Library Assessment Toolkit & Dashboard Scoping Research Final Report and Path Forward

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Summary

Research to scope a Library Assessment Toolkit and Dashboard, conducted between January and June 2016, suggests that the majority of library managers approach assessment and evaluation in an ad hoc and reactive manner as questions arise. Managers spend valuable time manually collecting, cleaning, and normalizing data from diverse systems, and then perform one-time or static interpretations. The library managers that we interviewed during our research felt that the availability of a toolkit and dashboard could free them to probe and interpret more data, think more strategically, and develop more meaningful questions about measuring and evaluating library performance. While the scoping research focused on the performance of research libraries, the proposed toolkit and dashboard framework could be adopted and customized by any type of library, including smaller college and university libraries, community college libraries, and public libraries. Institutionalizing the project through sponsorship by an appropriate body or syndicate of libraries would help assure its extensibility nationally and internationally.

The proposed toolkit and dashboard would build upon multiple important library assessment efforts internationally

Based on our research and interviews, the proposed toolkit would require the following elements:

- Key library performance indicators and supporting data formulae
- Library data inventory
- Library data dictionary
- Data normalization script library
- Customizable web browser-based dashboard with data visualization modules of key library performance indicators
- Recommendations and case studies for open data warehousing solutions
- Establishment of a membership consortium and online community to enable the adoption and support long-term sustainability of the toolkit and dashboard

The proposed toolkit and dashboard would build upon multiple important library assessment efforts internationally, including ARL's various assessment activities, JISC and the Higher Education Statistical Association's HEIDI plus initiatives (which includes the former LAMP project), Wollongong's Library Cube, the Public Library Association's Outcome Measures, ISO standard 11620:2014 of Library

Summary

Performance Indicators, and proprietary library collection assessment tools, such as SpringShare's LibAnalytics, OCLC's GreenGlass, and Orange Boy's demographic analytics dashboard, Savannah. The proposed project diverges from these important efforts, however, in that it would provide an "end-to-end," comprehensive framework that connects library key performance indicators with the full range of library data sources -- from operational and financial data to collection management data. The proposed project incorporates recommendations and tools for the technical support of data aggregation and normalization, efforts that are currently significant obstacles to libraries' assessment efforts. All of these elements will be needed if library managers are to be able to access and visualize current and historical library data in meaningful ways in support of quicker and better decisions concerning resources and services.

Establishing an open, online community and membership consortium would be key to the adoption and sustainability of the toolkit and dashboard

The parties involved in the scoping research -- University of California, Davis; University of Oxford; Göttingen State and University Library; and Athenaeum21 -- estimate that three years would be needed to develop a full-blown toolkit and dashboard as described. Establishing an open, online community and membership consortium would be key to the adoption and sustainability of the toolkit and dashboard. Likewise, an immediate first step towards the development of the toolkit and dashboard would be technical assessment of the feasibility and costs associated with open data warehousing solutions.

To advance this work, UC Davis and the project partners are in discussions with the members of Association of Research Libraries' Assessment Committee about developing the metrics framework and a community of institutions that could form the initial Dashboard community of users. With those elements of the overall work in place, the technology element to build the toolkit and dashboard can be more precisely scoped and costed. We will monitor the market in the interim to ensure that the technology development can advance quickly at that time.

Review of Work Completed

the general approach represented by a toolkit and dashboard resonated with the community

From January to June 2016, UC Davis and Athenaeum21, with collaborators at Göttingen and the Bodleian, engaged in scoping research to determine the nature and feasibility of a "library assessment dashboard toolkit." The specific purpose of the project was to scope the resources needed to design and build the toolkit and dashboard. Outcomes of this scoping research included

- A **draft framework** for mapping relationships among data sources, metrics, strategic and managerial questions, and service areas in libraries (Appendix 1.1)
- A detailed **data inventory** elaborating the common data sources available to libraries and the disparities among data sources across institutions (Appendix 1.2)
- A **tools inventory** summarizing the most commonly available tools for business intelligence, data warehousing, library assessment, and data visualization in academic research libraries (Appendix 1.3)
- A **requirements document**, outlining user needs for a library data warehouse and dashboard toolkit (Appendix 1.4)
- **User needs interviews**, investigating potential typical users and their immediate and future needs (Appendix 1.5).
- A preliminary concept for the **user interface** of the dashboard based on the draft framework (Appendix 1.6)
- A detailed **project implementation plan** including timeline, resource estimates for implementation of a dashboard and toolkit (Appendix 2).

In addition to a review of current and recent projects and initiatives at research libraries addressing the challenge of library assessment, the scoping team conducted interviews with fourteen research library leaders and/or assessment librarians at a number of pioneering institutions (including Yale, Duke, Penn, Wollongong, Jisc) in order to assess

- Current status of or plans for assessment at their organization
- Key management and strategic questions that library managers and executives want to be able to answer

The project team found that not only is there need for the development of a toolkit and dashboard, the general approach represented by a toolkit and

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dashboard resonated with the community. Notably, it was clear from both the interviews and queries to relevant listservs that

- Library managers and leaders agree on the need for a set of assessment tools and standards, ideally including capability to share and compare data across institutions
- In some cases, current needs are partially met by ad hoc sets of existing tools, sometimes via the library itself and at other times via access to institution-wide business intelligence (BI) tools

…most assessment activities are reactive: "Everything we're doing now is done on a question/ answer basis"

- Access to tools and standards is inconsistent among libraries, with a number of libraries having access to Tableau for visualizing data, but few having access to a data warehousing solution and even fewer having the resources to assemble the necessary components that would allow them to make use of their data effectively and consistently
- Even in cases where libraries have access to institution-wide BI solutions, these solutions may not be apt for their specific needs and often need to be customized
- The majority of assessment librarians' time is currently spent reacting to ad hoc, unanticipated requests, and manually normalizing and transforming the needed data. It was apparent from the interviews that libraries are striving for a systematic and regular approach to assessment data, but such an approach is not on the immediate horizon. As one interviewee said, "The holy grail for me is: 1) Present plan, 2) report on cost, 3) identify outcomes." The reality, however, is that most assessment activities are reactive: "Everything we're doing now is done on a question/answer basis"
- Many groups (such as LAMP in the UK, ISO standards for Library Performance Indicators, the University of Pennsylvania's MetriDoc data warehousing solution) have made significant efforts addressing aspects of end-to-end library assessment solutions or frameworks, but these solutions have not seen widespread adoption within the library community, and each solution offers just one facet of what could be a comprehensive, systematic solution for libraries
- The most sophisticated efforts that we encountered in the domain of aggregating and presenting data to assess library performance (namely, the Charlotte-Mecklenberg Public Library in North Carolina and the Jisc/HESA HEIDI Plus project in the UK) emerged out of library response to funding and budget cuts, or from reporting mandates tied to government legislation

Review of Work Completed

The current state of the use of assessment tools at research libraries around the world is inconsistent; our findings indicated that the need and desire for a standard toolkit is both common and urgent. As one interviewee said, "I think we will always have more complex, deep questions than a dashboard like this would answer, but having the dashboard would enable us to spend less time on getting answers to basic questions, and spend more time on the complex, deep questions."

"…having the dashboard would enable us to spend less time on getting answers to basic questions, and spend more time on the complex, deep questions."

Our research and interviews also suggested that library leaders are looking for answers to many of the same questions. The most common questions were the following (in the words of the interview respondents):

- Usage/Impact
- Who is not using the Library – is there a pattern in time or across demographics?
- Conversely, who is using the library, and what are the usage patterns?
- How effective are our promotional activities?
- Are the right demographic groups using the right resources?
- How does Library usage benefit clients?
- Collections
- Are we buying the right resources?
- Are the resources we are buying being used?
- What is the overall cost per use of digital versus print materials?
- How many reproduction requests are we getting?
- Are we getting ILL requests for items we already own? Is it because items are not being found via our systems, or because they are not available? If they are not available, are there ways we can make items more quickly available?
- When does it make sense to lease or borrow, versus purchase?
- How does time-sensitivity of fulfillment of requested item factor into the equation?
- Work Rate and Project Management
- How quickly is our backlog growing?
- How long did a specific project take and what was the breakdown of resources (costs for hardware, software, staff resources)?
- What is work volume by time of day, day of the week, and time during academic term across multiple work areas/functions (e.g., circulation, technical services, reference desk, research consultations, and instructional sessions)

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- Staff time and cost per project
- Physical Space
- How is our physical space being used, by whom and when?
- How many people are in our reading room(s) on average?
- How frequently are our on-site print collections being used?
- Does frequency of use justify in-library location, or should certain print items be stored off-site?
- Financial
- How are we spending our budget? What is the allocation, for example, between application developers and purchased discovery services?

The commonality of the questions, in conjunction with the desire to compare data across institutions, indicate that some effort may profitably be put to developing and defining a framework of performance indicators and defined data sources. With the right set of questions, identified and largely agreed to by a community of users, the framework should provide an overall picture of activities in a library sufficient to make many decisions about resource allocation. In the longer term, providing such a foundation will also enable libraries to more effectively demonstrate their contribution towards their parent institutions' teaching, learning, and research missions.

Other important findings of this scoping research include an understanding of how to prioritize access to "live data." That is, how important is it to update data on a live basis -- say, hourly or daily? What is the preferred frequency to update data? The project team found that for the interviewed library managers and executives, real-time live data is not currently a high priority. While dashboards often focus on live operational data, it was clear that in most cases quarterly updates would be fine and, in some cases, annual updates are sufficient. This preference will have the effect of lowering the costs of building and maintaining the toolkit as it will not need to account for live connections to all data sources. We anticipate, however, based on the responses of the more sophisticated assessment efforts (chiefly, in our research, Charlotte-Mecklenberg Public Library), that as quarterly and monthly data are normalized and utilized in a dashboard, the demand will likely increase for live data as new questions emerge.

Conclusion and Future Plans

All of the evidence gathered in the scoping research points to a clear need in the academic library community for a kit of standards and tools that would facilitate analysis, sharing, and comparing (benchmarking) data across institutions. Another outcome of this scoping research is a proposed model plan for a three-year project to develop the dashboard and toolkit and deploy them across the academic library community. Appendix 2 describes in detail this model project plan comprising a cooperative among multiple pilot implementing libraries and a strategic and implementation lead able to work across institutions. We estimate that such an approach to the effort would break out into the following elements:

- Framework, Data Model, and UI Dashboard
- Technical Infrastructure
- Project Management/Collaboration
- Community Engagement/Sustainability

Our scoping research described the conceptual underpinnings, technical elements, and a relatively detailed plan that would be required to develop a common library assessment toolkit and dashboard. There is need for such a framework and supporting infrastructure, according to our research, but limited capacity and expertise to develop them at the individual institutional level. A long-term goal and important extension of local practice supported by a common library assessment toolkit and dashboard is infrastructure for institutions to share and benchmark data with one another. An established, credible organization that can or already does manage the collection and sharing of data across individual institutions would be ideally situated to sponsor the development of the toolkit, dashboard, supporting technical infrastructure, and user community. Ideal entities would include mission-based, not-for-profit organizations with established credibility in the library assessment community, a focus on the success of research libraries, and capability of innovating, taking risks, and leveraging technology.

Our research has uncovered that the possible technical approaches to collecting, hosting, and managing data sources are varied and divergent,

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particularly in light of cloud-based solutions to managing data that provide alternatives to more traditional data warehousing approaches. Initiatives in institutions of higher education in the US and Europe that are in early stages of development may reveal advantages and disadvantages of various potential technical approaches within the next six to eighteen months.

Deeper research into the emerging approaches is needed before more precise development time and cost estimates can be made for the technical infrastructural components of the dashboard. However, work towards fully developing the framework and data dictionary, with real library data sources, can be undertaken in the near-term by individual institutions and/or sponsoring organizations. We are in conversations with the Association of Research Libraries and its Assessment Committee about the project, and are staying abreast of technology and organizational developments at JISC and HESA in the UK, the University of Pennsylvania (for the MetriDoc platform), the new Open Library Foundation's Folio system, and other initiatives. We expect the technology landscape and potential partnerships and sponsorships to solidify over the next year or so.

It was clear from our research that the responsibility for the long-term sustainability of the shared framework and/or software should not fall on a single institution. Therefore partnership with a membership organization or a network of membership organizations is being considered as a logical home for a new library assessment metrics framework and dashboard. That framework will, in turn, allow us to finalize the scope and cost of the toolkit and dashboard platform that libraries will need to collect, monitor, and use the metrics for more effective management. With the technology landscape in this area evolving so rapidly, beginning software developing before a widely agreed upon set of metrics are adopted would be premature. So we will defer developing a full grant proposal until the framework development is complete and the technology landscape can be reassessed over the next year.

The appendices below provide detailed explanation of the project scope and deliverables, as well as a project plan. While we are deferring the project described below, the work on the Library Assessment Dashboard Framework can continue through community collaboration and we remain confident that

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the project we planned will be ready to commence in a year, with only modest updates to the plan.

We would like to thank the Mellon Foundation for making this work possible, and for their ongoing support for scholarly communications and higher education research.

Appendix 1: Scoping Research Detail

1. Library Assessment Dashboard Draft Framework

All elements of this conceptual framework will be represented by modules in the library assessment dashboard user interface. Examples of Strategic, Managerial, and Operational key performance indicators are provided below. Each of these examples will be represented in the library assessment dashboard user interface as a chart or graph, or as a series of charts or graphs, as in the visual mockup in Appendix 1.6.

Key Performance Indicators (KPIs) will initially be based on the ISO11620:2014 Library Performance Indicators standard, and on indicators utilized by the partnering institutions. The KPIs listed below that are preceded by numbers (e.g. "B.2.2.2 Percentage of External Users") are ISO11620:2014 standards.

Service Area	Strategic KPI Examples	Key Managerial KPI Examples	Key Operational KPI Examples
Users and Space	B.2.2.2 Percentage of External Users; B.2.2.3 Percentage of the Total Library Lending to External Users	B.1.3.3 Hours Open Compared to Demand; B.1.3.4 Percentage of Storage Space Which Has an Appropriate Environment	Percentage of shelf space utilized
Collections	Percentage of Collection in digital format	B.2.1.1 Collection Turnover; B.1.2.6 Percentage of Rare Materials Accessible via Web Catalogues;	See 'Work Rate' Service Area
Library Use	B.2.1.2 Loans per Capita; B.2.1.3 Percentage of Stock Not Used B.3.1.3 Cost per Download	B.2.3.1 User Places Occupancy Rate; B.2.1.4 Number of Content Units Downloaded per Capita; B.1.1.3 Percentage of Rejected Accesses;	B.2.2.5 Number of User Attendances at Training Lessons per Capita
Financial	B.4.3.2 Percentage of Institutional Means allocated to the Library;	B.3.3.6 Staff Costs per Title Catalogued	B.3.1.3 Cost per Download

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	B.3.3.1 User Services Staff as a Percentage of Total Staff; B.3.3.3 Ratio of Acquisition Expenditures to Staff Costs		
Work Rate	See 'Financial' Service Area	B.3.3.5 Employee Productivity in Lending and Delivery Services; B.4.2.1 Percentage of Library Staff Providing Electronic Services; B.4.2.4 Percentage of Staff in Cooperative Partnerships and Projects	B.1.2.1 Shelving Accuracy; B.1.2.2 Median Time of Document Retrieval from Closed Stacks; B.1.2.3 Speed of Interlibrary Lending
Public Engagement	Exhibition Attendance Alumni gifts	No of visitors to websites (# website sessions)	Average length of visit to webpage - dwell time
Satisfaction	B.2.4.2 User Satisfaction; B.2.4.3 Willingness to Return	B.2.4.2 User Satisfaction; B.2.4.3 Willingness to Return	B.2.4.2 User Satisfaction; B.2.4.3 Willingness to Return

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2. Data Inventory

A detailed data inventory follows, elaborating the common data sources available to libraries and illustrating the disparities among data sources across institutions

Readers and Space

Category	Level of data	Data	related ISO 11620 Library Performance Indicator	Source system (UCD)	Source system (Oxford)	Source system (Gott)	Frequency of collection
University context	Management	Number of academic staff (FTE)	B.1.4.1 Staff per Capita; B.2.4.1 Percentage of the Target Population Reached; B.2.2.4 User Attendances at Library Events per Capita	Budget & Institutional Analysis (http://budget.ucdavis.edu/data-reports/documents/campus-population/ptotlpop_ycurr.pdf)	HESA return		Annually
University context	Management	Number of other University staff (FTE)	B.1.4.1 Staff per Capita; B.2.4.1 Percentage of the Target Population Reached; B.2.2.4 User Attendances at Library Events per Capita	Budget & Institutional Analysis (http://budget.ucdavis.edu/data-reports/documents/campus-population/ptotlpop_ycurr.pdf)	HESA return		Annually
University context	Management	Number of students (FTE)	B.1.4.1 Staff per Capita; B.2.4.1 Percentage of the Target Population Reached; B.2.2.4 User Attendances at Library Events per Capita	Budget and Institutional Analysis (http://budget.ucdavis.edu/data-reports/enrollment-reports.html)	HESA return		Annually
Reader/Patron/User Numbers	Strategic	Number of University readers	B.1.4.1 Staff per Capita; B.2.4.1 Percentage of the Target Population Reached; B.2.2.4 User Attendances at Library Events per Capita	Campus data: graduate & undergraduate students enrollments and other data (http://budget.ucdavis.edu/data-reports/enrollment-reports.html)	calculation		
Reader/Patron/User Numbers	Strategic	Number of external readers	B.2.2.2 Percentage of External Users; B.2.2.3 Percentage of the Total Library Lending to External Users		Library card database		Census last weekday of teaching year
Reader/Patron/User Numbers	Strategic	Registered active users	B.1.4.1 Staff per Capita; B.2.4.1 Percentage of the Target Population Reached; B.2.2.4 User Attendances at Library Events per Capita			Yes	Annual
Library space	Strategic	Number of libraries		Library Homepage (https://www.lib.ucdavis.edu/)	Planon		Annual
Library space	Strategic	Number of other areas managed by the library	B.1.3.1 User Area per Capita		Planon		Annual

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Library space	Strategic	Net Internal Floor Area	B.1.3.1 User Area per Capita	Campus & Space Planning (account required - url: http://crm.ucdavis.edu/space-resource-management/annual-report-and-database-downloads.html)	Planon		Annual
Library space	Strategic	Gross Internal Floor Area	B.1.3.1 User Area per Capita	Campus & Space Planning (account required - url: http://crm.ucdavis.edu/space-resource-management/annual-report-and-database-downloads.html)	Planon		Annual
Physical Library provision	Strategic	Number of reader seats	B.1.3.2 User Places per Capita		Manual Count		Annual
Physical Library provision	Management	Number of reader workstations	B.1.3.2 User Places per Capita		Manual Count		Annual
Physical Library provision	Management	Number of reader seats at AV equipment	B.1.3.2 User Places per Capita		Manual Count		Annual
Physical Library provision	Management	Opening hours by library	B.1.3.3 Hours Open Compared to Demand	UCD Library Hours page (https://www.lib.ucdavis.edu/ul/about/hours/)	Website	Yes	Annual
Physical Library provision	Strategic	Number of libraries open 24/7	B.1.3.3 Hours Open Compared to Demand	UCD Library Hours page (https://www.lib.ucdavis.edu/ul/about/hours/)	Website		Annual
Physical Library provision	Strategic	Number of regular opening hours per week in the main library	B.1.3.3 Hours Open Compared to Demand	UCD Library Hours page (https://www.lib.ucdavis.edu/ul/about/hours/)	Website	Yes	Annual
Physical Library provision	Operational	Utilized shelf space	B.1.3.4 Percentage of Storage Space Which Has an Appropriate Environment	Yes	Manual count		Annual
Physical Library provision	Operational	Open shelf space					

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Collection Size

Category	Level of data	Data	related ISO 11620 Library Performance Indicator	Source system (UCD)	Source system (Oxford)	Source system (Gott)	Frequency of collection
Print stock	Strategic	Total catalogued print stock		UC Libraries' statistics - url: http://libraries.universityofcalifornia.edu/about/facts-and-figures; ARL-url: https://www.arlstatistics.org/dashboard; ACRL- url: https://acrl.countingopinions.com/main.php; and Internal Library documents	ALEPH		Annual
Print stock	Management	Extent of print collection for each physical library		UC Libraries' statistics - url: http://libraries.universityofcalifornia.edu/about/facts-and-figures; ARL-url: https://www.arlstatistics.org/dashboard; ACRL- url: https://acrl.countingopinions.com/main.php; and Internal Library documents	ALEPH		Annual
Print stock	Management	Number of additions to catalogued stock	B.2.1.1 Collection Turnover	UC Libraries' statistics - url: http://libraries.universityofcalifornia.edu/about/facts-and-figures; ARL-url: https://www.arlstatistics.org/dashboard; ACRL- url: https://acrl.countingopinions.com/main.php; and Internal Library documents	ALEPH		Annual
Print stock	Management	Number of additions to catalogued stock for each physical library	B.2.1.1 Collection Turnover	UC Libraries' statistics - url: http://libraries.universityofcalifornia.edu/about/facts-and-figures; ARL-url: https://www.arlstatistics.org/dashboard; ACRL- url: https://acrl.countingopinions.com/main.php; and Internal Library documents	ALEPH		Annual
Print stock	Management	Number of withdrawls to catalogued stock for each physical library	B.2.1.1 Collection Turnover	UC Libraries' statistics - url: http://libraries.universityofcalifornia.edu/about/facts-and-figures; ARL-url: https://www.arlstatistics.org/dashboard; ACRL- url: https://acrl.countingopinions.com/main.php; and Internal Library documents	ALEPH		Annual
Legal Deposit	Management	Number of print Legal Deposit books received		UC Libraries' statistics - url: http://libraries.universityofcalifornia.edu/about/facts-and-figures; ARL-url: https://www.arlstatistics.org/dashboard; ACRL- url: https://acrl.countingopinions.com/main.php; and Internal Library documents	ALEPH		

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Special Collections	Management	Meters of archives and manuscripts received	B.1.2.6 Percentage of Rare Materials Accessible via Web Catalogues; B.1.2.7 Percentage of Rare Collection in Stable Condition	UC Libraries' statistics - url: http://libraries.universityofcalifornia.edu/about/facts-and-figures; ARL-url: https://www.arlstatistics.org/dashboard; ACRL- url: https://acrl.countingopinions.com/main.php; and Internal Library documents	Custom database		Annual
Special Collections	Strategic	Total meters of archives and manuscripts		UC Libraries' statistics - url: http://libraries.universityofcalifornia.edu/about/facts-and-figures; ARL-url: https://www.arlstatistics.org/dashboard; ACRL- url: https://acrl.countingopinions.com/main.php; and Internal Library documents	Calculated		Annual
Ebooks	Strategic	Total number of electronic books		UC Libraries' statistics - url: http://libraries.universityofcalifornia.edu/about/facts-and-figures; ARL-url: https://www.arlstatistics.org/dashboard; ACRL- url: https://acrl.countingopinions.com/main.php; and Internal Library documents	Excel		Annual
Ebooks	Management	Number of ebooks purchased this year		UC Libraries' statistics - url: http://libraries.universityofcalifornia.edu/about/facts-and-figures; ARL-url: https://www.arlstatistics.org/dashboard; ACRL- url: https://acrl.countingopinions.com/main.php; and Internal Library documents	Excel		Annual
Legal Deposit	Management	Electronic legal deposit books			ALPEH, SFX, Marcit + other data		Weekly
Journals	Management	Number of current serial titles in print only		UC Libraries' statistics - url: http://libraries.universityofcalifornia.edu/about/facts-and-figures; ARL-url: https://www.arlstatistics.org/dashboard; ACRL- url: https://acrl.countingopinions.com/main.php; and Internal Library documents	ALPEH, SFX, Marcit + other data		Weekly
Journals	Strategic	Number of current serial titles available electronically		UC Libraries' statistics - url: http://libraries.universityofcalifornia.edu/about/facts-and-figures; ARL-url: https://www.arlstatistics.org/dashboard; ACRL- url: https://acrl.countingopinions.com/main.php; and Internal Library documents	ALPEH, SFX, Marcit + other data		Weekly
Journals	Strategic	Total number of serial titles		UC Libraries' statistics - url: http://libraries.universityofcalifornia.edu/about/facts-	ALPEH, SFX, Marcit + other data		Weekly

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				and-figures; ARL-url: https://www.arlstatistics.org/dashboard; ACRL- url: https://acrl.countingopinions.com/main.php; and Internal Library documents			
Legal deposit	Management	Number of Legal Deposit print serial titles received			ALPEH, SFX, Marcit + other data		Weekly
Legal deposit	Management	Number of Legal Deposit electronic serial titles received			ALPEH, SFX, Marcit + other data		Weekly
Databases	Management	Number of databases purchased but not this year			Excel		Annual
Databases	Management	Number of databases purchased this year		UC Libraries' statistics - url: http://libraries.universityofcalifornia.edu/about/facts-and-figures; ARL-url: https://www.arlstatistics.org/dashboard; ACRL- url: https://acrl.countingopinions.com/main.php; and Internal Library documents	Excel		Annual
Databases	Management	Number of free databases made available via Library platforms			Ex Libris database		Annual
Databases	Strategic	Total number of databases available		UC Libraries' statistics - url: http://libraries.universityofcalifornia.edu/about/facts-and-figures; ARL-url: https://www.arlstatistics.org/dashboard; ACRL- url: https://acrl.countingopinions.com/main.php; and Internal Library documents	calculated		Annual
Repository	Strategic	Number of complete works (Total)		Yes	Custom database		Monthly
Repository	Management	Number of bib records (total)		UC Libraries' statistics - url: http://libraries.universityofcalifornia.edu/about/facts-and-figures; ARL-url: https://www.arlstatistics.org/dashboard; ACRL- url:	Custom database		Monthly

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				https://acrl.countingopinions.com/main.php; and Internal Library documents			
Repository	Management	Number of complete works (added)		Yes	Custom database		Monthly
Repository	Management	Number of bib records (added)		UC Libraries' statistics - url: http://libraries.universityofcalifornia.edu/about/facts-and-figures; ARL-url: https://www.arlstatistics.org/dashboard; ACRL- url: https://acrl.countingopinions.com/main.php; and Internal Library documents	Custom database		Monthly
Digitization	Management	Digital Assets added to collection	B.1.1.4 Number of Documents Digitized per 1000 Documents in Collection	UC Libraries' statistics - url: http://libraries.universityofcalifornia.edu/about/facts-and-figures; ARL-url: https://www.arlstatistics.org/dashboard; ACRL- url: https://acrl.countingopinions.com/main.php; and Internal Library documents	Goobi + HFS	Yes	Annual
Digitization	Strategic	Digital assets (total)	B.1.1.4 Number of Documents Digitized per 1000 Documents in Collection	UC Libraries' statistics - url: http://libraries.universityofcalifornia.edu/about/facts-and-figures; ARL-url: https://www.arlstatistics.org/dashboard; ACRL- url: https://acrl.countingopinions.com/main.php; and Internal Library documents	digital.bodleian	Yes	Annual

Library use

Category	**Level of data**	**Data**	**related ISO 11620 Library Performance Indicator**	**Source system (UCD)**	**Source system (Oxford)**	**Source system (Gott)**	**Frequency of collection**
Physical Library use	Strategic	Reader visits total	B.2.2.1 Library Visits per Capita	ARL-url: https://www.arlstatistics.org/dashboard;	Telepen; Salto; manual	Yes	Continuous
Physical Library use	Management	Reader visits by library	B.2.2.1 Library Visits per Capita	ARL-url: https://www.arlstatistics.org/dashboard;	Telepen; Salto; manual	Yes	Continuous
Physical Library use	Management	Reader visits unique visitors	B.2.2.1 Library Visits per Capita		Telepen; Salto		Continuous
Physical Library use	Management	Occupancy	B.2.3.1 User Places Occupancy Rate		Manual count		Census 12 days per year (twice per day)
Physical	Management	Use of carrels	B.2.3.1 User Places Occupancy Rate			Yes	Annual

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Library use							
Circulation	Strategic	Circulation of physical stock (total)	B.2.1.2 Loans per Capita; B.2.1.3 Percentage of Stock Not Used	Aleph; Access Database - Refile data print resources that are Library Use Only (LUO); UC Libraries' statistics - url: http://libraries.universityofcalifornia.edu/about/facts-and-figures; ARL-url: https://www.arlstatistics.org/dashboard; ACRL- url: https://acrl.countingopinions.com/main.php	Aleph + manual count + Aeon	Yes	Annual
Circulation	Management	Circulation of physical stock for each physical library	B.2.1.2 Loans per Capita; B.2.1.3 Percentage of Stock Not Used	Aleph; Access Database - Refile data print resources that are Library Use Only (LUO); UC Libraries' statistics - url: http://libraries.universityofcalifornia.edu/about/facts-and-figures; ARL-url: https://www.arlstatistics.org/dashboard; ACRL- url: https://acrl.countingopinions.com/main.php	Aleph + manual count + Aeon	Yes	Annual
Circulation	Management	Number of reservations		Yes		Yes	Annual
Resource discovery	Strategic	Number of OPAC searches			Aleph	Pica / DBS Pixel	Annual
Resource discovery	Strategic	Database searches (COUNTER DB1)		CDL, Collection Development & Management Licensed Resources Team (http://www.cdlib.org/services/collections/usage_stats/)	SUSHI/JUSP	Yes	Bodleian - Quarterly; UCD - monthly, yearly. Can be determined by user.
Digital library use	Strategic	Full-text article requests from journals (COUNTER JR1	B.2.1.4 Number of Content Units Downloaded per Capita; B.1.1.3 Percentage of Rejected Accesses; B.3.1.3 Cost per Download	CDL, Collection Development & Management Licensed Resources Team (http://www.cdlib.org/services/collections/usage_stats/)	SUSHI/JUSP	Yes	Bodleian - Quarterly; UCD - monthly, yearly. Can be determined by user.
Digital library use	Strategic	Section requests for electronic books (COUNTER BR2	B.2.1.4 Number of Content Units Downloaded per Capita; B.1.1.3 Percentage of Rejected Accesses; B.3.1.3 Cost per Download	CDL, Collection Development & Management Licensed Resources Team (http://www.cdlib.org/services/collections/usage_stats/)	SUSHI/JUSP	Yes	Bodleian - Quarterly; UCD - monthly, yearly. Can

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							be determined by user.
Digital library use	Strategic	Accesses to digitized images			Google Analytics	Yes	Continuous
PCAS	Management	Number of photocopies		yes	Pcounter	Yes	Annual
PCAS	Management	Number of scans		yes	Pcounter	Yes	Annual
PCAS	Management	Number of print outs		yes	Pcounter	Yes	Annual
ILL	Management	Number of ILLs requested by our readers	B.2.1.2 Loans per Capita	CDL Resource Sharing and campus ILL offices (http://www.cdlib.org/services/d2d/ill/ill_usage_statistics.html); ADS, ILL (UCD ILL usage statistics maintained by ILL department); UC Libraries' statistics - url: http://libraries.universityofcalifornia.edu/about/facts-and-figures; ARL-url: https://www.arlstatistics.org/dashboard; ACRL- url: https://acrl.countingopinions.com/main.php; and Internal Library documents	Custom database	MyBib	Bodleian - Annual; UCD - daily, monthly, yearly, etc. Can be determined by user.
Information skills	Strategic	Number of Info Skills courses	B.2.2.4 User Attendances at Library Events per Capita	UC Libraries' statistics - url: http://libraries.universityofcalifornia.edu/about/facts-and-figures; ARL-url: https://www.arlstatistics.org/dashboard; ACRL- url: https://acrl.countingopinions.com/main.php; and Internal Library documents	Excel	Yes	Termly
Information skills	Strategic	Number of Info Skills course attendees	B.2.2.5 Number of User Attendances at Training Lessons per Capita	Yes	Excel	Yes	Termly
Information skills	Management	Number of Info Skills courses by subject / library		Yes	Excel		Termly
Information skills	Management	Number of Info Skills course attendees by subject / library	B.2.2.5 Number of User Attendances at Training Lessons per Capita	Yes	Excel		Termly
Enquiries	Strategic	Count of all enquiries received		Yes	Manual	Yes	Sample 1 week per year / 2 weeks per

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							year
Enquiries	Management	Count of all enquiries received, by type and requestor for each library		Yes	Manual	Yes	Sample 1 week per year / 2 weeks per year
Enquiries	Management	Scholarly communication advice (OA, Copyright etc)		Yes	Manual		
Repository use	Strategic	Number of accesses to full text items in repository (total)	B.2.1.5 Number of Downloads per Document Digitized; B.2.1.4 Number of Content Units Downloaded per Capita; B.1.1.3 Percentage of Rejected Accesses; B.3.1.3 Cost per Download		Custom database (SQL)		Monthly
Repository use	Management	Number of accesses to bib records in repository (total)			Custom database (SQL)		Monthly
Repository use	Management	Number of accesses to full text items in repository (new)	B.2.1.5 Number of Downloads per Document Digitized; B.2.1.4 Number of Content Units Downloaded per Capita; B.1.1.3 Percentage of Rejected Accesses; B.3.1.3 Cost per Download		Custom database (SQL)		Monthly
Repository use	Management	Number of accesses to bib records in repository (new)			Custom database (SQL)		Monthly
Repository use	Management / Strategic	Number of accesses to items digitized against specific project			Custom database (SQL)		Monthly

Financial

Category	**Level of data**	**Data**	**related ISO 11620 Library Performance Indicator**	**Source system (UCD)**	**Source system (Oxford)**	**Source system (Gott)**	**Frequency of collection**

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University context	Strategic	University expenditure	B.4.3.2 Percentage of Institutional Means allocated to the Library	Camput budget information: UCD Financial Report - http://cfo.ucdavis.edu/documents/publications/financial-report-2014-15-web.pdf and UCD Overview - http://budget.ucdavis.edu/factsheet/current_base_budget_overview.pdf		Website	Annual
Library space	Strategic	Space charge		Yes		SAP, FI	Annual
Admissions (external)	Strategic	Admissions for academic year		http://budget.ucdavis.edu/data-reports/enrollment-reports.html	Custom Card Database	Website	Annual
Income	Strategic	Income from PCAS	B.4.3.1 Percentage of Library Means Received by Special Grant or Income Generated		Calculated	SAP, FI	
Income	Strategic	Income from ILL	B.4.3.1 Percentage of Library Means Received by Special Grant or Income Generated			SAP, FI	
Enterprises	Management	Number of book titles published		Yes		Excel	
Enterprises	Management	Published titles - books sold			Excel	Excel	
Enterprises	Management	Shop sales	B.4.3.1 Percentage of Library Means Received by Special Grant or Income Generated		K3 retail systems	SAP, FI	Annual
Enterprises	Management	Number of visitors taking guided tours			EPOS, Calendar, Online store	Excel	Daily
Enterprises	Management	Number of visitors taking audio tours			EPOS, Calendar, Online store	Excel	Daily
Enterprises	Management	Number of visitors to the Divinity School			EPOS, Calendar, Online store	Excel	Daily
Enterprises	Management	Total number of tour visitors			EPOS, Calendar, Online store	Excel	Daily

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Income from Enterprises	Strategic		B.4.3.1 Percentage of Library Means Received by Special Grant or Income Generated			SAP, FI	
Staff	Strategic	Professional posts (FTE) (excl trading & projects)		Yes	CORE	SAP, HR	
Staff	Strategic	Other library posts (FTE) (excl trading & projects)		Yes	CORE	SAP, HR	
Staff	Strategic	Total Trading posts (FTE)		Yes	CORE	SAP, HR	
Staff	Strategic	Total externally funded project posts (FTE)		Yes	CORE	SAP, HR	
Staff	Strategic	Total library/information posts (FTE)		Yes	CORE	SAP, HR	
Staff	Strategic	Professional posts (£) (excl trading & projects)		Yes	Oracle Financials	not available	
Staff	Strategic	Other library posts (£) (excl trading & projects)		Yes	Oracle Financials	not available	
Staff	Strategic	Total Trading posts (£)		Yes	Oracle Financials	SAP, FI	
Staff	Strategic	Total externally funded project posts (£)		Yes	Oracle Financials	SAP, FI	
Staff	Strategic	Total library/information posts (£)		Yes	Oracle Financials	SAP, FI	
Expenditure	Management	Expenditure on Books inc. special collections	B.3.1.2 Acquisition Cost per Collection Use	Yes	Oracle Financials	ACQ	
Expenditure	Management	Expenditure on Print serials	B.3.1.2 Acquisition Cost per Collection Use	Yes	Oracle Financials	ACQ	
Expenditure	Management	Expenditure on Electronic serials	B.3.1.2 Acquisition Cost per Collection Use	Yes	Oracle Financials	ACQ	
Expenditure	Management	Expenditure on e-Books	B.3.1.2 Acquisition Cost per Collection Use	Yes	Oracle Financials	ACQ	

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Expenditure	Management	Expenditure on e-Book databases	B.3.1.2 Acquisition Cost per Collection Use	Yes	Oracle Financials	ACQ	
Expenditure	Management	Expenditure on Other databases	B.3.1.2 Acquisition Cost per Collection Use	Yes	Oracle Financials	ACQ	
Expenditure	Management	Expenditure on Binding, preservation and repairs		Yes	Oracle Financials	ACQ	
Expenditure	Management	Expenditure on Non-book and other library materials, not included elsewhere		Yes	Oracle Financials	ACQ	
Expenditure	Strategic	Expenditure on Total Information Provision and Access Expenditure		Yes	Oracle Financials	ACQ	
Expenditure	Strategic	Expenditure on APCs if this is part of the Library budget			Oracle Financials	ACQ	
Expenditure	Strategic	Total expenditure on digital resources	B.4.1.1 Percentage of Expenditure on Information Provision Spent on the Electronic Collection	Yes	Oracle Financials	ACQ	
Expenditure	Strategic	Total expenditure of print resources		Yes	Oracle Financials	ACQ	
Expenditure	Strategic	Total Equipment Expenditure		Yes	Oracle Financials	SAP, FI	
Expenditure	Strategic	Total expenditure on buildings & utilities			Oracle Financials	SAP, FI	
Expenditure	Strategic	Total other operational expenditure		Yes	Oracle Financials	SAP, FI	
Expenditure	Strategic	Total gross library expenditure		Yes	Oracle Financials	SAP, FI	
Income	Strategic	Income - Block grant	B.4.3.1 Percentage of Library Means Received by Special Grant or Income	Yes	Oracle Financials	SAP, FI	

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			Generated				
Income	Strategic	Other income - total internal	B.4.3.1 Percentage of Library Means Received by Special Grant or Income Generated	Yes	Oracle Financials	SAP, FI	
Income	Management	Income from Fines for overdue loans, and reparation for lost items etc.	B.4.3.1 Percentage of Library Means Received by Special Grant or Income Generated	Yes	Oracle Financials	SAP, FI	
Income	Strategic	Other income - total external	B.4.3.1 Percentage of Library Means Received by Special Grant or Income Generated	Yes	Oracle Financials	SAP, FI	
Income	Strategic	Research grants	B.4.3.1 Percentage of Library Means Received by Special Grant or Income Generated	Yes	Oracle Financials	not applicable	
Income	Strategic	Income received for projects	B.4.3.1 Percentage of Library Means Received by Special Grant or Income Generated	Yes	Oracle Financials	SAP, FI	
Income	Strategic	Actual annual income received from donations and bequests	B.4.3.1 Percentage of Library Means Received by Special Grant or Income Generated	Yes	Oracle Financials	not applicable	
Income	Strategic	Any other income from external sources	B.4.3.1 Percentage of Library Means Received by Special Grant or Income Generated	Yes	Oracle Financials	SAP, FI	
Income	Strategic	Total income		Yes	Oracle Financials	SAP, FI	
Eresources	Operational	E-resource publication, subscription, licence and management info		Yes	Knowledgebase+	ACQ	
Eresources	Operational	Expenditure on eresources by subject / librarian / faculty			Oracle Financials + ALPEH	ACQ	Monthly

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Expenditure	Management	Cost per Collection Use	B.3.1.1 Cost per Collection Use				
Expenditure	Management	Cost per Download	B.3.1.3 Cost per Download				
Expenditure	Management	Cost per User	B.3.4.1 Cost per User				
Expenditure	Management	Cost per Library Visit	B.3.4.2 Cost per Library Visit				
Expenditure	Management	Staff Costs per Title Catalogued	B.3.3.6 Staff Costs per Title Catalogued				
Expenditure	Management	User Services Staff as a Percentage of Total Staff	B.3.3.1 User Services Staff as a Percentage of Total Staff				
Expenditure	Management	Ratio of Acquisition Expenditures to Staff Costs	B.3.3.3 Ratio of Acquisition Expenditures to Staff Costs				

Public Engagement

Category	**Level of data**	**Data**	**related ISO 11620 Library Performance Indicator**	**Source system (UCD)**	**Source system (Oxford)**	**Source system (Gott)**	**Frequency of collection**
Exhibition	Management	Special Collection items loaned for exhibition elsewhere			Excel		Annual
Exhibition	Strategic	Special Collection items displayed at Bodleian Libraries		yes	Excel		Annual
Exhibition	Strategic	Visitors to exhibitions (total)			Countwise		Daily
Exhibition	Management	Visitors to exhibitions (per exhibition)			Countwise		Daily
Digitization	Management	# images taken in the studio made available to the public via Bodleian hosted service			Digital.Bodleian		Annual
Digitization	Management	# images taken in the studio made available to the public hosted elsewhere					Annual
Digitization	Strategic	Total number of images of			calculated		Annual

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		treasures available to the public					
Social Media	Strategic	Mentions on social media			calculated		Annual
Social Media	Management	Twitter impressions			Twitter		Monthly
Social Media	Management	Twitter engagements (people clicking, re-tweeting, favouriting)			Twitter		Monthly
Social Media	Management	YouTube minutes watched			Youtube		Monthly
Social Media	Management	Visitors to blogs			GoogleAnalytics		Monthly
Social Media	Management	Impressions on Pinterest			Pinterest		Monthly
Social Media	Management	Number of times users engaged with our content on Facebook			Facebook		Monthly
Social Media	Management	facebook impressions			Facebook		Monthly
Social Media	Management	Instagram followers			Instagram		Monthly
Social Media	Management	Instagram likes			Instagram		Monthly
Website	Strategic	No of visitors to websites (# website sessions)			GoogleAnalytics	Yes	Continuous
Website	Management	Average length of visit to webpage - dwell time			GoogleAnalytics		Continuous
Media	Management	Mentions in UK newspapers / print and online media (excl social media)			Meltwater and vocus		Weekly
Media	Management	Mentions in international (non-UK) newspapers, print and online media (excl social media)			IPCB		Weekly
Ebooks	Strategic	Number of books available via GoogleBooks					

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Work Rate

Category	Level of data	Data	related ISO 11620 Library Performance Indicator	Source system (UDC)	Source system (Oxford)	Source system (Gott)	Frequency of collection
ILL	Operational	Number of Inter-library loans satisfied	B.1.2.4 Percentage of Successful Interlibrary Loans	Yes	Custom database		
ILL	Operational	Number of items requested by other libraries	B.1.2.4 Percentage of Successful Interlibrary Loans	Yes			
ILL	Operational	Number of items supplied to other libraries	B.1.2.4 Percentage of Successful Interlibrary Loans	Yes			
Scan & Deliver	Operational	Total number of scan & deliver requests		yes	SOLO		Annual
Scan & Deliver	Operational	% completed scan & deliver requests			SOLO		Annual
Circulation	Operational	Number of items re-shelved		yes			
Conservation	Operational	Items treated in conservation workshop	B.1.2.8 Percentage of Rare Materials Needing Conservation/Restoration Treatment that Received Such Treatment	Yes	Excel		Monthly
Digitization	Operational	Throughput of digitization studio		Yes			
ARACU	Operational	Number of print disabled students supported by ARACU					
ARACU	Operational	Number of pages produced in alternative formats		yes	Excel		Daily
ARACU	Operational	Number of items located in accessible format			Excel		Daily
Communications	Operational	Number of PR campaigns			Excel		Annual
Communications	Operational	Number of pieces of graphic design work undertaken			Excel		Annual
HR	Operational	Number of recruitment campaigns run			CORE		Annual
Enterprises	Operational	Items added to Electronic Enlightenment database			GoogleAnalytics		Annual
Cataloguing	Operational	Number of items			Excel		Daily

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		catalogued					
HR	Management	Staff development courses run		Yes	CORE		Annual
HR	Management	Staff development course attendees	B.4.2.3 Percentage of Staff Time Spent in Training; B.4.2.2 Number of Attendance Hours at Formal Training Lessons per Staff Member	Yes	CORE		Annual
HR	Management	Staff development course participants	B.4.2.3 Percentage of Staff Time Spent in Training; B.4.2.2 Number of Attendance Hours at Formal Training Lessons per Staff Member	Yes	CORE		Annual
Storage & Logistics	Operational	Items ingested into Book Storage Facility		Yes	BSFIS (warehouse management system		Annual
Collection developme nt	Operational	Scoping and selection, by category / criteria		Yes			
Acquisitions	Operational	Processing		Yes			
Acquisitions	Operational	Checkin		Yes			
Acquisitions	Operational	Claiming					
Acquisitions	Operational	licensing		Yes			
Cataloguing	Operational	Origional cataloguing by format / source / standard		Yes			
Cataloguing	Operational	Copy cataloguing					
Cataloguing	Operational	Authority control					
Cataloguing	Operational	Data loading and processing		Harvest, OCLC			
Cataloguing	Operational	e-resources loading and maintainance		SFX, GIS, DAMS			
Cataloguing	Operational	Standards setting		Yes			
IT	Operational	Software / systems upgrades, enhancements and bugs fixed		Yes			
	Operational	Shelving Accuracy	B.1.2.1 Shelving Accuracy				
	Operational	Median Time of Document Retrieval from Closed	B.1.2.2 Median Time of Document Retrieval from Closed Stacks				

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		Stacks					
ILL	Operational	Speed of Interlibrary Lending	B.1.2.3 Speed of Interlibrary Lending				
Reference	Operational	Speed of Reference Transactions	B.1.2.5 Speed of Reference Transactions				
	Operational	Median Time of Document Acquisition	B.3.2.1 Median Time of Document Acquisition				
	Operational	Median Time of Document Processing	B.3.2.2 Median Time of Document Processing				
	Operational	Correct Answer Fill Rate	B.3.3.2 Correct Answer Fill Rate				
	Management	Employee Productivity in Media Processing	B.3.3.4 Employee Productivity in Media Processing				
	Management	Employee Productivity in Lending and Delivery Services	B.3.3.5 Employee Productivity in Lending and Delivery Services				
	Management	Percentage of Library Staff Providing Electronic Services	B.4.2.1 Percentage of Library Staff Providing Electronic Services				
	Management	Percentage of Staff in Cooperative Partnerships and Projects	B.4.2.4 Percentage of Staff in Cooperative Partnerships and Projects				

Satisfaction

Category	**Level of data**	**Data**	**related ISO 11620 Library Performance Indicator**	**Source system (UCD)**	**Source system (Oxford)**	**Source system (Gott)**	**Frequency of collection**
User satisfaction	Strategic	National Student Survey score on library question (Q16)	B.2.4.2 User Satisfaction; B.2.4.3 Willingness to Return		NSS results excel sheet		Annual
User satisfaction	Strategic	Ithaka Faculty Survey	B.2.4.2 User Satisfaction; B.2.4.3 Willingness to Return	Ithaka survey results			
Employee satisfaction	Strategic	Employee survey					
User satisfaction	Strategic	Qualtrics surveys	B.2.4.2 User Satisfaction; B.2.4.3 Willingness to Return				

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Parent Institution

Category	Level of data	Data	related ISO 11620 Library Performance Indicator	Source system (UCD)	Source system (Oxford)	Source system (Gott)	Frequency of collection	Notes
Faculty Success	Strategic	Tenure/promotion judgments						ARL-ASSESS and LIBER Listserv query response
Faculty Success	Strategic	Faculty Publications	B.1.1.5 Percentage of the Owner Institution's Academic Publications in the Institutional Repository					
Faculty Success	Strategic	Faculty Research Productivity						ARL-ASSESS and LIBER Listserv query response
Faculty Success	Strategic	Faculty Grants						ARL-ASSESS and LIBER Listserv query response
Institution Success	Strategic	Student Enrollment						ARL-ASSESS and LIBER Listserv query response
Institution Success	Strategic	Recruitment of prospective students						ARL-ASSESS and LIBER Listserv query response
Institution Success	Strategic	Matriculation of admitted students						ARL-ASSESS and LIBER Listserv query response
Institution Success	Strategic	Faculty recruitment						ARL-ASSESS and LIBER Listserv query response
Institution Success	Strategic	Institutional rankings						ARL-ASSESS and LIBER Listserv query response
Institution Success	Strategic	Institutional Reputation & Prestige						ARL-ASSESS and LIBER Listserv query response
Institution Success	Strategic	Alumni donations						
Research Success	Strategic	Number of publications, number of patents, value of technology transfer						ARL-ASSESS and LIBER Listserv query response
Research Success	Strategic	Number of grant proposals (funded or unfunded)						ARL-ASSESS and LIBER Listserv query response
Research Success	Strategic	Value of grants funded						ARL-ASSESS and LIBER Listserv query response
Student Success	Strategic	Fall-to-fall retention						ARL-ASSESS and LIBER Listserv query response
Student Success	Strategic	Graduation rates						ARL-ASSESS and LIBER Listserv query response
Student Success	Strategic	Student Retention & Graduation						ARL-ASSESS and LIBER Listserv query response

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Student Success	Strategic	Internship success						ARL-ASSESS and LIBER Listserv query response
Student Success	Strategic	Job placement						ARL-ASSESS and LIBER Listserv query response
Student Success	Strategic	Job salaries						ARL-ASSESS and LIBER Listserv query response
Student Success	Strategic	Professional/graduate school acceptance						ARL-ASSESS and LIBER Listserv query response
Student Success	Strategic	Marketable skills						ARL-ASSESS and LIBER Listserv query response
Student Success	Strategic	Student Success						ARL-ASSESS and LIBER Listserv query response
Student Success	Strategic	GPA						ARL-ASSESS and LIBER Listserv query response
Student Success	Strategic	Professional/educational test scores						ARL-ASSESS and LIBER Listserv query response
Student Success	Strategic	Student Achievement						ARL-ASSESS and LIBER Listserv query response
Student Success	Strategic	Learning assessments						ARL-ASSESS and LIBER Listserv query response
Student Success	Strategic	Student Learning						ARL-ASSESS and LIBER Listserv query response
Student Success	Strategic	Senior/alumni studies						ARL-ASSESS and LIBER Listserv query response
Teaching Support	Management	Integration of library resources and services into course syllabi, websites,	B.1.1.2 Percentage of Required Titles in Collection; B1.1.1 Required Titles Availability					ARL-ASSESS and LIBER Listserv query response
Teaching Support	Management	lectures, labs, texts, reserve readings, etc.	B.1.1.2 Percentage of Required Titles in Collection; B1.1.1 Required Titles Availability					ARL-ASSESS and LIBER Listserv query response
Teaching Support	Management	Faculty/librarian collaborations; cooperative curriculum, assignment, or						ARL-ASSESS and LIBER Listserv query response

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Other Sources

Source of Input	Data Source or Indicator	Description 1
CDL (California Digital Library)	HathiTrust	
CDL (California Digital Library)	DASH	
CDL (California Digital Library)	DMP Tool	
CDL (California Digital Library)	eScholarship	
CDL (California Digital Library)	EZID	
CDL (California Digital Library)	Mass Digitization: Google	
CDL (California Digital Library)	Mass Digitization: Internet Archive	
CDL (California Digital Library)	Melvyl	
CDL (California Digital Library)	Merritt	
CDL (California Digital Library)	OAC/Calisphere	
CDL (California Digital Library)	Request	
CDL (California Digital Library)	UC Shared Print	
CDL (California Digital Library)	UC eLinks	
CDL (California Digital Library)	UCLDC-Access	
CDL (California Digital Library)	UCLDC-DAMS	
CDL (California Digital Library)	Web Archiving Service	
CDL (California Digital Library)	WEST	
ISO 11620:2014 - Library performance indicators	B1.1.1 Required Titles Availability	B.1 Resources, Access, and Infrastructure // B.1.1 Collection

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ISO 11620:2014 - Library performance indicators	B.1.1.2 Percentage of Required Titles in Collection	B.1 Resources, Access, and Infrastructure // B.1.1 Collection
ISO 11620:2014 - Library performance indicators	B.1.1.3 Percentage of Rejected Accesses	B.1 Resources, Access, and Infrastructure // B.1.1 Collection
ISO 11620:2014 - Library performance indicators	B.1.1.4 Number of Documents Digitized per 1000 Documents in Collection	B.1 Resources, Access, and Infrastructure // B.1.1 Collection
ISO 11620:2014 - Library performance indicators	B.1.1.5 Percentage of the Owner Institution's Academic Publications in the Institutional Repository	B.1 Resources, Access, and Infrastructure // B.1.1 Collection
ISO 11620:2014 - Library performance indicators	B.1.2.1 Shelving Accuracy	B.1 Resources, Access, and Infrastructure // B.1.2 Access
ISO 11620:2014 - Library performance indicators	B.1.2.2 Median Time of Document Retrieval from Closed Stacks	B.1 Resources, Access, and Infrastructure // B.1.2 Access
ISO 11620:2014 - Library performance indicators	B.1.2.3 Speed of Interlibrary Lending	B.1 Resources, Access, and Infrastructure // B.1.2 Access
ISO 11620:2014 - Library performance indicators	B.1.2.4 Percentage of Successful Interlibrary Loans	B.1 Resources, Access, and Infrastructure // B.1.2 Access
ISO 11620:2014 - Library performance indicators	B.1.2.5 Speed of Reference Transactions	B.1 Resources, Access, and Infrastructure // B.1.2 Access
ISO 11620:2014 - Library performance indicators	B.1.2.6 Percentage of Rare Materials Accessible via Web Catalogues	B.1 Resources, Access, and Infrastructure // B.1.2 Access
ISO 11620:2014 - Library performance indicators	B.1.2.7 Percentage of Rare Collection in Stable Condition	B.1 Resources, Access, and Infrastructure // B.1.2 Access
ISO 11620:2014 - Library performance indicators	B.1.2.8 Percentage of Rare Materials Needing Conservation/Restoration Treatment that Received Such Treatment	B.1 Resources, Access, and Infrastructure // B.1.2 Access
ISO 11620:2014 - Library performance indicators	B.1.3.1 User Area per Capita	B.1 Resources, Access, and Infrastructure // B.1.2 Access
ISO 11620:2014 - Library performance indicators	B.1.3.2 User Places per Capita	B.1 Resources, Access, and Infrastructure // B.1.2 Access

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ISO 11620:2014 - Library performance indicators	B.1.3.3 Hours Open Compared to Demand	B.1 Resources, Access, and Infrastructure // B.1.2 Access
ISO 11620:2014 - Library performance indicators	B.1.3.4 Percentage of Storage Space Which Has an Appropriate Environment	B.1 Resources, Access, and Infrastructure // B.1.2 Access
ISO 11620:2014 - Library performance indicators	B.1.4.1 Staff per Capita	B.1 Resources, Access, and Infrastructure // B.1.2 Access
ISO 11620:2014 - Library performance indicators	B.2.1.1 Collection Turnover	B.2 Use // B.2.1 Collection
ISO 11620:2014 - Library performance indicators	B.2.1.2 Loans per Capita	B.2 Use // B.2.1 Collection
ISO 11620:2014 - Library performance indicators	B.2.1.3 Percentage of Stock Not Used	B.2 Use // B.2.1 Collection
ISO 11620:2014 - Library performance indicators	B.2.1.4 Number of Content Units Downloaded per Capita	B.2 Use // B.2.1 Collection
ISO 11620:2014 - Library performance indicators	B.2.1.5 Number of Downloads per Document Digitized	B.2 Use // B.2.1 Collection
ISO 11620:2014 - Library performance indicators	B.2.2.1 Library Visits per Capita	B.2 Use // B.2.2 Access
ISO 11620:2014 - Library performance indicators	B.2.2.2 Percentage of External Users	B.2 Use // B.2.2 Access
ISO 11620:2014 - Library performance indicators	B.2.2.3 Percentage of the Total Library Lending to External Users	B.2 Use // B.2.2 Access
ISO 11620:2014 - Library performance indicators	B.2.2.4 User Attendances at Library Events per Capita	B.2 Use // B.2.2 Access
ISO 11620:2014 - Library performance indicators	B.2.2.5 Number of User Attendances at Training Lessons per Capita	B.2 Use // B.2.2 Access
ISO 11620:2014 - Library performance indicators	B.2.3.1 User Places Occupancy Rate	B.2 Use // B.2.3 Facilities

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ISO 11620:2014 - Library performance indicators	B.2.4.1 Percentage of the Target Population Reached	B.2 Use // B.2.4 General
ISO 11620:2014 - Library performance indicators	B.2.4.2 User Satisfaction	B.2 Use // B.2.4 General
ISO 11620:2014 - Library performance indicators	B.2.4.3 Willingness to Return	B.2 Use // B.2.4 General
ISO 11620:2014 - Library performance indicators	B.3.1.1 Cost per Collection Use	B.3 Efficiency // B.3.1 Collection
ISO 11620:2014 - Library performance indicators	B.3.1.2 Acquisition cost per Collection Use	B.3 Efficiency // B.3.1 Collection
ISO 11620:2014 - Library performance indicators	B.3.1.3 Cost per Download	B.3 Efficiency // B.3.1 Collection
ISO 11620:2014 - Library performance indicators	B.3.2.1 Median Time of Document Acquisition	B.3 Efficiency // B.3.2 Access
ISO 11620:2014 - Library performance indicators	B.3.2.2 Median Time of Document Processing	B.3 Efficiency // B.3.2 Access
ISO 11620:2014 - Library performance indicators	B.3.3.1 User Services Staff as a Percentage of Total Staff	B.3 Efficiency // B.3.3 Staff
ISO 11620:2014 - Library performance indicators	B.3.3.2 Correct Answer Fill Rate	B.3 Efficiency // B.3.3 Staff
ISO 11620:2014 - Library performance indicators	B.3.3.3 Ratio of Acquisition Expenditures to Staff Costs	B.3 Efficiency // B.3.3 Staff
ISO 11620:2014 - Library performance indicators	B.3.3.4 Employee Productivity in Media Processing	B.3 Efficiency // B.3.3 Staff
ISO 11620:2014 - Library performance indicators	B.3.3.5 Employee Productivity in Lending and Delivery Services	B.3 Efficiency // B.3.3 Staff
ISO 11620:2014 - Library performance indicators	B.3.3.6 Staff Costs per Title Catalogued	B.3 Efficiency // B.3.3 Staff

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ISO 11620:2014 - Library performance indicators	B.3.4.1 Cost per User	B.3 Efficiency // B.3.4 General
ISO 11620:2014 - Library performance indicators	B.3.4.2 Cost per Library Visit	B.3 Efficiency // B.3.4 General
ISO 11620:2014 - Library performance indicators	B.4.1.1 Percentage of Expenditure on Information Provision Spent on the Electronic Collection	B.4 Potentials and Development // B.4.1 Collection
ISO 11620:2014 - Library performance indicators	B.4.2.1 Percentage of Library Staff Providing Electronic Services	B.4 Potentials and Development // B.4.2 Staff
ISO 11620:2014 - Library performance indicators	B.4.2.2 Number of Attendance Hours at Formal Training Lessons per Staff Member	B.4 Potentials and Development // B.4.2 Staff
ISO 11620:2014 - Library performance indicators	B.4.2.3 Percentage of Staff Time Spent in Training	B.4 Potentials and Development // B.4.2 Staff
ISO 11620:2014 - Library performance indicators	B.4.2.4 Percentage of Staff in Cooperative Partnerships and Projects	B.4 Potentials and Development // B.4.2 Staff
ISO 11620:2014 - Library performance indicators	B.4.3.1 Percentage of Library Means Received by Special Grant or Income Generated	B.4 Potentials and Development // B.4.3 General
ISO 11620:2014 - Library performance indicators	B.4.3.2 Percentage of Institutional Means allocated to the Library	B.4 Potentials and Development // B.4.3 General
ISO 2789 (2006) - International library statistics		
IARU Indicators	**University**	
IARU Indicators	Number of students	Number of enrolled students at the beginning of the reporting year
IARU Indicators	Number of academic staff	Full-time equivalent (FTE) academic staff at the beginning of the reporting year

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IARU Indicators	**Library**	
IARU Indicators	Number of registered users of the library	Registered users of the library who have at least one loan or other services to their users` account data (i.e. interlibrary loan, copies, etc.). "Library" means: the central organisational unit for information access at the university (with central funds, staff etc.)
IARU Indicators	of which members of the university	*optional (only if the data is available)*
IARU Indicators	of which external users	*optional (only if the data is available)*
IARU Indicators	Number of opening hours per week	Total number of regular opening hours per week (max: 27/4=168 hours)
IARU Indicators	Number of user workplaces	Total number of workplaces (chair+desk or standing workplace) available in the library to users
IARU Indicators	of which workplaces for indivual/quiet studying	numer of workplaces dedicated to individual/quiet studying
IARU Indicators	of which workplaces in areas for group work	number of units for group work (irrespective of individual seats and desks)
IARU Indicators	other workplaces	number of places in other areas (e.g. lounge areas etc.)
IARU Indicators	Number of rare collections and archives	number of units of rare collections and archives belonging to the library
IARU Indicators	**Library Staff**	
IARU Indicators	Number of FTE library staff during the reporting year/fiscal year	The number of filled or temporarily vacant FTE staff positions at the beginning of the reporting year/fiscal year that are paid from funds under library control. Student assistant staff included. FTEs of part-time employees are computed by taking the total number of hours worked per week by part-time employees and dividing by the number of hours considered by the reporting library to be a full-time work week. Data are reported to two decimal places.
IARU Indicators	Numer of FTE permanent staff during the reporting year/fiscal year	*optional (only if the data is available)*

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IARU Indicators	Numer of FTE non-permanent staff during the reporting year/fiscal year	*optional (only if the data is available)*
IARU Indicators	**Expenditures**	
IARU Indicators	Total library expenditures (currency: USD, exchange rate as of 12/31/2014)	The total of all funds (in USD) expended from the library budget during the reporting year/fiscal year regardless of when the funds may have been received, including salaries, analog and digital resources (acquisitions and licensing, current serial subscriptions, document delivery/interlibrary loan, preservation, binding), other expenditures for information resources, bibliographic utilities, expenditures for hardware and software and all other operating expenditures. If databases or electronic serials are financed within a consortium or partially by central funding, only the library's own expenditure should be counted. If you do not wish to transfer the sum to USD with exchange rate as of 12/31/2014 please provide the data in your local currency and indicate. We will then transfer the sum to USD with exchange rate as of 12/31/2014.
IARU Indicators	of which total salaries staff	Total salaries/wages for total FTE in USD
IARU Indicators	of which expenditures for resources	The total of all funds expended from the library budget during the reporting year/fiscal year for all forms of resources (analog and digital) in USD
IARU Indicators	Other library expenditures	Please only include funds expended from the library budget and comment on the character of the main expenditures (e.g. project costs, capital expenditure, furnishing and equipment, staff training, IT)
IARU Indicators	**Information Resources**	
IARU Indicators	***Digital resources***	
IARU Indicators	Licensed electronic journals	Total number of licensed electronic journals (titles)
IARU Indicators	Licensed e-books	Total number of licensed e-books
IARU Indicators	Licensed databases	Total number of licensed databases

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IARU Indicators	***Analog resources***	
IARU Indicators	Books, serial backfiles and other paper materials	Total number of books, serial backfiles and other paper materials
IARU Indicators	Audiovisual material	Total number of audiovisual material by units
IARU Indicators	***Usage***	
IARU Indicators	Total number of loans	Total number of loans including interlibrary loans and documents provided/lent to other libraries, renewals and initial transactions included (excluding reserves)
IARU Indicators	***Digital information, services, databases, networks***	
IARU Indicators	Number of accesses to licensed electronic journals	Downloads or pageviews of electronic journals
IARU Indicators	Number of accesses to e-books	Downloads or pageviews of e-books
IARU Indicators	Number of accesses to databases	Pageviews or logins
IARU Indicators	**Services**	
IARU Indicators	Number of trainings	Number of trainings (information services) to groups, not to individuals. Guided tours and presentations at conferences are excluded.
IARU Indicators	Number of virtual trainings	Webinars and MOOCs
IARU Indicators	Number of face-to-face trainings	Face-to-face Traingings and workshops
IARU Indicators	Attendance at trainings	Total attendance at trainings
IARU Indicators	Attendance at virtual trainings	Attendance at webinars and MOOCs
IARU Indicators	Attendance at face-to-face trainings	Attendance at face-to-face trainings and workshops
IARU Indicators	Digitisation	Number of pages digitized by the library
IARU Indicators	Number of pages digitized by the library	Number of pages digitized by the library
IARU Indicators	Number of pages digitized by a service provider or external partner	Number of pages digitized by a service provider or external

		partner
IMLS website	IMLS Data Catalog (various data sets)	https://data.imls.gov/?_ga=1.150154102.1923974197.1455600006

3. Tools Inventory

A detailed tools inventory follows, indicating the most commonly available tools for business intelligence, data warehousing, library assessment, and data visualization in academic research libraries.

Tools Supporting Data Analytics, Visualization & Warehousing

Open	Proprietary	Visualizations/ Dashboarding	Data Warehousing	Tool Type	Tool Name	URL	Description	Notes
	Y	Y		Analytics & Reporting	Adaptive Insight	http://www.adaptiveinsights.com/	"Forecasting, reporting, and analysis software for Finance teams."	
Y		Y		Analytics & Visualization Platform	Continuum Analytics	https://www.continuum.io/		
Y	Y	Y		Analytics & Visualization	Domo	https://www.domo.com/industries/education		
Y		Y		Analytics & Visualization (library use)	Emory University Library Use Dashboard GitHub Repository	https://github.com /emory-libraries/libraryuse		
Y		Y		Analytics & Visualization	JasperSoft	http://www.jaspersoft.com/business-intelligence-solutions		
Y		Y		Analytics & Visualization	Kibana	https://www.elastic.co/products/kibana		See: https://www.elastic.co/blog/kibana-4-and-civic-hacking-investigating-campaign-contributions

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Y		Y		Analytics	Pentaho	http://www.pentaho.com/product/business-visualization-analytics		
	Y	Y		Analytics & Visualization	Qlikview	http://www.qlik.com	Tableau competitor	
	Y	Y	Y	Analytics & Visualization (public libraries)	Savannah	http://www.orangeboyinc.com/savannah-overview	"Savannah houses a data warehouse, proprietary customer segmentation, performance dashboards, target customer communications and feedback, a powerful data mining and analytics feature, and GIS mapping capabilities–all in a single platform."	Introduced late Spring/Summer 2016. Orange Boy focused on demographic data.
	Y	Y		Analytics & Visualization Platform	Socrata	http://www.socrata.com	Socrata is a company that provides cloud-based data visualization and analysis tools for opening government data. Originally called Blist, Socrata was founded in February 2007. Socrata targets non-technical Internet users who want to view and share government, healthcare, energy, education, or environment data. Its products are issued under a proprietary, closed, exclusive license.	
Y		Y		Analytics & Visualization	SpagoBI	http://www.spagobi.org/homepage/product/business-intelligence/	"SpagoBI is the only entirely Open Source Business Intelligence suite. It covers all the analytical areas of Business Intelligence projects, with innovative themes and engines. SpagoBI offers a wide range of analytical tools"	
	Y	Y		Analytics & Visualization (library website and collections data)	Springshare LibAnalytics	http://www.springshare.com/libanalytics/		
	Y	Y		Analytics & Visualization	Tableau	http://www.tableau.com/	See ARL videos: https://www.youtube.com/playlist?list=PLaHPIIKtRXCIHA0f1wJ-raajNS_tW4moi	
Y		Y		Analytics & Visualization	The R Project for Statistical Computing	https://www.r-project.org/	software environment for statistical computing and graphics. It compiles and runs on a wide variety of UNIX platforms, Windows and MacOS.	s. http://www.r-bloggers.com/r-in-business-intelligence/
Y		Y		Data visualization	BIRT	http://www.eclipse.org/birt/	"An open source technology platform used to create data visualizations and reports that can be embedded into rich client and web applications"	

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Y		Y		Data visualization	Chart.js	http://www.chartjs.org/	"Chart.js is a tiny open source library that supports just six chart types: line, bar, radar, polar, pie and doughnut. But the reason I like it is that sometimes that's all the charts one needs for a project. If the application is big and complex, then libraries like Google Charts and FusionCharts makes sense, otherwise for small hobby projects Chart.js is the perfect solution. It uses HTML5 canvas element for rendering charts. All the charts are responsive and use flat design. It is one of the most popular open-source charting libraries to emerge recently. Check out the documentation for live examples of all six chart types."	
Y		Y		Data visualization	D3 Plus	http://d3plus.org/	"Data visualization made easy. A javascript library that extends the popular D3.js to enable fast and beautiful visualizations."	Started in 2014. Visualization examples: http://d3plus.org/examples/
Y		Y		Data visualization	D3.js	https://d3js.org/	"D3.js is a JavaScript library for manipulating documents based on data. D3 helps you bring data to life using HTML, SVG, and CSS. D3's emphasis on web standards gives you the full capabilities of modern browsers without tying yourself to a proprietary framework, combining powerful visualization components and a data-driven approach to DOM manipulation. D3.js, short for 'Data Driven Documents', is the first name that comes to mind when we think of a Data Visualization Software. It uses HTML, CSS, and SVG to render some amazing charts and diagrams. If you can imagine any visualization, you can do it with D3. It is feature packed, interactivity rich and extremely beautiful. Most of all it's free and open-source. It doesn't ship with pre-built charts out of the box, but has a nice gallery which showcases what's possible with D3. There are two major concerns with D3.js: it has a steep learning curve and it is compatible only with modern browsers (IE 9+). So pick it up only when you have enough time in hand and are not concerned about displaying your charts on older browsers"	
	Y	Y		Data visualization	Datamartist	http://www.datamartist.com/		
Y	Y	Y		Data visualization (basic)	Google Forms / Google Charts	https://developers.google.com/chart/		
	Y	Y		Data visualization	Microsoft Power BI	https://powerbi.microsoft.com/en-us/		

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Y		Y		Data visualization	OpenI	http://openi.org/	"plug-ins for Jasper and Pentaho"	
Y		Y		Data visualization	Plotly	https://plot.ly/		Plotly only charges for developers and chart creators. Chart and dashboard viewers never have to pay for a licence, or be locked out from a dashboard because their company has ran out of licenses.
Y		Y		Data visualization	Raw	http://raw.densitydesign.org	"Raw defines itself as 'the missing link between spreadsheets and vector graphics'. It is built on top of D3.js and is extremely well designed. It has such an intuitive interface that you'll feel like you've used it before. It is open-source and doesn't require any registration. It has a library of 16 chart types to choose from and all the processing is done in browser. So your data is safe. RAW is highly customizable and extensible, and can even accept new custom layouts."	
Y		Y		Data visualization	Shiny Apps	http://www.shinyapps.io/		
Y		Y		Data visualization	Visualization Toolkit (VTK)	http://www.vtk.org/	"The Visualization Toolkit (VTK) is an open-source, freely available software system for 3D computer graphics, image processing, and visualization. It consists of a C++ class library and several interpreted interface layers including Tcl/Tk, Java, and Python. VTK supports a wide variety of visualization algorithms including scalar, vector, tensor, texture, and volumetric methods, as well as advanced modeling techniques such as implicit modeling, polygon reduction, mesh smoothing, cutting, contouring, and Delaunay triangulation. VTK has an extensive information visualization framework and a suite of 3D interaction widgets. The toolkit supports parallel processing and integrates with various databases on GUI toolkits such as Qt and Tk. VTK is cross-platform and runs on Linux, Windows, Mac, and Unix platforms. VTK is part of Kitware's collection of commercially supported open-source platforms for software development."\	
	Y		Y	Data Warehouse	Amazon Redshift	http://docs.aws.amazon.com/redshift/latest/mgmt/welcome.html		Hosted solution

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	Y		Y	Data Warehouse, Analytics	Amazon Web Services	https://aws.amazon.com/products/?nc2=h_ql_ny_livestream_blu		
	Y		Y	Data Warehouse	IBM Netezza	http://www-01.ibm.com/software/data/netezza/		
Y			Y	Data Warehouse and BI	Learning Locker	https://learninglocker.net/	"Learning Locker is an open source Learning Record Store (LRS); a type of database designed to store learning activity statements generated by xAPI (Tin Can) compliant learning activities."	
Y			Y	Data Warehouse and BI	MetriDoc		"IT infrastructure that facilitates the collection, transport, and use of library activity data. 'Lite Warehousing,' w/ some reporting views, and some data capture interface"	Sponsored by the University of Pennsylvania, and funded by the Institute of Museum and Library Services, Provides multi-tenant capabilities, as proven through BorrowDirect data warehousing for multiple institutions
Y			Y	Data Warehouse and BI	Pentaho	http://wiki.pentaho.com/display/COM/Community+Wiki+Home	"A Comprehensive Data Integration and Business Analytics Platform"	
Y			Y	Data Warehouse and BI	Talend	https://www.talend.com/resource/data-warehouse-tools.html	"The market for data warehouse tools and other integration technologies is shifting in favor of open source solutions. Talend is at the forefront of this movement, providing progressive businesses with open source data warehouse tools that deliver as much or more quality and functionality as proprietary solutions, while having substantially lower total cost of ownership. Talend offers a range of complementary data warehouse tools spanning data integration, big data integration, data quality, and master data management (MDM)."	

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Adjacent Tools

Open	Proprietary	Visualizations/Dashboarding	Data Warehousing	Tool Type	Tool Name	URL	Description	Notes
	Y			Analytics	Cognos			
	Y	Y		Analytics & Visualization	TalentLab	https://talent-lab.com/	Focused on human resources market	
	Y	Y		Analytics Consulting	Tessella	http://tessella.com	"We use data science to accelerate evidence-based decision making, allowing businesses to improve profitability, reduce costs, streamline operations, avoid errors and out-innovate the competition."	
	Y			Any data source reporting	SAP Crystal Reports	http://www.crystalreports.com	"Consolidate key metrics and information from multiple sources into a single dashboard to monitor business performance with SAP® Crystal Dashboard Design software. Dashboards with what-if analysis and visualizations such as maps, charts, and gauges present critical business key performance indicators (KPIs) with drillable, interactive dashboard views that can be deployed within Microsoft Office applications, through SAP Crystal Server, or via Flash, web applications or mobile devices."	from Martha Kyrillidou
	Y	Y		Balanced Scorecard reporting software	Clearpoint Strategy	https://www.clearpointstrategy.com/		Copyright 2014.
Y				Big data software	Apache Hadoop	http://hadoop.apache.org/		
	Y			Collection management platform	Alma	http://www.exlibrisgroup.com/category/AlmaOverview		
	Y			Collection management platform	EBSCO Holdings and Link Management	https://www.ebscohost.com/discovery/technology/holdings-and-link-management	"a single administrative module to manage all your holdings; electronic and print"	
	Y			Collection management platform	Intota	http://www.proquest.com/products-services/intota.html	Intota combines industry-leading discovery, linking, collection management and assessment in one system built on a comprehensive knowledgebase.	

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	Y	Y		Collection Management Tool / ILS Data	OCLC GreenGlass	http://www.oclc.org/support/training/portfolios/library-management/sustainable-collections.en.html	ILS & Collection Data	
	Y			Comparative Research University Data Set / Proprietary Data Analytics Portal	Academic Analytics LLC	http://academicanalytics.com/Public/WhatWeDo		Mentioned in ACRL's 2010 "The Value of Academic Libraries" Report
Y				Content Management System	DKAN / Nucivic	http://www.nucivic.com/	"a turnkey open data platform that makes it easy for public sector institutions to publish data"	Platform: Drupal Primary language: PHP Database: MySQL, MariaDB, PostgreSQL, SQL Server or Oracle Web server: Apache or Nginx Operating system: Linux, Windows, OSX or Unix GNU Public License, version 2
Y				Data cleanup	Open Refine	http://openrefine.org/	"OpenRefine (formerly Google Refine) is a powerful tool for working with messy data: cleaning it; transforming it from one format into another; and extending it with web services and external data. Please note that since October 2nd, 2012, Google is not actively supporting this project, which has now been rebranded to OpenRefine. Project development, documentation and promotion is now fully supported by volunteers. Find out more about the history of OpenRefine and how you can help the community."	
Y				Data indexing and transformation	Catmandu	http://librecat.org/Catmandu/	"Catmandu is a command line tool to access and convert data from your digital library, research services or any other open data sets. The toolkit was originally developed as part of the LibreCat project and attracts now an international development team with many participating institutions."	Currently in use by Goettingen team.
	Y			Data mining	SAS Enterprise Miner	http://www.sas.com/en_us/software/analytics/enterprise-miner.html		
	Y			Data mining and text analytics sof	SPSS Modeler	http://www-01.ibm.com/software/analytics/spss/products/modeler/		

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				tware				
	Y		Y	Data Warehouse	SAP Business Warehouse	http://www.sap.com/pc/tech/data-warehousing/software/netweaver-business-warehouse/index.html		
	Y			Digital Preservation software / hardware	LibNova	http://www.digitalpreservationsoftware.com/digital-preservation-solutions/libdata-digital-preservation-storage/		
Y				Financial Reporting	Raptor	http://iam.cf.ac.uk/trac/RAPTOR/wiki/Software/Overview	Raptor is a free to use, open source software suite generally designed to enable accounting within event-based systems, and specifically aimed at accounting within systems that handle authentication events such as the Shibboleth IdP, OpenAthens LA, and EZproxy. The academic IT services community is the user community with the requirements that led to the development of this software, but it should be more generally applicable.	Sponsored by Cardiff University. Log file analysis for multiple content types.
		Y		Google Analytics Dashboard	Getting Found SEO Cookbook	http://www.clir.org/pubs/reports/pub165/pub165abst		Sponsoring organization is CLIR
				Institutional Assessment Management System	Academic Effect (formerly WEAVEonline)	http://academiceffect.com/		Mentioned in ACRL's 2010 "The Value of Academic Libraries" Report
				Institutional Assessment Management System	eLumen	http://elumen.info		Mentioned in ACRL's 2010 "The Value of Academic Libraries" Report
				Institutional Assessment Management System	Nuventive TracDat	http://www.nuventive.com/products/tracdat/		Mentioned in ACRL's 2010 "The Value of Academic Libraries" Report
				Institutional Assessment Management System	Tk20	http://www.tk20.com/		Mentioned in ACRL's 2010 "The Value of Academic Libraries" Report
				Integrated Advising &	AdvisorTrac	See http://www.nacada.ksu.edu/Resourc		Source: Megan Oakleaf

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				Planning / Early Alert Systems		es/Clearinghouse/View-Articles/Early-alert-systems-and-resource-links.aspx		
ht				Integrated Advising & Planning / Early Alert Systems	AvisoCoaching	See http://www.nacada.ksu.edu/Resources/Clearinghouse/View-Articles/Early-alert-systems-and-resource-links.aspx		Source: Megan Oakleaf
				Integrated Advising & Planning / Early Alert Systems	Copley Retention	See http://www.nacada.ksu.edu/Resources/Clearinghouse/View-Articles/Early-alert-systems-and-resource-links.aspx		Source: Megan Oakleaf
				Integrated Advising & Planning / Early Alert Systems	DropGuard	See http://www.nacada.ksu.edu/Resources/Clearinghouse/View-Articles/Early-alert-systems-and-resource-links.aspx		Source: Megan Oakleaf
				Integrated Advising & Planning / Early Alert Systems	Early Alert Retention Software	See http://www.nacada.ksu.edu/Resources/Clearinghouse/View-Articles/Early-alert-systems-and-resource-links.aspx		Source: Megan Oakleaf
				Integrated Advising & Planning / Early Alert Systems	Ellucian (Banner)	See http://www.nacada.ksu.edu/Resources/Clearinghouse/View-Articles/Early-alert-systems-and-resource-links.aspx		Source: Megan Oakleaf
				Integrated Advising & Planning / Early Alert Systems	EMAS Retention Pro	See http://www.nacada.ksu.edu/Resources/Clearinghouse/View-Articles/Early-alert-systems-and-resource-links.aspx		Source: Megan Oakleaf
				Integrated Advising & Planning / Early Alert Systems	GradesFirst	See http://www.nacada.ksu.edu/Resources/Clearinghouse/View-Articles/Early-alert-systems-and-resource-links.aspx		Source: Megan Oakleaf

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Y				Integrated Advising & Planning / Early Alert Systems	Kuali Student (open source)			Source: Megan Oakleaf
Y				Integrated Advising & Planning / Early Alert Systems	Open Academic Analytics Initiative (OAAI)			Source: Megan Oakleaf
				Integrated Advising & Planning / Early Alert Systems	Pharos360	See http://www.nacada.ksu.edu/Resources/Clearinghouse/View-Articles/Early-alert-systems-and-resource-links.aspx		Source: Megan Oakleaf
				Integrated Advising & Planning / Early Alert Systems	Starfish Early Alert System	See http://www.nacada.ksu.edu/Resources/Clearinghouse/View-Articles/Early-alert-systems-and-resource-links.aspx		Source: Megan Oakleaf
				Integrated Advising & Planning / Early Alert Systems	Student Early Alert System	See http://www.nacada.ksu.edu/Resources/Clearinghouse/View-Articles/Early-alert-systems-and-resource-links.aspx		Source: Megan Oakleaf
Y				Integrated Advising & Planning / Early Alert Systems	Student Success Plan (open source)	See http://www.nacada.ksu.edu/Resources/Clearinghouse/View-Articles/Early-alert-systems-and-resource-links.aspx		Source: Megan Oakleaf
	Y			Library services platform	BlueCloud Library Services Platform	http://www.sirsidynix.com/products/library-services-platform	"BLUEcloud Library Services Platform (LSP) adds cloud-based features to Horizon and Symphony. Built on Horizon and Symphony's efficient back end architecture and a growing array of web services, BLUEcloud moves libraries into the future of web clients, evidence-based acquisition, and native eResource management without losing essential ILS features. Best of all, most BLUEcloud web clients are included in your Horizon or Symphony maintenance payments./// BLUEcloud web clients work anywhere, on any device to give your library insightful analytics, efficient staff workflows, end-	

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							to-end eResource integration, and more. // BLUEcloud Campus is an open LSP made to serve the specific needs of your academic library. By combining the top features of EBSCO and SirsiDynix with products built for education "	
Y				Library services platform	TIND	http://tind.io		Sponsoring organization is CERN
Y				Library services platform	Folio	https://www.folio.org/platform/		Funded by EBSCO. Delivering in 2017/2018
Y				Real-time Search	Elastic Search	https://www.elastic.co/products/elasticsearch		
Y				Research Data Repository Directory	RE3Data.org	http://re3data.org		
				ROI Calculators	ALA ROI in (mostly public) libraries to users	http://www.ala.org/research/librariesmatter/taxonomy/term/129		
				ROI Calculators	Library Research Service ROI Calculators	http://www.lrs.org/data-tools/public-libraries/roi-calculators/		
Y				Space Assessment	Suma	http://www.lib.ncsu.edu/dli/projects/spaceassesstool.	An opensource mobile space assessment platform	Sponsored by NCSU libraries
		Y		SQL Database reporting & visualization	Periscope Data	https://www.periscopedata.com/#		
				Web-based Data Exploration Interface	IPEDS Data Center	http://nces.ed.gov/ipeds/datacenter/		Sponsored by National Center for Education Statistics., funded by the Department of Education. multiple exportable statistics data formats

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				Web-based Data Exploration Interface for ARL stats	Counting Opinions / LibPas / LibStats	http://www.countingopinions.com/	IT infrastructure that Ingests and facilitates the use of data. Used by ACRLmetrics. provides organizations with innovative, comprehensive, cost-effective ways to capture, manage and measure performance data, including open-ended customer feedback, qualitative and quantitative data, trends, benchmarks, outcomes and peer comparisons. Counting Opinions web-based solutions: Are delivered in real-time and provide organizations with valid, immediate, 24x7x365 results. Include powerful "click-only" reports that clearly identify actionable opportunities for improvement. Are fully hosted in a secure professionally managed facility, require minimal or no IT involvement and work across all browsers and platforms. /// Located in Toronto Canada, Counting Opinions has been serving the library community since 2004.	
	Y				Qualtrics	http://www.qualtrics.com/higher-education/		

4. Requirements Document

A requirements document follows, outlining the functional and nonfunctional requirements for a library data warehouse and dashboard toolkit.

Functional Requirements

Data Acquisition
System must cope with a mix of low frequency and high frequency sources (daily, quarterly, annually), which should be updated based on the frequency of the updates from the data sources
Manual (person-based) ingest: Users should be able to upload Excel documents for locally gathered data OR be able to input data into a webform
Machine-based ingest: The ability to have data imports to be run at predetermined times, or related to a business event. From at a minumum the following types of systems and standards:
Library Management Systems (ExLibris, Innovative, OCLC etc.)
Z39.50, OAI, other exchange systems
eBook vendors and software
Human Resources (PeopleSoft, Hires, etc.)
Insitutional Repository (D-Space, Fedora, etc.)
Interlibrary Loan Software
Google Analytics (or other web analytics)
Social Media Analytics such as Twitter and Instagram
Financial Systems (Oracle, SAP, etc.)
Facilities Management and Estates Software (eg, Planon)
Digitization Management Software (eg., D-Work and Goobi)
Gatecount systems (Salto, Telepen, etc.)
Patron Interaction Recording (SUMA, LibAnalytics, etc.)
Ithaka survey
SFX
SUSHI and COUNTER
Media Monitoring (Meltwater, Vocus, etc.)
Special Collections Management Software (Aeon, etc.)

Print Management Software (PCAS/PCounter, etc.)
Sharepoint
Warehouse Management Software
It must be possible to easily (i.e. without requiring a major project) change the data input and data transformation processes to meet any changes to the reporting requirements. That is, the system must support a plugin-based architecture.
Data Cleaning / Normalisation
A set of standard processes that will clean and normalise data. These processes should be simple enough for a non-programmer to run
Part of the data cleaning should include anonymisation. Users should be able to tell the systems what data to anonymise.
The system should keep the raw/uncleaned data
Data Manipulation
The ability to view, BUT NOT update information using a custom form.
The ability to view information in a row and column format
The ability to change the data model, fields, or field names but not the entries of the data
Data Inquiry
There should be a basic UI for data inquiry that will return data in (non-visualised form). The point of this UI would be, for example, to check on the data underlying the visualizations if something were in doubt.
Simple ad-hoc inquiry for super-users: The ability to enter and execute a query retrieving information, containing information having, simple sums, counts and averages, grouped by specified values.
The ability to execute queries within specific constraints E.g. all reader visits between two dates. This could be done using facets pre-defined facets
Information will be captured at the detail level, perhaps at a transaction level. Would be useful to see transactional data so that the data can be verified (i.e. find outliers).
The ability to export data into other packages for further analysis in user-definable export formats (JSON, Excel, XML, SPSS, R)
Data Storage
Versioning and version control
Authentication with different levels of permissions (users v. superusers)
Authentication systems should communicate with existing user directories
Performance Indicators and KPIs User Interface
A user interface with a selection of pre-installed Performance indicators and KPIs.
Users should be able to pick from a list of these PIs/KPIs for display on their dashboard module

Users should be able to view, but not modify, the underlying formulae (that is, the relationship between the data and the PI/KPI) with a simple action such as a click or mouse hover
The ability to create 'local' PIs/KPIs (that is, ones that do not come pre-installed) that will appear in the dashboard.
Dashboard UI
A tab-based user interface, where each tab contains a set of data visualizations (modules) organised by library functional area
Within each functional area, the modules that visualize the data / formulas tied to the KPIs
Each dashboard should be pre-populated, but users should be able to de-select modules from appearing
Users should be able to copy individual visualizations (for pasting into a word doc, for example)
Standard 'reports' should be creatable and downloadable as pdfs (for sharing)

Non-Functional Requirements

Usability
The solution for inputting / gathering data should be able to be used by infrequent users without error. The solution should also able to be used by users with minimal training.
Branding
The output from the solution will conform to the branding rules of the University and the Bodleian Libraries
Performance
Minimum response time - quicker than opening Excel from a shared drive.
Information security
The solution should meet the requirements of the University Information Security policy.
Portability and Accessibility
The ability to use the BI tools from remote locations using VPN.

Bodleian Libraries' Requirements (from Frankie Wilson)

Category	Title	Description
Data Inquiry	Simple ad-hoc inquiry for super-users	The ability to enter and execute a query retrieving information, containing information having, simple sums, counts and averages, grouped by specified values.
Data Inquiry	Simple ad-hoc inquiry for users	The ability to enter and execute a query retrieving information, containing information

		having, simple sums, counts and averages, grouped by specified values.
Data Inquiry	Pre-calculated data	The ability to have some data that is pre-calculated, so as to improve the performance of data queries.
Data Inquiry	Prompted ad-hoc inquires	The ability to execute queries that prompt the user for constraints when run. E.g. all reader visits between two dates.
Data Import	Scheduled Data Imports	The ability to have data imports to be run at predetermined times, or related to a business event. Some users would like flexibility in the extract process so that the frequency of import can be changed.
Data Inquiry	External Sources of Information	The ability to include information from outside the Data Warehouse with the data from the Data Warehouse. This could include spreadsheets, files, etc.
Data Export	Export information for personal use	The ability to export data into other packages for further analysis. Examples:
		· Import into a spreadsheet
		· Import into a personal database
		· Reports to PDF
Data Inquiry	Use Summary Information	Information that is aggregated to pre-determined levels.
		Example:
		Reader numbers by library by time.
Data Inquiry	Use Detail Information	Information will be captured at the detail level, perhaps at a transaction level. Would be useful to see transactional data so that the data can be verified (i.e. find outliers).
Data Manipulation	Custom forms	The ability to view and update information using a custom form.
Data Manipulation	Spreadsheet view	The ability to view information in a row and column format
Data Manipulation	Interactive updates	The ability to change information in real time
Data Manipulation	Data Warehouse Write Back	The ability to change information in real time and to have those changes audited i.e. who, when and what.
Data Analysis	Forecasting	The ability to use the data for forecasting purposes.
Data Analysis	Budgeting	The ability to use the data for budgeting purposes.

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Data Analysis	Time Series Analysis	The ability to perform a time series analysis on the data
Data Analysis	Business Modelling/What if scenarios	The ability to undertake what if scenarios on the data to reflect possible outcomes
Data Analysis	Goal Seeking	The ability to define a desired goal, and have various factors evaluated to achieve that goal.
Data Analysis	Regression Analysis	The ability to analyse how different variables affect an outcome, and use that data to predict outcomes for other data series.
Data Analysis	Financial Functions	The ability to use financial functions such as IRR and NPV.
Data Analysis	Statistical Functions	The ability to use simple and advanced statistical functions.
Data Analysis	Segmentation	The ability to define groups based on a criteria, and then re-use that group for further analysis.
Reporting	Columnar Reports	There will be report types that allow information to be listed in columns with column headings.
Reporting	Cross tab or pivoted Reports	There will be pivoted or cross tabular reports type in the reposting tools.
Reporting	Banded Reports	There will be banded reports available in the reporting tools.
Reporting	Aggregation	The reporting tool will have the ability to create totals and sub-totals.
Reporting	Complex Calculations	The reporting tool will have the ability to undertake complex calculations, for example Percent of Total, Rolling Sums and Period Comparisons.
Reporting	Drill Up and Drill Down	The reporting tool should have the ability to view information at a specific level and be able to drill up and down the various hierarchies.
Reporting	Mixed Text and Graphics	The reporting tool must be able to mix text and graphics when generating reports.
Reporting	Cosmetic Control	The reporting tool must be able to have various text controls including different fonts, bolding ,etc.
Reporting	Exception Reporting	The reporting tool must have the ability to produce exception reports, for example:
		· Book sales drop by 10%
		· Visitor numbers increase by 50%
Reporting	Report templates	The reporting tool will support templates so that report layouts and designs can be

		reused.
Reporting	Prompted Reports	The reporting tool will allow reports to be created that allow users to be prompted for criteria.
Reporting	Reporting Preferences	The ability to provide custom reports and to set preferences for content or constraints.
Graphics	Chart Types	The reporting tool will provide the following sets of charts for incorporation within reports:
		Pie, bar, stacked bar, line, high/low, radar, area, histograms, combinations.
Graphics	Multiple Scales	The reporting tool will support the use of multiple scales on graphs.
Graphics	Split Scales	The reporting tool will support the use of split scales in graphs.
Graphics	Median Line	The reporting tool will allow the addition of a median line to a graph.
Graphics	Text	The reporting tool will allow the placement of text on graphs for annotation purposes.
Graphics	Slide Shows	The reporting tool will allow slide shows to be created for presentation purposes.
Graphics	Custom Drawing	The reporting tool will have drawing functions to allow custom objects to be added to reports.
Graphics	Maps	The reporting tool will allow maps to be used on reports.
Graphics	Clip Art	The reporting tool will have clip art to use on reports.
Graphics	Chart templates	The reporting tool will have the ability to have chart templates so that charts can be reused.
Graphics	Automatic Updates	When data is updated any reports/charts using that data will automatically be updated.
Automation	Task Automation	The ability to automate frequently run tasks.
Automation	Complete/Advanced Automation	The ability to fully automate a business function requiring many steps
Automation	Scheduled Automation	The ability to have common tasks executed at predetermined times or according to Business Events
Portability and Accessibility	Remote Access to Tools - Mobile	The ability to use the BI tools from remote locations using mobile devices
Portability and Accessibility	Remote Access to tools – VPN	The ability to use the BI tools from remote locations using VPN.
Portability and Accessibility	Internal Collaboration – Email	The ability to share access to BI reports with persons inside the library using email.

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Portability and Accessibility	Internal Collaboration – Publish on a Portal	The ability to share access to BI reports with persons inside the library by publishing to a portal.
Portability and Accessibility	External Collaboration	The ability to send BI reports to persons outside the library.
Look and feel	Branding	The output from the solution will conform to the branding rules of the University and the Bodleian Libraries
Usability	Usability	The solution for inputting / gathering data should be able to be used by infrequent users without error. The solution should also able to be used by users with minimal training.
Usability	Data input	The process for inputting data should not impose unnecessary or incorrect data hierarchies onto those inputting data.
Performance	Performance	Volume of data
Performance	Performance	Minimum response time - quicker than opening Excel from a shared drive.
Maintainability and Portability	Maintainability	It must be possible to easily (i.e. without requiring a major project) change the data input and data transformation processes to meet any changes to the reporting requirements.
Maintainability and Portability	Portability	The solution should be designed such that it can be used as a template for use in other University units with minimal rework.
Security	Security	The solution should meet the requirements of the University Information Security policy.
Legal	Data Protection	As it is possible that the solution will hold information that could identify an individual the solution will have to meet the appropriate legal requirements such as the DPA.
Data Updates	Data Updates	Data should be updated based on the frequency of updates from the source data, this could be anything from daily to annual.
Users	No. of Users	No. of Super Users – 2 No of users to input data - 50 No. of users to view reports – 50 to 100
Portability and Accessibility	Remote Access to Tools - Mobile	The ability to use the BI tools from remote locations using mobile devices
Portability and Accessibility	Remote Access to tools – VPN	The ability to use the BI tools from remote locations using VPN.

5. Interviewees

In addition to the needs identified (see Appendix 1.4) by core research team participants at UCD, Oxford, and Göttingen, approximately 20 individuals at the following institutions were interviewed in 9 sessions to validate and elaborate user needs:

- Duke University
- University of Pennsylvania
- Yale University
- Charlotte-Mecklenberg Public Library
- Syracuse University iSchool
- Wollongong University Library, Australia
- Harvey Mudd College
- Jisc UK

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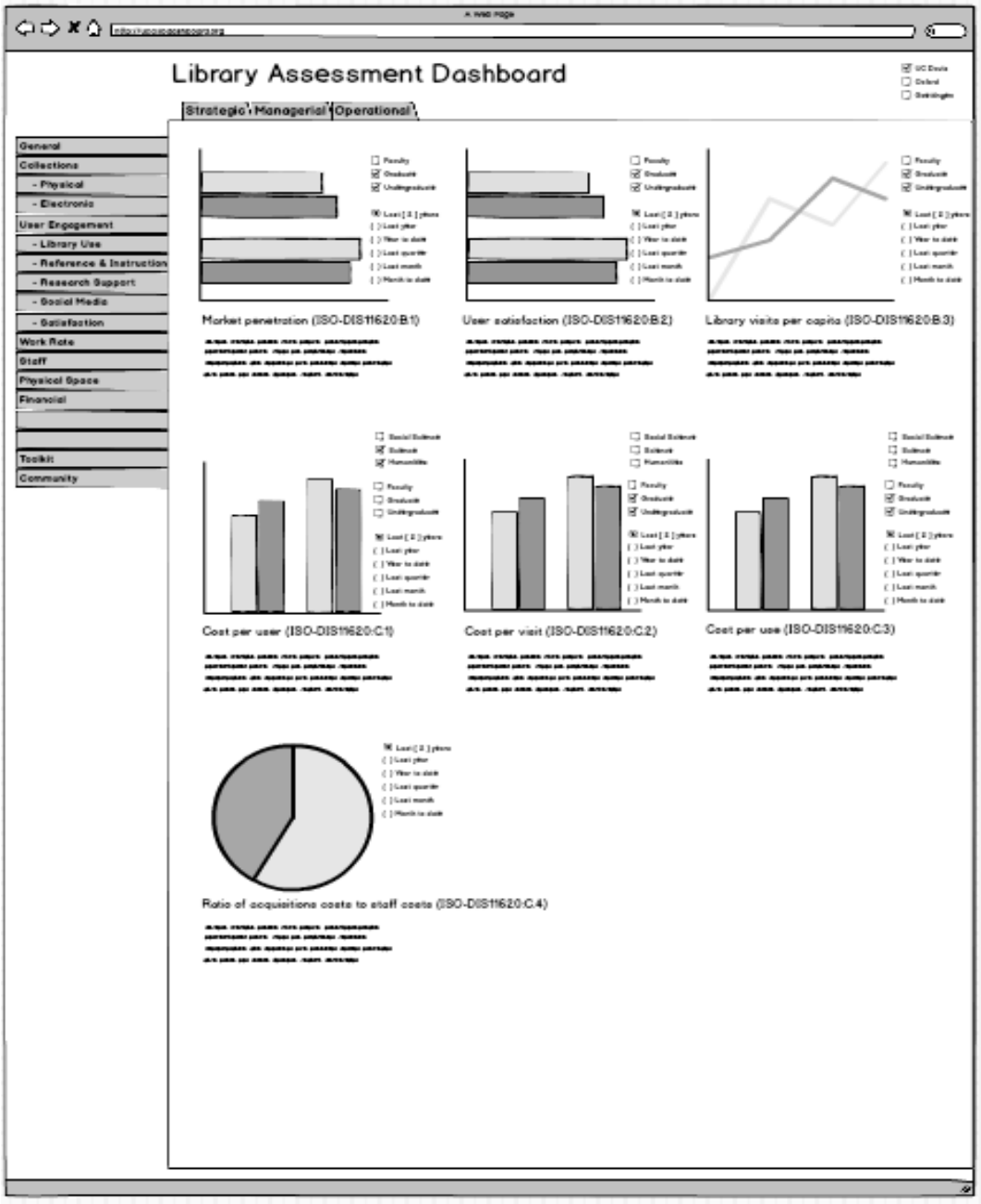
6. Preliminary Dashboard User Interface Concept



Appendix 2: Proposed Model Project Plan

1. Definitions

We define the **toolkit** as a set of documented standards, best practices, scripts, and off-the-shelf and/or open source analytics modules to leverage existing data sources, along with supporting infrastructures, together enabling libraries to implement their own library assessment executive dashboard.

Within the context of this project, we define the **Dashboard** as:

A locally-deployable or fully-hosted (cloud-based) service that adheres to all of the standards and best-practices defined by the toolkit (above), and provides a standard (but customizable) set of visualizations of user data.

We define **Data Warehousing Solution** (again, within the context of this project) as:

A means by which libraries can store, access, interact with, and visualize data provisioned from multiple sources.

2. Proposal

To restate: what is proposed is a three-year project to create a robust and community-supported toolkit that will enable users to implement their own library executive assessment dashboard. While the team had considered recommending the approach of designing and then developing a full-service, hosted dashboard (not unlike OCLC's GreenGlass collection assessment product), we feel that the long rollout and complexity of this approach makes a toolkit-centered approach a more reasonable and practical first effort.

By taking a toolkit-based approach, institutions would be able to take the most appropriate implementation path for their situation and make use of institutional tools as either recommended or locally prescribed. The approach would allow, for example, an institution to focus on a data gathering and normalizing strategy

Appendix 2: Proposed Model Project Plan

and then apply it to their data warehousing solution. One interviewee said, "Our biggest issue is getting and keeping the data and getting it clean. Data is scattered and it's messy." By starting with solutions for data normalization, that project team can focus efforts where they are currently most needed locally.

This approach will also allow focus on the creation of a robust and community-supported foundational framework of performance indicators and data sources. The rollout of such a framework would be essential to both the adoption of the toolkit and to the ability to compare and benchmark data across institutions.

Perhaps most importantly, the toolkit approach would also support early adoption by libraries that have already put some work into their own assessment tools but need solutions for gaps in their program. In turn, we would hope these early adopters become champions of the toolkit and support others in the community who are starting from scratch.

There are six core components of the proposed toolkit:

1. **Data sources.** A set of standardized, key data elements originating from multiple platforms and systems. The elements contribute to an understanding of library performance over time. Documentation will be compiled with references to the data elements' originating systems, access protocols, and instructions for how to work with the data. The standardization here allows for cross-institution comparisons and benchmarking. Examples vary from gate count data to reference desk statistics, authentication data, web analytics, financial data, and physical space data (e.g., shelf space, rooms booked, etc.). Instructions for "how to work with the data" will include guidance such as how to get statistical data about collections out of the most commonly-used library management systems, and how to export Google Analytics data via API.
2. **Data dictionary.** Accepted definitions for all of the common data sources to ensure that institutions are comparing items appropriately.
3. **Data cleaning library.** A library of instructions and operations (scripts, commands) to clean, transform, and/or normalize key data sources.
4. **Library assessment framework.** The framework is a library of measurable indicators of performance, each with an associated formula that explains the

relationship between the data and the indicator. Developing standards around data sources should provide clear guidance on how the data can contribute to key strategic and managerial questions facing libraries. In a similar vein, prioritizing some data sources over others constitutes an implicit recommendation to stop collecting data in certain areas. As an example of a performance indicator, the project could establish a standard formula for determining the cost of storing a book on a shelf. Local costs for staff, materials, systems, climate control, etc. will vary across institutions, but the formula should remain consistent. To take another example, to understand the gap between interlibrary loan requests received by a library versus the number of ILL requests it fulfills, the toolkit would supply the formula:

> *Ratio of requests received to requests sent out in interlibrary lending / document supply = # requests received from other libraries / #requests received from users for items from other libraries.*

The proposed project would start with the ISO Library Performance Indicators and fill in gaps identified by the community.

5. **User interface.** Having cleaned and/or normalized the data, the user interface (UI) should provide a standard set of visualizations (i.e., a dashboard) that map onto the performance indicators.
6. **A data-warehousing solution.** A means by which libraries can store, archive, and preserve in a common way data originating from multiple sources. In addition to the various proprietary data warehouses in use across educational institutions (Oracle, IBM, etc.), the project team has identified at least three potentially viable open options (MetriDoc, Pentaho, and Learning Locker).

And while not, per se, a component of the toolkit, an active and supportive User Community would be crucial to the success and long term sustainability of the work. Institutions will need support to be able to initiate participation; to add, modify, and contribute to the tools and standards in ways that benefit them; and contribute their modifications back to the community on a regular basis.

3. Expected Outcomes and Benefits

Ultimately, the aim of this project is to facilitate evidence-based decision-making and management of library services, resources, and assets, using existing library

and institutional data sources. The library assessment executive dashboard toolkit will collect and standardize the presentation of data from multiple sources, for access, viewing, and comparing. The toolkit will provide a much-needed centralized view into multiple data sources to support decision making related to departmental budget allocations, personnel allocations, and space planning; stewardship of existing library materials and procurement of new resources (including collection development, purchase, and subscription/renewal decisions); and more. By standardizing and centralizing these data, their colocation can more readily provide meaningful contexts for analysis and decision-making. Libraries should be able to use the resulting toolkit of standards, best practices, scripts, and off-the-shelf and/or open source analytics modules to leverage their own existing data sources and supporting infrastructures.

Phases 1-3 set the stage for a future shared service to support institutions' data-warehousing and data-sharing needs. Several nascent initiatives in the higher education and research impact assessment space (e.g., UK Jisc's HEIDI Plus, HEIDI Lab, Library Labs, Learning Analytics, and National Research Information Infrastructure initiatives), and in the library technology and services landscape (e.g., Folio, funded by EBSCO and developed by Index Data; TIND, formerly Envinio, and originally developed by CERN), will be more mature at the time Phase 3 begins. At that point, we will be able to assess where and how the dashboard and toolkit can further integrate with evolving systems and institutional assessment initiatives, and better support libraries' evolving workflows and business intelligence needs.

4. Preliminary Staffing Plan

- **(SPM) Strategic Project Manager**
  - A21 will serve as strategic project lead for this project, coordinating with the Local Project Managers at participating pilot institutions
  - Coordinates with other major initiatives and organizations, including crucially finding the right 'home' for the project
  - Submits project reports to funder(s)
  - Researches business models and sustainability

- **(LAE) Library Assessment Expert/Community Engagement Manager**
  - Designs the Framework and Data Dictionary
  - Manages the engagement with the Library Assessment Community
- **(LPM) Local Project Managers**
  - Day-to-day local project management/Coordination at each institution
- **(DW) Local Data Wrangler**
  - Person responsible for gathering and organizing the disparate data sets from each institution
- **(D) Developers**
  - Software development
  - Installation of the reference implementations at each institution
  - Respond to testing and feedback by making improvements to initial installations
- **(TCEM) Technical Community Engagement Manager**
  - Engages with the technical community around the toolsets
  - Manages the project GitHub account and ensures all code is well documented and available when ready

5. Roadmap

As a result of the scoping work reported here, the project team has proposed a roadmap for the project that divides the work into four distinct phases.

Phase 0. Establish Sponsorship, Project Governance, and Team

The project will require organizational infrastructure and support, procuring funding sources, and a strategic project management team to support the follow-on phases

Work Packages

WP0.1. Organizational Support

Deliverable: Creating a new organizational entity responsible for the support and development of the toolkit, established under an appropriate umbrella

organization.
Effort Required: 1 x 0.1 Strategic Project Manager for 12 months

No one institution can (or should) take responsibility for the sustainability of the project, so a consortium needs to be recruited or created to manage the work and outputs of the community over the long term; a new managerial and economic organization needs to be established. Modeled on the International Image Interoperability Framework (IIIF) consortium, the organization would manage the work to ensure efforts are not duplicated and identify the needs of the community to feed back to the toolkit.

WP0.2. Project Management and Strategic Coordination with other Major Initiatives
Deliverable: A project run on time and to budget, that is well coordinated with initiatives and stakeholders in several countries.
Effort Required: 1 x 0.9 Strategic Project Manager for 36 months; 3 x .2 Local Project Managers for 36 months

The Strategic Project Managers will be responsible for ensuring that all work packages and deliverables are met, and that the project is run on time and on budget. As this project is intended to result in a community-supported tool, the strategic dissemination and coordination of work amongst several communities of stakeholders will be essential.

Phase 1. Build and Test Reference Implementations

To keep the overhead of building something new in the first phase to a minimum, we propose to assemble the toolkit using as many existing, common components as possible. The focus of the first phase of work will be on building the standards for the Library Assessment Framework, defining the data sources, and procedures to clean and normalize the data, as these were the most immediate needs of the community not currently being addressed through other projects. The main goal of Phase 1 is to assemble and build out the components of the toolkit so that

each partner institution will have implemented their own library assessment executive dashboard using the agreed Library Assessment Framework.

Work Packages

WP1. Library Assessment Framework

Deliverable: A fully populated version of the Library Assessment Framework (see Appendix 1-1) that is freely available online

Effort Required: 0.5 Library Assessment Expert for 8 months

Performance Indicators and Data Formulae. Using the Framework template from the scoping research (Appendix 1) and starting with the ISO Library Performance Indicators, work will be done to document and compile mathematical formulas comprised of Data Sources, that support the Key Performance Indicators (KPIs), for example:

> *Ratio of requests received to requests sent out in interlibrary lending / document supply = # requests received from other libraries / # requests received from users for items from other libraries*

This work is best done by the community of assessment librarians who have each in some way already set such KPIs and supporting formulas in motion at their own libraries. In this way, the work will be first about normalizing the Performance Indicators, KPIs, and Formulae across institutions and then about filling in gaps where they exist.

WP2. Data Dictionary

Deliverable: A freely-available, online data dictionary based on the data from the pilot participating institutions.

Effort Required: 0.5 Library Assessment Expert for 3 months; 3 x 0.2 Data Wrangler for 3 months

Starting with the data library assembled as part of the scoping research and reported here, the data dictionary will contain a precise definition of each data source to ensure consistent usage among institutions. Part of the process of defining each data source will be to identify source systems where applicable (that is, from which software or system does or can the data be discovered) and

to compile instructions for how to gather data manually (for example, how libraries should conduct reading room head counts). It is essential that the data dictionary takes into account existing worldwide standards for gathering library statistics, such as SCONUL and ARL statistics.

WP3. Data Warehousing Requirements
Deliverable: A detailed requirements checklist that will help to determine the appropriate data warehousing solution at each partner institution
Effort Required: 3 x 0.5 Developers for 4 months

For the data warehousing solution, a deeper and fairly technical investigation will be needed to determine the appropriate solution overall and for participating institutions in particular. Pentaho, MetriDoc, and Learning Locker have all been used on library assessment projects, but additional analysis and planning would be needed to be confident of fitting the needs of each institution. Starting from the requirements document compiled during the scoping phase reported here, the project software development team would review the current state of likely data warehouse solutions (including, at a minimum, MetriDoc, Pentaho, and Learning Locker) to make a recommendation for implementation at each institution. Partners may make the same or a different choice based on local infrastructure and needs.

WP4. Validation, Normalization, and Conversion of Data
Deliverable: Cleaned data packages and sources, ready for ingest into the relevant data warehouse at each institution.
Effort Required: 3 x 0.2 Developers for 10 months; 3 x 0.2 Data Wranglers for 10 months.

Disparate data sources from each institution will need to be validated, normalized, and converted according to an agreed upon set of standards and practices. The work in this phase will eventually inform a set of community-based standards and practices that will address one of the most pressing current issues

for assessment librarians (i.e., data quality).

WP5. Data Warehouse Implementations
Deliverable: Fully implemented and populated data warehouse solutions at each of the collaborating institutions.
Effort Required: 3 x 0.4 Developers for 6 months

Based on the requirements set out in Work Package 3, each participating pilot library would implement a data warehouse solution appropriate for for its needs. Each library would likely have a different technical environments (concerning library management systems, financial systems, and business intelligence systems, for example) and reporting obligations to standards bodies (e.g., ARL, SCONUL, etc.). This will lead to variations in the implementations at each institution, which will provide excellent data about scalability and applicability of the toolkit across multiple environments.

WP6. Dashboard Implementations
Deliverable: A set of usable Library Assessment Dashboards based on the Library Assessment Framework, in use at each collaborating institution
Effort Required: 3 x 0.4 Developers for 6 months

We are not creating new software in the first phase of this project; rather, these dashboards will make use of the most commonly used visualization tools. Our research indicated that Tableau is the most commonly used in libraries (despite its expense). Tableau is not ideal as it is both proprietary and expensive, but it is well-known and currently in-use by a number of libraries, particularly by libraries likely to be early adopters of the toolkit. We are also interested in exploring the use of Google Charts, which may be a viable open (although still proprietary) option. As with the data warehouse implementations, the potential for variation across institutions through the reference implementations will inform the overall scalability of the toolkit by allowing for the documentation of different options. This work will begin with a detailed requirements-gathering exercise and the dashboards will be designed around the Library Assessment Framework.

WP7. Test the Data Warehouse and Dashboard Implementations to Assess Scalability

Deliverable: A detailed testing report on the reference implementations outlining where they can be improved

Effort Required: 3 x 1.0 Developers for 1 month; 3 x 0.2 Local Project Managers for 1 month

By hosting the reference implementations at multiple institutions we hope to maximize the identification of both scale and localization issues. This work package will perform robust tests on each of the reference implementations and identify for community attention gaps and needs for feedback.

Phase 2. Share: Documentation and Packaging of the Toolkit for the Community

The reference implementations in Phase 1 will result in documentation about the process and outcomes at each institution. This phase of work will focus on packaging and publication of that documentation to form the beginnings of the toolkit community. In that way, this phase represents the point of the toolkit 'going live' and the scaling of efforts to build a community.

Work Packages

WP8. Toolkit Website and Outreach Platform

Deliverable: A single site that documents and links together all the pieces of the toolkit

Effort Required: 1 x .5 Technical Community Engagement Manager for 4 months; 1 x .5 Library Assessment Expert for 4 months

This is the work of assembling the toolkit through the creation of an open website that will assemble in one place all of the related tools, standards, and community activities. Each of the components of the toolkit will be defined and documented in detail on the site, beginning with the documentation from the reference implementations to guide users to their own eventual implementations. The site

will make use of existing tools for managing version control such as GitHub and also embed community and outreach activities.

WP9. Outreach and Community-building

Deliverables: An engaged user-community with evidence of participation from institutions outside the main partners

Effort Required: 1 x .5 Technical Community Engagement Manager for 20 months; 1 Library Assessment Expert for 22 months

The key to scaling and sustaining the toolkit will be the development of a strong and active user community. The goal of the community-building activities is to get enough buy-in and investment from users to that they will contribute back to the community. This could be via direct contributions (that is, downloading something, modifying it, and contributing it back) or through deploying the toolkit and reporting back to the community on their experiences. There will be two facets of the user community -- one around technical solutions and another around the performance indicator framework. For the technical community, some of the activity will be centered in and around GitHub. For the non-technical community a suitable platform will be chosen. Both will be accessed through the main toolkit website.

WP10. Data Warehouse Case Studies

Deliverable: A detailed case study of each of the data warehouse implementations

Effort Required: 1 x .5 Technical Community Engagement Manager for 2 months

Through experience with the reference implementations we will create a set of case studies that document the installations for each of the partner institutions. This will include details of any plugins designed for optional data warehousing solutions to allow for connections with commercially available university enterprise systems (Oracle, SAP, Kuali, etc.). This work will include examples of how different libraries have implemented data warehousing solutions and the key considerations.

Appendix 2: Proposed Model Project Plan

WP11. Data Source Case Studies

Deliverable: Based on the reference implementations, a freely available, online set of instructions for making use of existing data sources,

Effort Required: 1 x .5 Technical Community Engagement Manager for 2 months; 3 x .2 Data Wranglers for 2 months

Beginning with the data inventory compiled during the scoping research, access to and use of each data source will be documented. The instructions for "how to work with" the data will include, for example, how to get statistical data about collections out of the library management systems used by each partner and how to export Google Analytics data via API. These case studies will serve to "seed" the toolkit site; the expectation is that these instructions will be updated and supported by the broader community as new sources of data arise. This work package will also include assembling a list of computer program commands to clean/transform /normalize key data sources that participants can contribute to and borrow from. As with other facets of the toolkit, the work in this phase is to seed the toolkit's library as thoroughly as possible and then to encourage other users to contribute.

WP12. Dashboard Case Studies

Deliverable: A freely available, online documentation of how dashboards were created in the reference implementations

Effort Required: 1 x .5 Library Assessment Expert for 2 months; 3 x .2 Developers for 2 months

The implementations of dashboards at each of the partner institutions will be documented in detail and provided to the community. As part of this work, the suitability of Tableau will be evaluated with the intention of eventually identifying or creating a set of dashboard modules based on an open codebase such as D3.

Appendix 2: Proposed Model Project Plan

Phase 3. Scale and Sustain the Toolkit and Community

This phase will focus on improving and refining the toolkit based on the lessons learned from the reference implementations; executing a more robust outreach and dissemination plan; exploring benchmarking, comparing, combining, and publishing data; and investigating new economic and business models for the toolkit.

Work Packages

WP14. Toolkit Refinement

Deliverables: Refinement of the initial installations should result in a version 2.0 of each of the reference implementations

Effort Required: 3 x .2 Developers for 3 months; 1 x .5 Technical Community Engagement Manager for 2 months; 1 x .5 Library Assessment Expert for 2 months

Installations will be iterated where needed based on the feedback from the reference implementations and early adopters, fixing gaps and bugs and making overall improvements in the toolkits. These refinements will be documented on the website and should therefore provide examples of how changes and improvements can be reported back into the community.

WP15. Toolkit Dissemination

Deliverable: Outreach and dissemination plan executed over the course of year 3

Effort Required: 1 x .1 Strategic Project Manager for 6 months; 1 x .1 Technical Community Engagement Manager for 6 months; 1 x .1 Library Assessment Expert for 6 months

With documentation and publication of the toolkit website, efforts will focus on disseminating the toolkit amongst a wider user group. Activities will include attendance and presentation at conferences, publication in professional journals, as well as an extensive social media and online campaign.

Appendix 2: Proposed Model Project Plan

WP16: Data Sharing and Benchmarking Research

Deliverable: An international roundtable focused on publishing and sharing library assessment data amongst institutions

Effort Required: 1 x .1 Strategic Project Manager for 6 months; 1 x .1 Library Assessment Expert for 6 months

For users interviewed in the course of the scoping research, benchmarking and comparing data across institutions was a high priority. Phases 1 and 2 of this project will have taken this into consideration in implementing the infrastructure of the toolkit. This work in Phase 3 will focus on bringing the community together to begin the social and political process of establishing codes of conduct for data publication as well as common benchmarks.

WP17. Scaling and Business Model Research

Deliverables: A white paper investigating of a fully-hosted/cloud-based implementation

Effort Required: 1 x .2 Strategic Project Manager for 4 months

In the final months of the project, the economic model of the toolkit will be reviewed for sustainability. Options will be considered such as turning the toolkit into a fully cloud hosted, login-based service managed by a non-profit (cf. OCLC's GreenGlass tool).

WP18. Coordination/Integration with Institution-Level Analytics

Deliverable: A white paper investigating the expansion of the Library Assessment Framework to include more nuanced measures such as ROI, impact, and learning and research analytics

Effort Required: 1 x .1 Strategic Project Manager for 6 months; 1 x .1 Library Assessment Expert for 6 months

Appendix 2: Proposed Model Project Plan

As library assessment activities mature, libraries will be increasingly asked to address how they add value to research and learning activities. The toolkit will need to grow to accommodate these new metrics. Some work is already underway in this area (notably the Jisc Learning Analytics Project and the Wollongong Library Cube) and the project will take advantage of existing work. Some of the expanded metrics we expect to address include:

- Impact of the library on teaching/learning
- Is there a correlation between students' academic success, and skill with information resources?
- Impact of library on research and publications
- Does involvement of research librarians improve the success of research outputs or publications?
- What is the return on investment for purchased/licensed content? Does it differ from print content?

6. Sustainability Plan

Establishing, building, and supporting a robust and committed user community will be central to the sustainability and growth of the toolkit. For this reason, each of the three project phases has a work package dedicated to building or growing the community. We expect there to be two branches to this toolkit Community. The first will focus on assessment measures and performance indicators. We expect this community to be the one to "own" the Library Assessment Framework -- that is, to modify, update, and support it as needed. A second branch of the community will be centered on the technology and tools within the toolkit. We would expect this part of the community to help make contributions to data warehousing and user interface solutions, not only by entering into discussions and identification of existing open software but by contributing to the development of plugins, APIs, and updates to the code.

We recognize that the use of open software within the toolkit does not mean that the software is entirely free of costs. Open source software must be sustained, refreshed, and updated like any other software and someone has to bear that cost. Participation in an open software project can be very difficult for institutions with few software development resources to justify. For all of these reasons, we are looking to the IIIF Consortium as a model for the toolkit's community. In Phase 1, we hope to identify the early adopters and likely contributors to the toolkit's communities. This phase of work will also provide a sense of where the community needs the most support. In Phase 2, we hope that the early adopter will commit resources to the formation of a formalized consortium to provide both steering and sustainability to the toolkit community. As with the IIIF, we expect the Consortium will provide ongoing oversight for the development of standards and technologies and help manage the growth of the community. The development of a formalized community will serve to efficiently distribute responsibilities across multiple institutions, preventing the burden of sustainability falling on any single library organization.

7. Intellectual Property

In order to maximize the benefit for the wider community, all components of the toolkit will be made available under open licenses. For software, we currently favor an MIT License (http://www.opensource.org/licenses/mit-license.php) generated under the auspices of the Open Source Initiative. The software will be made available on GitHub (https://github.com/). The other intellectual property will remain the property of the contributors, who will be encouraged to make these materials available for wide use and re-use under a CC license.

8. Preliminary Budget

The preliminary budget does not yet reflect any computer hardware costs, or meeting, outreach and travel costs for the community engagement component of project.

	#	Allocation	Mos	Person-mos.
Strategic Project Manager (SPM)				
WP0. Project Management	1	0.9	36	32.4
WP13. Organizational Support	1	0.1	12	1.2
WP15. Toolkit Dissemination	1	0.1	6	0.6
WP16: Data Sharing and Benchmarking Research	1	0.1	6	0.6
WP17. Scaling and Business Model Research	1	0.2	4	0.8
WP18. Coordination/Integration with Institution-Level Analytics	1	0.1	6	0.6
TOTAL Person Months				**36.2**
Local Project Managers (LPMs)				
WP0. Project Management	3	0.2	36	21.6
WP7. Test Data Warehouse & Dashboard Implementations to Ensure Scalability	3	0.2	1	0.6
TOTAL Person Months				**22.2**
Library Assessment Expert & Community Engagement Mgr. (LAE)				
WP1. Library Assessment Framework	1	0.5	8	4
WP2. Data Dictionary	1	0.5	3	1.5
WP4. Validation, Normalization, and Conversion of Data	1	0.2	10	2
WP8. Toolkit Website and Outreach Platform	1	0.5	4	2
WP9. Outreach and Community-building	1	1	22	22

WP12. Dashboard Case Studies	1	0.5	2	1
WP14. Toolkit Refinement	1	0.5	2	1
WP15. Toolkit Dissemination	1	0.1	6	0.6
WP16: Data Sharing and Benchmarking Research	1	0.1	6	0.6
WP18. Coordination/Integration with Institution-Level Analytics	1	0.1	6	0.6
TOTAL Person Months				**35.3**
Local Data Wranglers (DW)				
WP2. Data Dictionary	3	0.2	3	1.8
WP4. Validation, Normalization, and Conversion of Data	3	0.2	10	6
WP11. Data Source Case Studies	3	0.2	2	1.2
TOTAL Person Months				**9**
Developers (D)				
WP3. Data Warehousing Requirements	3	0.5	4	6
WP4. Validation, Normalization, and Conversion of Data	3	0.2	10	6
WP5. Data Warehouse Implementations at UCD, Bodleian, Göttingen	3	0.4	6	7.2
WP6. Dashboard Implementations at UCD, Bodleian, Göttingen.	3	0.4	6	7.2
WP7. Test Data Warehouse & Dashboard Implementations to Ensure Scalability	3	1	1	3
WP12. Dashboard Case Studies	3	0.2	2	1.2
WP14. Toolkit Refinement	3	0.2	3	1.8
TOTAL Person Months				**32.4**
Technical Community Engagement Manager (TCEM)				
WP8. Toolkit Website and Outreach Platform	1	0.5	4	2
WP9. Outreach and Community-building	1	0.5	20	10
WP10. Data Warehouse Case Studies	1	0.5	2	1
WP11. Data Source Case Studies	1	0.5	2	1
WP14. Toolkit Refinement	1	0.5	2	1
WP15. Toolkit Dissemination	1	0.1	6	0.6
TOTAL Person Months				**15.6**

Appendix 2: Proposed Model Project Plan

9. Detailed Staffing Plan & Schedule

A detailed project cost & staffing plan and timeline follows.

Project Plan & Schedule, 2 years

ACTIVITY	#	Allocation	Mos.	person months	Month > 1 2 3 4 5 6 7 8 9 10 11 12	13 14 15 16 17 18 19 20 21 22 23 24	25 26 27 28 29 30 31 32 33 34 35 36
WP0. Project Management and Coordination with other Major Initiatives							
Strategic Project Manager (SPM)	1	1	36	36			
Local Project Managers (LPMs)	3	0.2	36	21.6			
Phase 1. Build and Test the Reference Implementations							
WP1. Library Assessment Framework							
Library Assessment Expert & Community Engagement Mgr. (LAE)	1	0.5	8	4			
WP2. Data Dictionary							
LAE	1	0.5	3	1.5			
Data Wranglers (DW)	3	0.2	3	1.8			
WP3. Data Warehousing Requirements							
Developers (D)	3	0.5	4	6			
WP4. Validation, Normalization, and Conversion of Data							
Developers (D)	3	0.2	10	6			
Data Wranglers (DW)	3	0.2	10	6			
WP5. Data Warehouse Implementations at UCD, Bodleian, Gottingen							
Developers (D)	3	0.4	6	7.2			

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WP6. Dashboard Implementations at UCD, Bodleian, Gottingen.				
Developers (D)	3	0.4	6	7.2
WP7. Test the Data Warehouse and Dashboard Implementations to ensure scalability				
Developers (D)	3	1	1	3
Local Project Managers (LPMs)	3	0.2	1	0.6
Phase 2. Share: Documentation and Packaging of the Toolkit for the Community				
WP8. Toolkit Website and Outreach Platform				
Technical Community Engagement Manager (TCEM)	1	0.5	4	2
Library Assessment Expert & Comm. Engagement Mgr (LAE)	1	0.5	4	2
WP9. Outreach and Community-building				
Technical Community Engagement Manager (TCEM)	1	0.5	20	10
Library Assessment Expert & Comm. Engagement Mgr (LAE)	1	1	22	22
WP10. Data Warehouse Case Studies				
Technical Community Engagement Manager (TCEM)	1	0.5	2	1
WP11. Data Source Case Studies				
Data Wranglers (DW)	3	0.2	2	1.2
Technical Community Engagement Manager (TCEM)	1	0.5	2	1
WP12. Dashboard Case Studies				
Library Assessment Expert & Comm. Engagement Mgr (LAE)	1	0.5	2	1
Developers (D)	3	0.2	2	1.2
WP13. Organizational Support				
Strategic Project Manager (SPM)	1	0.1	12	1.2

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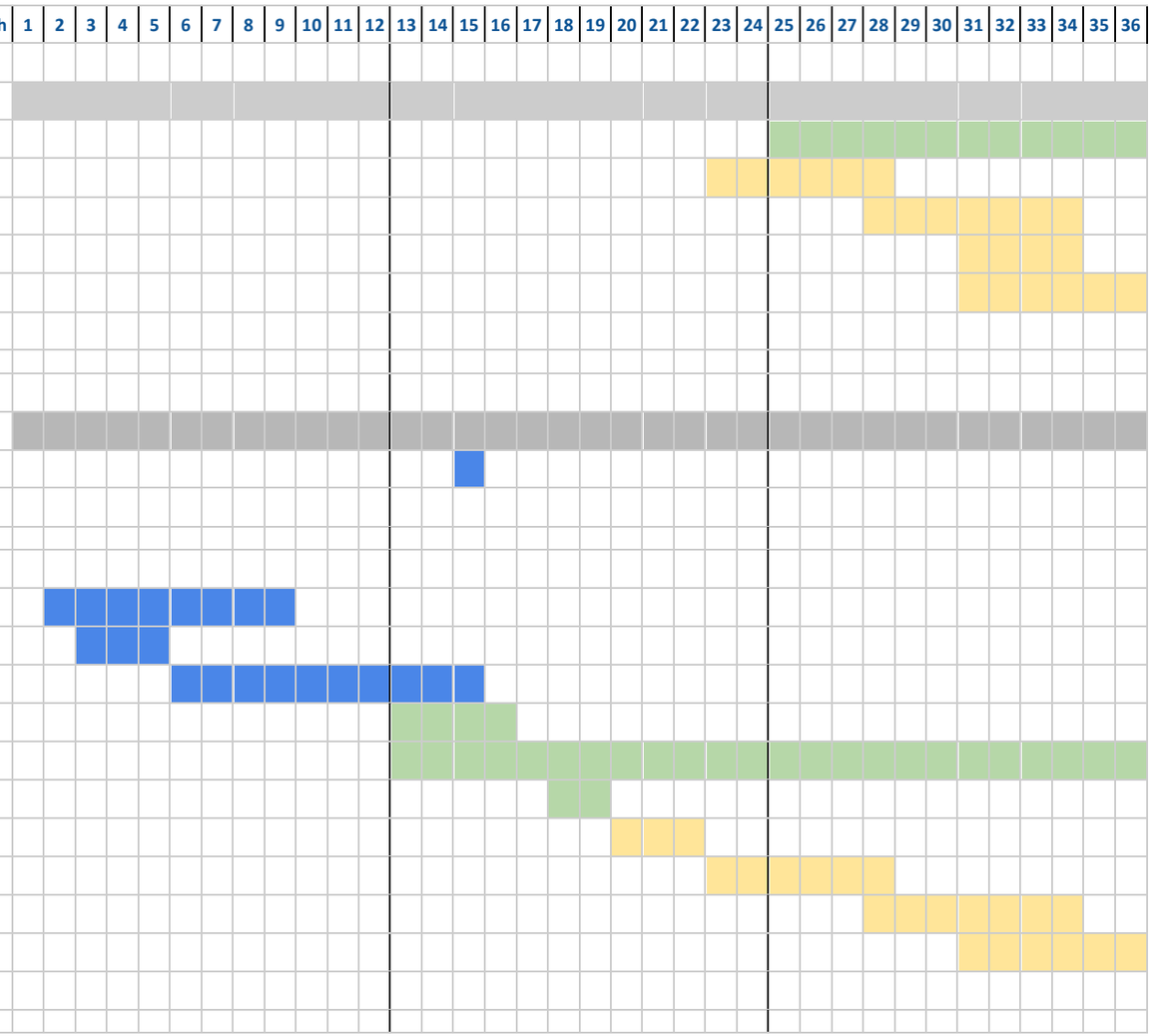
Phase 3. Scale and Sustain the Toolkit and Community				
WP14. Toolkit Refinement				
Developers (D)	3	0.2	3	1.8
Technical Community Engagement Manager (TCEM)	1	0.5	2	1
Library Assessment Expert & Comm. Engagement Mgr (LAE)	1	0.5	2	1
WP15. Toolkit Dissemination				
Strategic Project Manager (SPM)	1	0.1	6	0.6
Technical Community Engagement Manager (TCEM)	1	0.1	6	0.6
Library Assessment Expert & Comm. Engagement Mgr (LAE)	1	0.1	6	0.6
WP16: Data Sharing and Benchmarking Research				
Strategic Project Manager (SPM)	1	0.1	6	0.6
Library Assessment Expert & Comm. Engagement Mgr (LAE)	1	0.1	6	0.6
WP17. Scaling and Business Model Research				
Strategic Project Manager (SPM)	1	0.2	4	0.8
WP18. Coordination / Integration with Institution-Level Analytics				
Strategic Project Manager (SPM)	1	0.1	6	0.8
Library Assessment Expert & Comm. Engagement Mgr (LAE)	1	0.1	6	0.8

Appendix 2: Proposed Model Project Plan

Staffing Plan Detail

	#	Allocation	Mos	Person-mos.
Strategic Project Manager (SPM)				
WP0. Project Management	1	0.9	36	32.4
WP13. Organizational Support	1	0.1	12	1.2
WP15. Toolkit Dissemination	1	0.1	6	0.6
WP16: Data Sharing and Benchmarking Research	1	0.1	6	0.6
WP17. Scaling and Business Model Research	1	0.2	4	0.8
WP18. Coordination / Integration with Institution-Level Analytics	1	0.1	6	0.6
TOTAL Person Months				**36.2**
Local Project Managers (LPMs)				
WP0. Project Management	3	0.2	36	21.6
WP7. Test Data Warehouse & Dashboard Implementations to Ensure Scalability	3	0.2	1	0.6
TOTAL Person Months				**22.2**
Library Assessment Expert & Community Engagement Mgr. (LAE)				
WP1. Library Assessment Framework	1	0.5	8	4
WP2. Data Dictionary	1	0.5	3	1.5
WP4. Validation, Normalization, and Conversion of Data	1	0.2	10	2
WP8. Toolkit Website and Outreach Platform	1	0.5	4	2
WP9. Outreach and Community-building	1	1	22	22
WP12. Dashboard Case Studies	1	0.5	2	1
WP14. Toolkit Refinement	1	0.5	2	1
WP15. Toolkit Dissemination	1	0.1	6	0.6
WP16: Data Sharing and Benchmarking Research	1	0.1	6	0.6
WP18. Coordination / Integration with Institution-Level Analytics	1	0.1	6	0.6
TOTAL Person Months				**35.3**



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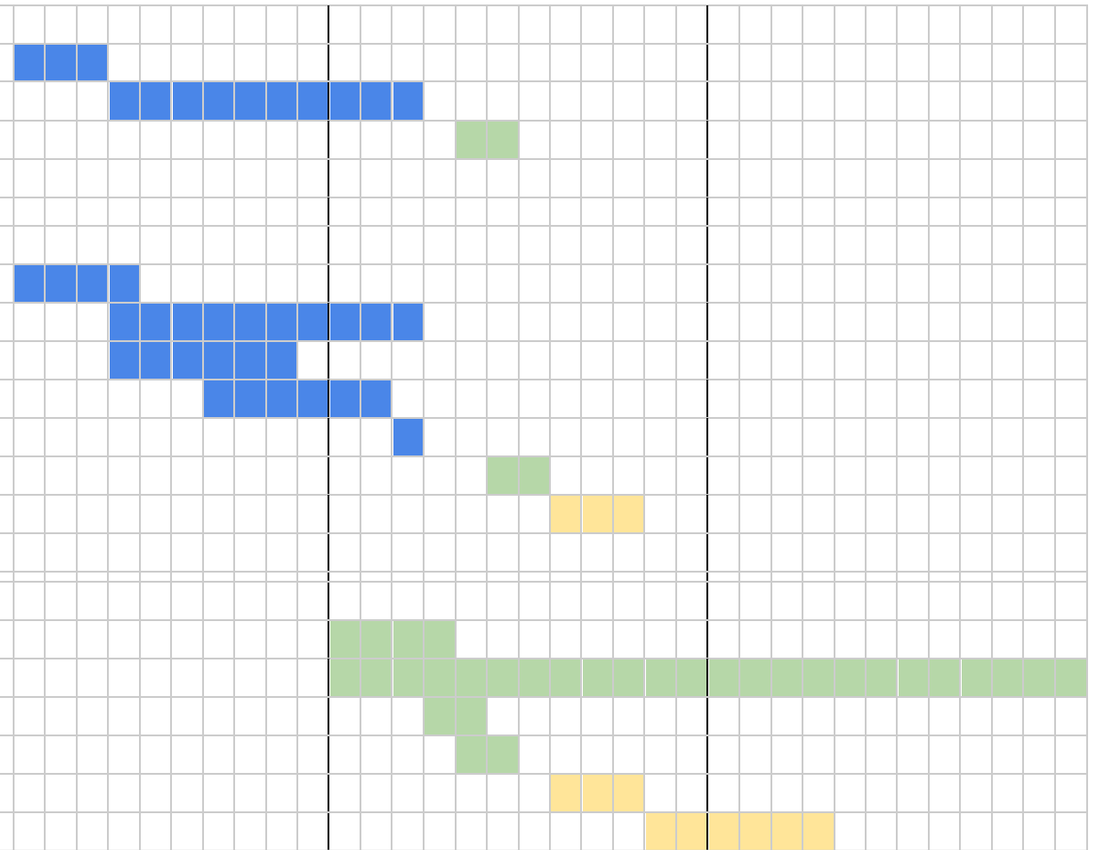
Local Data Wranglers (DW)					
WP2. Data Dictionary	3	0.2	3	1.8	
WP4. Validation, Normalization, and Conversion of Data	3	0.2	10	6	
WP11. Data Source Case Studies	3	0.2	2	1.2	
TOTAL Person Months				**9**	
Developers (D)					
WP3. Data Warehousing Requirements	3	0.5	4	6	
WP4. Validation, Normalization, and Conversion of Data	3	0.2	10	6	
WP5. Data Warehouse Implementations at UCD, Bodleian, Gottingen	3	0.4	6	7.2	
WP6. Dashboard Implementations at UCD, Bodleian, Gottingen.	3	0.4	6	7.2	
WP7. Test Data Warehouse & Dashboard Implementations to Ensure Scalability	3	1	1	3	
WP12. Dashboard Case Studies	3	0.2	2	1.2	
WP14. Toolkit Refinement	3	0.2	3	1.8	
TOTAL Person Months				**32.4**	
Technical Community Engagement Manager (TCEM)					
WP8. Toolkit Website and Outreach Platform	1	0.5	4	2	
WP9. Outreach and Community-building	1	0.5	20	10	
WP10. Data Warehouse Case Studies	1	0.5	2	1	
WP11. Data Source Case Studies	1	0.5	2	1	
WP14. Toolkit Refinement	1	0.5	2	1	
WP15. Toolkit Dissemination	1	0.1	6	0.6	
TOTAL Person Months				**15.6**	



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