# The Right Team for the Right Job

### Investigating team competencies in library technology procurement projects

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## Abstract

This study investigates success factors in library technology procurement projects.

The constant evolution of the tools and technologies supporting services is a testament to the general success of technology planning in libraries. However, reports of repeated difficulties faced by institutions in selecting technical solutions and vendors sustainably are often discussed in the profession.

A literature review provided little evidence of an endemic problem in library technology procurement projects. However, it was also found that objective success measurement is rarely included in publications reporting on such projects.

A mixed method study was therefore developed to collect recent project information, using the DeLone and McLean framework for success measurement, an approach that has been shown to place more emphasis on end user impact. An online questionnaire was distributed to gather quantitative data on project success, along with elements on procurement methods used and the skills represented in project teams, with the intend to determine to what extent these factors impact project success. A series of interviews was also conducted to gather qualitative data to further investigate this question.

Results showed that the type of procurement method employed had little impact on project success. The composition of procurement teams was however shown to have an influence. Procurement teams that include a wider variety of staff representatives and diverse skillsets appear more likely to contribute to successful projects. Further, it was determined that the presence of IT specialists on project teams was more productive than that of representatives from library management. Project management and accessibility assessment were found to be the skills the most likely to be associated with project success.

More generally, it was found that projects favouring flexible and modular solutions, separating the procurement of base systems from the custom local developments, and using agile development paradigms stood a greater chance to succeed in the long term.

## Declaration

This work has not previously been accepted in substance for any degree and is not being concurrently submitted in candidature for any degree.

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Date September 18, 2016

#### Statement 1

This work is the result of my own investigations, except where otherwise stated. Where \*correction services have been used, the extent and nature of the correction is clearly marked in a footnote(s).

Other sources are acknowledged (e.g. by footnotes giving explicit references). A bibliography is appended.

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# Abbreviations and acronyms

ANOVA	ANalysis Of Variance
API	Application Programming Interface
BOS	Originally the Bristol Online Survey, an online survey service
CMS	Content Management System
CSV	Comma Separated Values
ERMS	Electronic Resource Management System
FTE	Full-Time Equivalent
ILS	Integrated Library System
IT	Information Technology
ITO	Information Technology Outsourcing
LMS	Library Management System
MANOVA	Multivariate ANalysis Of VAriance
MARC	MAchine Readable Catalogue record
RFI	Request for Information
RFP	Request for Proposals
RFQ	Request for Quotations
UK	United Kingdom
US/USA	United States (of America)

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## 1 Introduction

#### 1.1 Background

Information technology is an integral part of the infrastructure a modern library needs to fulfil its operational needs and strategic priorities (Breeding, 2015a, p. 29). Software such as integrated library systems, library management systems, online catalogues, content discovery solutions, link resolvers, digital repositories, room management systems, scheduling tools, virtual reference platforms, etc. underline the day to day operation of many libraries (Colegrove, 2015, p. 2). Complementing this specialized toolset are the solutions that all organisations in the 21<sup>st</sup> century require to operate, such as networking, email, instant messaging, teleconferencing, project management and office software. All these tools require hardware, computers, mobile devices, self-service kiosks, and servers on which they run. While an increasing proportion of software services now run on remote "cloud" servers hosted by third parties, maintaining servers and networking equipment is still required for some applications (Breeding, 2016a, p. 37; Ruttenberg, 2013, p. 154). As their mandate expands, libraries constantly invest in new technology, with the latest trend being digital fabrication tools such as 3D printers, plotters, laser cutters, virtual headsets and digital media production suites for reality the "makerspaces" that are cropping up in libraries worldwide (Altman, Bernhardt, Horowitz, Lu, & Shapiro, 2015, p. 11).

When libraries began to implement computers to automate their operations in the 1960s, such systems were often developed specifically for particular libraries, and by a dedicated team of engineers (Tedd, 2007, p. 303). As these systems evolved and became more complex, technology companies emerged from the organisations that had initially developed them, with the purpose of maintaining, developing and, crucially, distributing and selling those systems to other libraries (2007, p. 310). Through "multiple rounds of mergers and acquisitions," a smaller number of "industry giants" (Breeding, 2015a, p. 30) ultimately emerged, a trend that shows no signs of slowing down (2016a, p. 31). This dwindling number of large corporations now dominate an "industry composed primarily of private companies having no public reporting requirements" (2015a, p. 29). The North American library technology market was estimated at US \$805 million in 2014 (p. 30).

Although there appears to be few definitive quantitative indicators about this topic, anecdotal evidence (see e.g. Burke, 2013; Hastings, 2014) suggests that the majority of the information technology tools and services required by libraries are purchased from such third-party vendors rather than developed in-house. An "increasing number of institutions" are however now considering open-source initiatives for the procurement of their major library management systems (Breeding, 2015a, p. 36), although this trend is mostly reported among academic libraries (p. 40).

Regularly evaluating, selecting, and implementing information technology solutions is now a requirement for libraries, who "have much at stake in

products that align well with their strategies, resonate with their patrons, and facilitate the work of their staff" (Breeding, 2016a, p. 31). The real or perceived (see Section 4.2.6) drive to modernise "obsolete" technology has institutions on a constant edge to rethink their established systems. "For libraries, this means careful planning and ongoing assessment of technology plans in order to stay ahead of the increasingly sharp curve of technological change and its societal impact" (Cohn & Kelsey, 2010, p. 8). Yet for many libraries this is "difficult to accomplish in a technological environment that is constantly shifting" (ibid.). Not all institutions have the capacity, staff and expertise to understand all technicalities arising from the evaluation or selection of library systems. "System purchases are among the most exhaustive, time-consuming processes a library organization undertakes" (Waller, 2003, p. 7). Moreover, as publicly funded institutions, many libraries are required "to follow strictly delineated procedures" purchasing such mandatory public as tenders. "Comprehensive requests for proposals (RFP) or more focused requests for quotations (RFQ) are often used as a means of competitively evaluating competing products or services" (Cohn & Kelsey, 2010, pp. 95–96). Such processes aim to make the procurement process fair for vendors by offering all an opportunity to offer their services, but also to ensure institutions select products that meet their technical, organisational and financial needs by encouraging them to follow a set evaluation procedure.

This process is however not trivial. High-level requirements are not easy to establish, especially as they require questioning the tools that many

librarians use on a daily basis (such as their Integrated Library System, or ILS) and express their needs not in terms of replicating the functionalities of the tools they know, but in more abstract terms. In theory, competitive procurement processes should enable stakeholders with no technical abilities to specify their needs using high-level requirements, and offer vendors the opportunity to translate these abstracts goals into technical requirements, which they then implement. However, new technology solutions are rarely implemented "in a vacuum" (Breeding, 2015a, p. 29) and must interact with systems that are already in place, which adds a level of complexity to the technical requirements necessary to ensure compatibility, a critical element in technology procurement. By nature of the competitive procurement approach, such requirements have to be identified very early in the process and are nearly impossible to adapt once the tender has been published or awarded. The rigidity of the procurement process coupled with the difficulty to establish requirements often lead to a discrepancy between the expectation of librarians towards technology projects and the products or services ultimately provided by the vendors they contracted to procure them (Calvert & Read, 2006, p. 649).

#### 1.2 Aims of this research

The shortcomings reported by Calvert and Read are coherent with the author's own observations about library technology projects he was involved in. The present study aims to explore this issue further and identify if there is a trend among library IT projects of a disconnect between initial expectations and the final implemented product, and what

are the factors that influence positively or negatively the success of such projects.

In recent years, the importance of IT skills for librarians, in particular computer programming for new library school graduates, has seen a renewed interest (see e.g. Yelton, 2015). The hypothesis that this study aims to test is whether technical knowledge among librarians, and in particular among those participating in the procurement processes for technology projects, helps reduce the discrepancy between expectations and results, and fosters greater success in library IT projects.

To test this hypothesis, this study therefore aims to a) identify the factors that influence successful IT procurement processes and b) determine to what extent the success of such processes is linked to the skill profile of members of the procurement team. While addressing this issue, it is also hoped that best practices for the procurement of technology solutions in libraries can be identified.

#### 1.3 Research questions

According to Bryman (2012, pp. 10–11), narrowing down the aims of a study to a series of research questions is "crucial" for the success of the endeavour. Not only do they help clearly state the purposes of the study, they also guide the entire research process from the literature search, the decision on what kind of research design(s) to employ, how to identify, collect and analyse data, to the presentation of results (p. 11). Following the model suggested by Creswell (2014, p. 139), a central question and a

series of associated sub-questions were developed. The central question follows the pattern of being the "broadest question that [can be asked] in the study", is open-ended and uses words that convey an open and emerging design (pp. 139-141):

Q1 What are the major factors that make a library technology procurement project successful? (Central question, open, qualitative, describing a phenomenon).

A related, secondary question was added after reviewing the literature, as different approaches to defining "success" were encountered:

Q2a What constitutes success for project stakeholders? (Secondary, open, qualitative, describing a phenomenon)

To test the hypothesis that there is a relationship between who is involved in the procurement process and success, another secondary question was developed:

Q2b Is project success affected by the skills represented in the procurement team that led to the selection of the vendor, product or solution driving the project? (Secondary, closed, quantitative, predicting an outcome).

If this hypothesis is confirmed, this question is followed by

Q2c Is there a particular skill profile for procurement teams that leads to greater project success? (Secondary, closed, quantitative, explaining causes and consequence of a phenomenon). The interviews not only led to the above secondary questions, they also influenced the final form and wording of all research questions (Bryman, 2012, p. 88) to reflect the community of practice shared by the interviewees and, to a lesser extent, by the author (Plano Clark & Badiee, 2010, p. 283).

Questions are categorized in the above list following the framework established by Denscombe (2010; cited by Bryman, 2012, p. 10).

#### 1.4 Purpose

This study investigates how technology solutions in libraries are selected and implemented. It aims to establish the factors that impact the success of those projects, in particular whether the presence or absence of specific skills in the procurement team has an effect on project success. Best practices for the composition of procurement teams for library IT projects will be derived from the results where appropriate.

#### 1.5 Objectives

The objectives of this study are:

- i To investigate past and current trends in library technology procurement processes;
- ii To establish how the success of technology projects in libraries is defined and measured;
- To explore whether there is evidence of discrepancy between users' expectations and implemented solutions in library technology projects;

- iv To explore what aspects of the procurement process affect project success;
- v To test the hypothesis that the composition of procurement teams is a factor of project success;
- vi To determine what skills should be represented on procurement teams to increase project success.

#### 1.6 Scope

This study focuses mainly on academic libraries in a Western, mainly English-speaking context. Even though the population was broadly defined to include all types of libraries, archives and museums, time and organisational constraints have led to the selection of a convenience sample composed mainly of academic libraries representatives for the quantitative part of this study. The qualitative element of the research sought to include the point of view of library technology vendors as well.

#### 1.7 Structure

This report is divided into six sections. A critical literature review was first conducted to establish the state of the art in technology procurement processes in libraries, identify trends in the factors impacting the success of such processes, as well as establish a framework to determine project success. The results of the literature review are presented in **Section 2** and were used to inform the methodology used to gather quantitative and qualitative data to address the research questions identified above.

Section 3 documents this methodology. The results obtained by the two data gathering instruments are then presented in Section 4 and discussed in Section 5. Section 6 concludes the study with a summary of findings and an evaluation of the research process.

Throughout this document, references use the Harvard American Psychological Association (APA) citation style.

## 2 Literature review

#### 2.1 Methodology

Several phases of literature search and review were conducted for this study: a preliminary overview served as a base for the research proposal, followed by a more extensive review of available literature to establish the state of the art on the research questions, as well as to inform the methodology of the study.

A systematic literature review process was used to investigate the state of the art pertaining to the research questions identified in **Section 1.3**. As Cooper establishes, this process (also referred to as *research synthesis*) starts by formulating the research problem, followed by a literature search, gathering of information from relevant studies, evaluating the quality of those studies, analysing, integrating their outcome, interpreting and finally presenting the results (2010, pp. 12–15).

Using the research questions as a starting point, the methodology suggested by Creswell was used for the literature search: identify key words, search libraries and databases and first identify a maximum of 50 relevant sources to serve as a base for further refinement (2014, pp. 31–32). Once the bibliographic sources were identified (see **Appendix A** for a list of sources used), key terms were progressively defined by conducting a series of queries inspired by the research questions, and analysing the

pertinence of the returned results. Using Boolean logic, the terms were then combined into search equations (Bryman, 2012, p. 118), which were then used on all sources. For terms returning large numbers of results (more than 50), both relevance and date sort (most recent publications) were used to focus on a subset of results for deeper review. "Snowballing" was also used to identify additional sources that were referenced in the bibliography of relevant articles. The "electronic invisible colleges" (Cooper, 2010, p. 56) formed by recent postings on email discussion groups, as well as curated bibliographies on library technology topics such as Renaville's (2014) were also used to identify additional sources.

Both French and English-language sources were investigated during the literature review, although only English-language content was ultimately determined to be relevant. Other languages were not actively researched due to time constraints, with the exception of Bae and Hong (2008), which provided a useful usage example of the DeLone and McLean (2003) method for success measurement that was used in this study. Even though Bae and Hong's article was written in Korean, its English abstract and reference section provided valuable information.

Following the template suggested by Pickard (2013, pp. 32–33), critical analysis of sources was conducted and research was synthetized accordingly. The methodological aspects of investigative studies were analysed in particular detail and served to ground the methods used in the present research. **Appendix B** summarises the methodological elements of a selection of sources.

#### 2.2 Results

The literature search returned a wide range of sources, relevant to the different research questions and allowing to "frame the problem" of the study (Creswell, 2014, p. 31). The majority of the literature on technology procurement for libraries focused on the selection of software solutions, primarily Integrated Library Systems, Library Management Systems, resource discovery solutions and digital repositories. Very few relevant sources were found on the acquisition of hardware, even though Hastings (2014) reports that the outsourcing potential of libraries goes largely beyond software. This large representation of software among library technology projects was also observed in the results of the questionnaire distributed for this study, which is discussed in more details in **Sections 3.4** and **4.1**.

Historical sources on the evolution of library technology (Breeding, 2015b; Tedd, 2007) and IT outsourcing in general (Eskelin, 2001; Gantman, 2011) provided general context. Several case studies on specific library IT projects such as federated search (Caswell & Wynstra, 2007; Freivalds & Lush, 2012) and ILS/LMS projects (Dula, Jacobsen, Ferguson, & Ross, 2012; Foster Evans & Thomas, 2007; Gleasner, 2016; Julich, Hirst, & Thompson, 2003; King, 2000) offered a closer look on the selection and implementation process. Some similar studies presenting the vendors' perspective were also reviewed (Grant, 1999; Kington, 1987). In general, the case studies reviewed revealed a trend consistent across articles reporting on library IT projects in that they offer little longitudinal focus, being written shortly after the project is finished,

and rarely mention frameworks for measuring success. For many of those studies, having completed the implementation process is synonymous with success.

To compensate this deficiency, studies showing both qualitative (Metz-Wiseman, Griffin, Borchert, & Henry, 2012) and quantitative (Dutta, Gwebu, & Wang, 2011) cross-sectional investigations of the impact of procurement variables on success indicators were also reviewed, as was one mixed method cross-sectional reflection on knowledge management issues and highlighting hidden costs of technology procurement projects (Haddad & Ribière, 2007).

Building on the "principle approach" for library technology selection outlined by Manifold (2000), authoritative, practical guides to procurement strategies for libraries and Request for Proposals (RFP) writing were consulted (Hodgson, 2002; Waller, 2003), as was the compilation of recent library experience with RFPs reported by Calvert and Read (2006). More general texts on IT strategic planning in libraries (Burke, 2013; Cohn & Kelsey, 2010; Peters et al., n.d.), IT procurement and acquisition (Beatty, 2013; Eskelin, 2001) and project management (Alexander, 2009; Brown, DeHayes, Hoffer, Martin, & Perkins, 2012; Knox, 2011; Olson, 2015; Russell, 2007; Schwalbe, 2011) provided a theoretical and practical foundation to the study.

These authors also provided a basis on which to measure project success. Alternative models such as those proposed by DeLone and McLean (1992, 2003), Lind and Culler (2013) and Badamas (2013) were also explored.

When the technology to be acquired is software, an alternative to procure it from a vendor is to develop it, either in-house or by contracting a developer to build a custom solution. Often, when the in-house development solution is chosen, it revolves around adapting and developing open-source software. Studies reporting on such projects in libraries (Dalling, 2011; Davidson & Casden, 2016; Thacker & Knutson, 2015) were therefore also consulted.

#### 2.2.1 Technology projects in libraries

The Library Technology Guides, created and edited by Marshall Breeding (2016b), are arguably among the most authoritative sources for library technology market trends and surveys. His *Perceptions* report series provides both cross-sectional and longitudinal data on the evolution of major library technology products, such as integrated library systems, library management systems and resource discovery services (2016c). These reports include tracking of product "selections" and "deselections", providing a global survey of libraries migrating between various vendors. Breeding further identifies the current major product trends as "index-based discovery services", "library service platforms" (e.g. "systems that can manage both electronic and print resources") (2015a, p. 29), all the while traditional integrated library systems (p. 32) still represent a large share of the library technology economy. An earlier comprehensive list of major technology development areas for libraries established by McGee (2006, pp. 474–475) is still largely consistent with Breeding's recent observations.

While he often reports on the reasons for preferring a particular platform to another, Breeding does not dwell however on the fundamental reasons why libraries periodically migrate from one system to another. Due to their focus on the major library technology products listed above, the *Library Technology Guides* also do not capture other types of technology projects, especially those that are developed internally by the institutions surveyed. Through her report on computer programming (or "coding") practices among librarians, particularly of the younger generations, Yelton (2015) offers a rare insight on the very active ecosystem of librarians developing custom-made solutions or contributing to open source initiatives that benefit a large number of institutions. However, she identified a pattern of "disconnect" between tech-savvy librarians and their managers (p. 23), pointing out that not all institutions appreciate the potential of "home-grown" solutions and often fail to see them as alternative to the "traditional" delegation of all developments to vendors and third parties (p. 29). This disconnect is further exemplified by Breeding himself who discounts open source software as offering "mixed results" (2016a, p. 37), recognizing the success of open source digital repository systems but failing to identify the "impressive collection of open source software" that Davidson and Casden report being developed by the library community "over the last decade" (2016 n. p.).

Schwalbe warns against pursuing technology outsourcing "for the wrong reasons" (2011, p. 465). Decisions to outsource to reduce the influence of internal staff, for other political reasons, or because of an unverified belief

that hiring a third party will increase control over costs can all be "harmful" to an organization (Gantman, 2011, p. 68). The hidden costs of outsourcing, such as the cost of managing the contract, the time investment of users, management and functional experts, as well as ancillary software and hardware costs are often forgotten (Haddad & Ribière, 2007, pp. 296–297). Moreover, few organizations have a process in place to identify such costs (ibid.).

#### 2.2.2 Procurement methods

Schwalbe defines procurement as "acquiring goods and/or services from an outside source." (2011, p. 462). Much as in other sectors of activity, library automation started in the late 1960s as independent systems that were each developed by the organisations that commissioned them. As these solutions, which would eventually become known as Integrated Library Systems, developed, ad-hoc collaboration between libraries led to the emergence of library networks that shared a common system (Tedd, 2007, p. 307), a trend that was not limited to libraries but mirrored a general shift from building to buying technology (Eskelin, 2001, p. xv). Commercial library automation solutions, or "turnkey systems," emerged only in the early 1980s, and with them the first library technology vendors, many of which grew out of the library systems that had initially developed the ILS they were now selling (p. 309). The decades that followed saw the emergence of a large number of library technology vendors, until a series of mergers and acquisition starting in the early 2000s (Breeding, 2015b) reduced the industry to a small number of ubiquitous "giants" (2015a, p. 30) that now

control most of the market for library automation technologies (see also Waller, 2003, pp. 12, 15). Libraries are thus very much involved in the business of procuring technology (Knox, 2011, p. 1), an operation that is also referred to as *Information Technology Outsourcing (ITO)*.

This process requires careful strategic planning: "the objectives of IT strategic planning are to determine the library's strategic directions for technology, to provide needed technology tools, and to re-invent the organization to the point where everyone becomes part of the IT process" (McGee, 2006, p. 471) It is also necessary to keep systems up to date and avoid "constantly catching up" (Oghenovo Kelvin, Oghenetega, & Jackson, 2012, p. 12). Further, "investigating and evaluating potential systems involves a thorough understanding of the institution's requirements, clearly communicating those requirements to vendors, and finally, determining how well each system meets those requirements" (Freivalds & Lush, 2012, p. 107). Failure to plan accordingly can be "disastrous", as Calvert and Read warn. "The profession abounds with stories (some true, some apocryphal) of disastrous system choices and of how easy it is easy to be swayed by a smooth-talking sales representative, especially for those managers have little previous experience of systems or of capital item purchasing" (2006, p. 649).

Formal procurement processes such as those outlined by Heckman (1999) and Manifold (2000) have been in part developed to avoid this kind of issues. The most prominent element of this process is the Request for Proposal (RFP):

"An RFP is a Request for [a] Proposal and can be part of the selection process of any major capital item or even a service. It is especially useful when the specifications for the product or service can be stated clearly. Librarians may use an RFP when seeking suppliers of software, hardware, books, shelving, photocopying, and even cafeteria services. (...) If a library simply wants to test the market, without making any firm commitment to purchase, then it can do so using an RFI (Request for Information), a less formal document that can be used to find out what is available and it may or may not lead to the next stage of selecting a system. An RFQ (Request for Quotation) does much the same but focuses on costs."

(Calvert & Read, 2006, p. 650)

The difference between RFP and RFQ is subtle and less prevalent in the context of libraries, where cost plays a smaller role than the definition of other requirements, as will be seen below. "RFQs usually do not take nearly as long to prepare as RFPs, nor do responses to them. Selections [in procurement involving RFQs] are often made on the lowest price bid" (Schwalbe, 2011, p. 475). Therefore, for the purpose of this study, RFPs and RFQs will not be differentiated, and RFP will be used to refer to either type of document.

Although the effectiveness of RFPs was initially challenged by library systems professionals (Matthews, 1994; Matthews, Salmon, & Frye Williams, 1987), they have now become the norm for procuring library systems. As Gantman points out, there is little research on the issues of IT outsourcing in the public sector (2011, p. 49) and thus the question of whether RFPs are the best approach to procurement remains open.

Critics note that in situations of great homogeneity, such as with vendors of library systems, an RFP can be a "hopelessly blunt instrument for procuring valuable, useful information" (Waller, 2003, p. 5). Burke concedes that "the RFP process can be very slow and sometimes quite frustrating" (2013, p. 43). Vendors, for their part, report that answering to a RFQ is costly (Grant, 1999, p. 303; Matthews, 1994, p. 59). Breeding (2015a, p. 31) reports that the constraint to embark in a formal procurement process is seen as a "risk" that such process may force libraries to change vendors and systems. Although this might be interpreted as an incentive for vendors to continuously improve their systems and thus avoid "leakage" (ibid.) of clients to competitors.

Researching the advantages and disadvantages of RFPs, Freivalds and Lush note that while "there is no consensus on the value of using an RFP for selecting an IT service" (2012, p. 105), even critics agree that, if nothing else, the process forces institutions to clearly state their needs (p. 106). This in turn helps them avoid mere "technolust" (Burke, 2013, p. 39) and focus on systems that meet their strategic planning. The requirements definition process alone can help libraries avoid pitfalls such as "sheep syndrome - purchasing what other librarians have bought" (Calvert & Read, 2006, p. 649) or that of "evaluating next systems solely through the lens of current systems" (Breeding, 2015c, p. 25).

Waller suggests that even though RFPs are often seen as "a necessary evil", they are advantageous both to libraries, who are required "to examine [their] problems and issues in greater detail than would normally

occur," and vendors, who are thus forced "to assemble competitive solutions that not only respond to the stated requirements but also transcend them – providing additional value for a given price" (2003, p. 11). Matthews however warns against forcing vendors to "get creative" and make promises they are unable to keep in order to respond to requirements that fall outside their usual service offering (1994, p. 57).

Burke adds that at the very least, an RFP offers "a means to evaluate a vendor and justify a decision" (2013, p. 43). Reflecting on the particularities of the library technology market, especially that of Integrated Library Systems where choice is scarce and "the majority of sales are upgrades or product migrations within the existing customer base", Waller notes that formal procurement "is a good tool for keeping vendors honest" (2003, p. 9).

Dalling (2011, p. 35) also reports that formal procurement processes are not a barrier for libraries interested to migrate towards open-source solutions. He provides anecdotal evidence that having a third party (possibly procured through a competitive process) provide support and installation of open-source software is a benefit (p. 39). This trend is echoed by Breeding (2015a, p. 41), noting the emergence of commercial companies that develop and offer services for open-source software. Calvert and Read reported a general level of trust for libraries in the RFP process, although their sample was limited to 11 libraries in Australia and New Zealand (2006).

Despite the uncertainty of its efficiency, formal procurement is now prevalent enough in libraries that there are several resources aimed at helping librarians prepare RFPs for the acquisition of their systems, see for example Hodgson (2002), while Waller's model RFP for the procurement of integrated library systems (2003) is an authoritative source. The use of RFPs is not limited to IT projects and is applied for example to the selection of bibliographic materials providers, as shown by Wilkinson (1998). Caswell and Wynstra regret the absence of model RFPs for specific technology products, although they point out that examples from other libraries can often be used for inspiration (2007, p. 51). The librarians interviewed by Calvert and Read however warn that "If using a document 'borrowed' from another library, use it as a guide only and make sure it meets the library's specific needs. Also, make sure it is not based on older technologies that will constrain vendors" (2006, p. 657).

In the end, Breeding recommends that regardless of the procurement method used, libraries should not get lost in technical requirements but keep the end goal in sight: "A procurement process should give equal value to the vision of what a proposed system aims to accomplish as it does the prescriptive details describing current operational practices" (2015c, p. 25).

#### 2.2.3 Skillset in procurement teams

Technology procurement projects are rarely conducted by individuals. Rather, ad-hoc teams are put together to write requirements, select a vendor or solution, monitor its implementation and manage the process

(Eskelin, 2001, p. 51). To address the secondary research question Q2c, *is there a particular skill profile that leads to greater project success*, the literature was analysed for recommendations on who to include on project teams. Haddad and Ribière stress that identifying required knowledge and adapting teams accordingly are critical to project success (2007, p. 306). Caswell and Wynstra confirm that "getting the right people involved in the process is key to achieving one's goals" (2007, p. 60).

Olson recommend forming teams so as "to bring people with a variety of skills together to accomplish the project's objectives" (2015, p. 155). This is especially true now that library systems "span virtually the entire range of operations of a library" and that "no one person can understand and take care of them all" (Manifold, 2000, p. 121). Brown concurs, stating that "a systems project team should be established and given the responsibility for acquiring the software. The team should include representatives from the business units that will implement the system, (...) analysts and other (...) specialists who will operate and support the [purchased] system and other systems that will interface with the [purchased system]" (2012, p. 393). McGee similarly recommends that team members "must represent the technical, policy, and operational aspects of the library and the issues, concerns, and goals for enhanced IT" adding that care must be taken not to "overload the team with senior staff or managers" (2006, p. 472). Knox shares the same advice, noting that "when selecting team members, it is important to recognize that the team members do not always have to be the department heads, managers, or supervisors. In fact, it can be helpful

to include hourly staff or specialized staff on your project team (when appropriate) as their perspective is often fresh and insightful" (2011, p. 8). "It is important to include people in the discussion who have expertise in both areas [technology and library operations] and the ability to bridge the gap" (ibid.). Calvert and Read go as far as to suggest that "every member of the team should have input into the development of [an] RFP" (2006, p. 660).

When building and managing a team to conduct a technology project in libraries, Peters et al. recommend to "include at least one frontline staff person (i.e. a circulation staff person or a reference librarian)". They also suggest a mix of "techie" and "non-techie" staff members, also mixing library IT with "a techie who doesn't work in a library". Recognizing that not all libraries have dedicated library technology staff, they invite management to research the skills of their staff and to include members who are "enthusiastic and knowledgeable about technology" (n.d., p. 34). The importance of involving IT staff in the selection process has been demonstrated by Dutta et al. who note that "in-house IT capabilities are associated with a more effective selection and alignment of ITO strategies and vendors" (2011, p. 20). Empirical evidence reported by Jetu and Riedl also shows that a high IT capability among the clients of ITO projects has a positive impact on project success (2012, p. 787).

Olson recommend including stakeholders (representing the users of the final product), sponsors (those "paying" for the project, or the reason for it to happen), project champions ("cheerleaders" who don't necessary

have formal authority on the project but have influence through their particular skillset) on the project team (2015, pp. 9–10).

The case studies analysed for this research for the most part follow these recommendations. Foster Evans and Thomas report that functional requirements for their system were "compiled with the aid of members of staff throughout the library", that evaluation of RFQ responses "was undertaken by teams of staff from across all of the library's departments" and that "each section was evaluated by staff with expertise and experience in that area, while more general requirements were assessed by inter-departmental teams" (2007, p. 329). Caswell and Wynstra indicate that "reference, systems, and technical services were represented" (2007, p. 55), Watjatrakul cites "CIO, IT staff, financial staff, legal adviser, senior managers, and users" (2014, p. 124) and Gleasner mentions "technical services, circulation, and information technology (IT)" (2016 n. p.). Freivalds and Lush add "archivists, business office personnel" to the list (2012, p. 110) while Metz-Wiseman et al. also mention "scholarly publishing" (2012, p. 81).

Yelton reports however that several of the librarians with computer programming knowledge she interviewed (n=50+) faced a lack of institutional recognition of their skills and were not sufficiently consulted in the selection of vendors or systems (2015, p. 24). This situation is especially unfortunate since not all institutions have staff with advanced technical skills. Davidson and Casden recognize that the adoption of collaboratively developed open source solutions simply is not an option for
some libraries as they require "a relatively costly common environment and skill set" that only "a few privileged institutions" possess (2016 n. p.).

An option for libraries missing technical in-house skills is to engage consultants for the duration of the procurement project (Waller, 2003, pp. 17– 18). "Experts outside the company, including potential suppliers themselves, can also provide expert judgment" (Schwalbe, 2011, p. 469). Waller does warn however that "many library consultants have been using the same RFPs for years and bid writers can easily identify the boilerplates of different consultants" and so "if you're working with a consultant, insist on originality in the RFP. After all, you're paying for it" (2003, p. 40). Depending on the scope of the project, the procurement of the consultant themselves can require going through an RFP process (Cohen & Cohen, 2003 n. p.).

In general however, McGee recommends libraries invest more in technical knowledge, which he indicates is critical for strategic IT planning and ensuring the organization stays current: "Staff with technical talent should be welcomed, challenged, motivated, and made to feel that the library is a place for them to contribute and grow" so that "organization constantly seeks and adapts best practices in delivering information resources and services to its patrons" (2006, p. 471). Dutta et al. add that "from a practical standpoint, it is critical for firms to understand that taking the ITO route (...) does not (and should not) diminish the focus on building internal IT capabilities" (2011, p. 20), a recommendation they note is

especially critical for smaller teams (p. 21). Metz-Wiseman suggest that organizations may need to train staff accordingly (2012, p. 81).

A side benefit of involving staff from multiple services is supporting change management and increasing "staff buy-in" for the new product or service, as reported by Caswell and Wynstra (2007, p. 55) and Calvert and Read (2006, p. 651). McGee notes that staff involvement is "critical to quality, acceptance, and buy-in" (2006, p. 472) while Grant mentions "building consensus" (1999, p. 303) and avoiding "silo planning" (p. 473). Metz-Wiseman reports that ensuring buy-in is especially important for larger institutions (2012, p. 81).

Finally, once a project team has been nominated, it is critical to "clarify their roles in the procurement process to build effective internal and external relationships" (Heckman, 1999, p. 70) within the library and with vendors and third parties.

## 2.2.4 Success measurement

As discussed above, while case study reports on library technology procurement projects are important to the profession, and this study in particular, for their recommendations and contribution to the shared body of knowledge, they often lack a formal measure of project success. Additionally, those studies are often published soon after the implementation project has been finished, thus without a sufficient longitudinal focus to reflect on the success of the initiative that is being reported.

Evaluation is however widely recognized as "a critical element of any project" (Knox, 2011, p. 101). While this process can be helpful for each institution to "learn from each project (...) and avoid repeating (...) mistakes in future projects" (ibid.), objective measures of success are required if outcomes are to be compared across different projects. Such horizontal measures of success are especially important to vendors wishing to establish the quality of their services in comparison to their competitors. Since 1994, The Standish Group, a consultancy firm, has been publishing global IT project success rates in their CHAOS Report (The Standish Group, 1994). To determine scores, projects are classified into three resolution types:

Resolution Type 1, or project success: The project is completed ontime and on-budget, with all features and functions as initially specified.

Resolution Type 2, or project challenged: The project is completed and operational but over-budget, over the time estimate, and offers fewer features and functions than originally specified.

Resolution Type 3, or project impaired: The project is canceled at some point during the development cycle.

(The Standish Group, 1994, p. 3)

In the CHAOS reports, success is thus defined along three dimensions: whether or not the project is completed on-time, on-budget and according to the initial specifications. Despite the influence of the CHAOS report on the IT outsourcing market, there is growing criticism against this approach. Ambler proposes an alternative metric using his own survey data (2014a, 2014b n. p.), where projects are classified as

- 1 Successful if a solution has been delivered and it met its success criteria within a range acceptable to the organization;
- 2 Challenged if a solution was delivered, but the team did not fully meet all of the project's success criteria within acceptable ranges (...);
- 3 Failed if the team did not deliver a solution.

(Ambler, 2014b n. p.)

Although Ambler claims his metric returns more trustworthy results, the dimensions being measured are still essentially the same, and are consistent with those that are recommended by IT project management experts. Schwalbe, for example, defines success as

- 1 The project met scope, time and cost goals.
- *2* The project satisfied the customer/sponsor.
- 3 The results of the project met its main objective, such as making or saving a certain amount of money, providing a good return on investment, or simply making the sponsor happy.

(Schwalbe, 2011, pp. 14–15)

Recognizing however that the second dimension, customer satisfaction, is harder to capture, she further recommends "measuring project health using metrics" such as "customer satisfaction and return on investment" (p. 17), an approach that is close to that of quality management suggested by Heckman (1999, p. 68). Knox invites her readers to "ask the hard questions" when reviewing projects: "what worked, what did not work and what could [be done] better next time?" (2011, p. 102).

Building on a similar set of questions, Russell goes into greater detail and recommends a framework of 13 dimensions (2007, p. 225) and 17 questions for a thorough review:

- 1 How close to the scheduled completion date was the project actually finished?
- 2 What did we learn about scheduling that will help us on our next project?
- 3 How close to budget was the final project cost?
- 4 What did we learn about budgeting that will help us on our next project?
- 5 What did we learn about communication during the project?
- 6 At completion, did the project output meet client specifications without additional work?
- 7 What, if any, additional work was required?
- 8 What did we learn about writing specifications that will help us on our next project?
- 9 What did we learn about staffing that will help us on our next project?
- 10 What did we learn about managing conflict through negotiation on this project?
- 11 What did we learn about monitoring performance that will help us on our next project?

- 12 What did we learn about taking corrective action that will help us on our next project?
- 13 What technological advances were made on this project?
- 14 What tools and techniques were developed that will be useful on our next project?
- 15 What recommendations do we have for future research and development?
- 16 What lessons did we learn from our dealings with service organizations and outside vendors?
- 17 If we had the opportunity to redo the project, what would we do differently?

(Russell, 2007, p. 218)

Olson also recommends involving stakeholders in project evaluation. She defines four dimensions to measure project success or failure:

- *1 correspondence* (*meeting design objectives*);
- 2 process (whether the project was finished on time and on budget);
- *3* interaction (whether the system is used as, and as much as it was planned to be);
- 4 expectations (of the stakeholders in general).

(after Olson, 2015, p. 170).

The common element in Knox's, Russell's and Olson's framework is that they all rely largely on stakeholder input, reducing the main process metric used by the CHAOS report (meeting timeline and budget) to a single dimension.

Alternative metrics include Breeding's, who suggest that from a vendor's perspective, "the number of contracts signed in a calendar year provides a general measure of success" (2015a, p. 30) though this does not imply successful implementation, as the signature of a contract occurs at the beginning of a vendor-client relationship, by definition before the project has started. Finally, Dutta et al. used a global ranking of IT outsourcing vendors as a qualifier for procurement quality (2011, p. 14), which is not only inapplicable for library vendors that are not represented on those rankings, but also, and more importantly, does not measure the success of individual projects. Lind and Culler explore the effects of a series of "critical success factors" on project success, but their factors are all process-oriented (e.g. management support, client involvement, sufficient personnel, project schedule) (2013, p. 45) and do not capture success from the customer's perspective. Méndez et al. follow a similar approach (2008). The fourteen responsibilities for success or failure identified by Badamas (2013, p. 35) also focus on project management dimensions.

DeLone and McNeal propose a radically different approach to measure success in information systems. Originally developed in 1992 using theoretical and empirical data (1992, p. 61) to "synthetize previous research into a more coherent body of knowledge", their model was subsequently adopted to measure project success in a variety of settings, motivating the authors to update their original findings. Notably, the dimension of

service quality, which has since been recognized as an important measure of success and has been implemented by the SERVQUAL model (2003, p. 18), was missing in the original model and has been added (p. 22). The updated model, which has been chosen to determine project success in the present study, defines six dimensions of success:

- 1 System Quality. This dimension includes objective measures of the system's usability, such as availability, reliability, adaptability and response time.
- 2 Information Quality. This dimension explores how effectively users of the system interact with it. Aspects such as whether the system is easy to understand for users, and if it provides services that are relevant to them are measured.
- *3* Service Quality. This dimension measures the overall support delivered by the provider of the system. This includes aspects such as assurance, empathy and responsiveness.
- 4 Use. This dimension captures the objective usage of the system, including aspects such as the number of visits/transactions handled by the system, but also the nature of use.
- 5 User satisfaction. This dimension is the mostly subjective pendant to the previous one, as it includes perceived satisfaction of the intended users. But objective measures can also be included, such as repeat usage.
- 6 Net benefits. This final dimension aims to capture objective gains to the organisation, such as cost, time and labour savings, but also additional usage of the service(s) provided by the organisation.

(after DeLone & McLean, 2003, pp. 10–11, 24–25)

Note that the original framework applies to a wide range of organisations, including for-profit corporations, and accordingly not all dimensions are relevant in the context of libraries or archives. The description above focuses on aspects that are relevant to the context of this study. For example, net benefits to for-profit organisations include aspects such as increased sales. As Gantman remarks, "in the public sector, IT helps in cutting costs and not in generating profits" (2011, p. 54). Thus, in a library or archives context, net benefits can be translated to a measured increase in the services provided by the organisation (e.g. increased loans, reference questions, etc.).

The updated DeLone and McLean model was shown to be applicable in practice as a success measurement device by Bae and Hong (2008) but no evidence was found of this approach having been used to evaluate library technology projects. Similarly, there seem to be little research on the relationship between the process-focused approach recommended in IT project management and the more results- and user-focused one suggested by DeLone and McLean.

# 2.3 Summary

Formal procurement processes such as Request for Proposals (RFPs) are common practice for the acquisition of technology by libraries. Even though there is little formal evidence of their impact on project success, RFPs are generally recognized as resource-consuming but effective tools to help libraries define their future needs with sufficient distance from

current solutions, and maintain a healthy drive for innovation among vendors.

The exact composition of systems procurement teams in libraries largely depends on project particularities, but there is consensus to suggest that they should span multiple skillsets, including both technical and non-technical individuals, frontline and back-office staff, as well as a vested but empowering participation by management. There is evidence suggesting that computer literacy is a useful skill to include in project teams, although it is recognized that not all institutions will have the necessary resources for it. The use of consultants can, in certain circumstances, compensate for the absence of local technical knowledge, as long as there is a strong participation by library staff to inform the project and ensure buy-in.

The success of technology projects is usually expressed in functional terms, as a measure of how well timelines, budget and technical requirements are met. Alternative, more holistic models exist that take impact on end users and general project quality into account. However, such models are not often used to evaluate library technology projects.

# 3 Methodology

# 3.1 Introduction

This chapter describes the research design used to investigate the research questions developed in **Section 1.3**. It discusses the research methods used and the rationale for adopting them, as well as sets the parameters for collecting and analysing data.

# 3.2 Research approach

Measuring the impact of project design, such as the definition of requirements or selection methods, on the success of information technology projects can be achieved by qualitative methods, as exemplified in Lampert and Vaughan (2009), Lee et al. (2004) and Bae and Hong (2008). The latter uses seven of the dimensions established by DeLone and McLean (1992, 2003) to quantify project success. Russell suggests a 13-dimension quantitative scale for reviewing success (2007, p. 226). Accordingly, a quantitative approach using a questionnaire as data collection instrument was chosen to address the research questions.

Quantitative metrics are also recognized by Schwalbe as a possible indicator of project "health" (2011, p. 17), however she warns that dimensions such as overall satisfaction by customers or project sponsors (p. 16) are harder to capture and suggests that qualitative data might be more appropriate in this context. Halpern et al. lament that the "over-

reliance" of library science research on questionnaires is "limiting the types of questions we are asking, and thus, the answers we can obtain" (2015 n.p.). Instead, they recommend choosing "the method that will provide the best answer" and note that "qualitative research methods are most appropriately employed when the research question is one that attempts to investigate, explore, or describe" (ibid.). Creswell also recommends relating the central research question to a qualitative strategy of inquiry (2014, p. 139).

Moreover, it was recognised that a qualitative approach would identify factors not captured by the DeLone and McLean model, and further enrich the picture by gathering experiences and best practices from practitioners, as well as probe the potential impacts of organisational culture on success factors. Gathering qualitative data through a series of interviews was therefore chosen as a second data-gathering instrument, to complement the project success data gathered by the questionnaire, but also to address the secondary research questions, which called for an exploratory approach. Such interviews were also recognized as a vector to gather more input from questionnaire respondents willing to be contacted after the completion of the web form.

# 3.3 Mixed method design

A mixed method research approach, combining quantitative and qualitative data gathering, was therefore preferred. This approach is recognized by Creswell as "providing a stronger understanding of the

problem" (2014, p. 215) than either of the quantitative of qualitative methods in and by themselves, while Bryman describes the data derived from mixed methods as "mutually illuminating" (2012, p. 628). Another advantage of mixed methods is that results from either method are compared against the other, providing an extra level of validation by triangulation (2012, p. 635).

Following the model of sequential explanatory design (Ivankova, Creswell, & Stick, 2006, p. 5; Creswell, 2014, p. 224), two subsequent data gathering phases were conducted, beginning with a quantitative survey and completed by a series of interviews. Both approaches are designed to collect data from multiple institutions, varying both in type and geographical location, but over a short period, following a cross-sectional research design (Bryman, 2012, p. 58). The use of interviews allowed subjects to bring perspective over a longer period of time, as they reflected on their experience with past and current projects, thus bringing a limited longitudinal perspective to the research (p. 63).

# 3.4 Questionnaire

## 3.4.1 Questionnaire versus survey

It is worthy to begin this discussion with the distinction between survey and questionnaire. According to Pickard (2013, p. 111), a survey is a research method that involves gathering data from a representative sample of a target population, for the purpose of studying relationships between specific variables. Thus defined, a survey produces findings that are

generalizable to the wider population. Bryman (2012, p. 60) employs a more nuanced definition, noting that the purpose of survey research is to detect patterns of association across more than one case. A questionnaire, on the other hand, is a data collection technique that can be used to gather both qualitative and quantitative data (Pickard, 2013, p. 111).

The study presented in this report has no pretention for generalization, as data was not gathered from a strictly representative sample, but rather aims at a limited transferability (Pickard, 2013, p. 21) of its findings to institutions and circumstances similar than those explored by the study. To avoid possible confusion, this report will respect the strict definition of survey as recommended by Pickard, and only the term questionnaire, will henceforth be used to refer to the data gathering method employed in this research.

## 3.4.2 Design

Questions were developed following a "funnelling" technique, "starting from general questions/topics and ... gradually directed to focus on more specific ... issues" (Bickman & Rog, 2009, p. 296). Accordingly, questions enquiring about the type and size of the institution for which the questionnaire is filled are asked first. Following are a series of questions about the skillset of this particular institution's staff. After that, focus narrows to a particular information technology project, exploring its development and finally its success.

The full list of questions included in the questionnaire can be found in **Appendix D**, while **Appendix E** provides details about the type and possible values for each question.

## Context

To establish whether the results could be transferred beyond the sample that filled the questionnaire, it was necessary to measure how representative of the general population the sample is. Accordingly, the guestionnaire started with two questions about the type and size of institution represented by the respondents. Although primarily aimed at libraries, the questionnaire was also distributed on discussion lists, and it was expected that respondents from the broader community of information professionals could respond. Drawing inspiration from the indicators developed by the UNESCO, IFLA and ISO for the standardization of library statistics (Heaney, 2009) and the classification used by the World Libraries Online directory ("LibWeb," 2016), categories were designed to capture four distinct types of libraries: public, academic, school and special libraries. The latter was further specified to include museum libraries. Archives and library organizations (including consortia) were also added to the list, with a final option for respondents to specify their own institution type if not captured by the predefined categories.

Since the aim of the context questions was to group responses by type and size of institutions, and as suggested by Metz-Wiseman et al. (2012, p. 79), institution size was captured not by requesting the absolute number of staff, but by asking respondents to classify their organisation among

four different size brackets. This allowed respondents to provide the required information for grouping the responses, without discouraging them by asking unnecessary specific questions about their institution, for which they might not have the answer. The metric used for this question was the Full-Time Equivalent (FTE), a well-established measure of staff size in libraries (Phan, Hardesty, & Hug, 2014, p. 45), and the question was further clarified to ensure that the response only captured staff directly working for the library, archive of museum when they are part of a larger structure, such as university libraries, corporate archives, etc.

#### Project team skillset

Participants were asked to indicate what skills were represented in the team that determined what vendor or product to select for the project. A similar set of questions was asked twice, once near the start of the questionnaire (Questions 3.1-3.10) about the representation of skill in the organisation in general, and a second time later in the questionnaire (Questions 8.1-8.10) specifically about their representation within the project team. The goal of that two-pronged approach was to establish a baseline for the available skillset. This was used to determine whether, when a skill was recognized as being under-represented in the project team, it was because of oversight or perceived lack of importance of a particular skill profile, or whether it was because that particular skillset was unavailable within the organisation.

The list of skills for this question was developed based on other studies on library technology procurement, notably Metz-Wiseman et al. (2012, p.

81) and Freivelds and Lush (2012, p. 110), the core competencies for librarians identified by the Ohio Library Council (Boon et al., 2014 n.p.) and by the Canadian Society of Association Executives ("Not-for-Profit Management Competencies," 2016). This list also mirrors the general team roles recommended by Eskelin for technology acquisition projects (2001, pp. 51– 52) and was further refined during the pilot phase (see Section 3.4.4 below).

#### Project information

After the baseline skillset question, participants were asked to focus on a specific information technology project they were aware of inside their organisation, and to answer the following questions in relation to that project, as per the funnelling technique described earlier. To help participants focus on a specific project (Pickard, 2013, p. 210), and to classify the type of projects represented in the responses, classification of the project in focus was asked in Question 4. The list of project types was based on product categories reported by Breeding (2015c, p. 23) and McGee (2006, pp. 474–475), completed by the anecdotal analysis of three months' worth of messages on the code4lib email discussion list, extracting the project types that were most often referenced in messages posted to the list. The list was further refined during the pilot phase (see Section 3.4.4 below). Participants further had the possibility to specify the project type if it wasn't captured by one of the predefined categories (Question 4.a).

#### Procurement and selection strategy

Procurement methodologies have a potential impact on project success, as Manifold (2000, p. 129) warns. This variable was therefore captured in Question 6, taking care to allow respondents to indicate if they did not know what strategy was followed so as to maintain the internal validity of the variable. Respondents were also able to specify the selection method in a free text field in case the predefined categories did not include it (Question 6.a).

#### Project success – process-oriented metrics

This section included questions to measure project success from a project management and process perspective (Olson, 2015, p. 170; Russell, 2007, p. 218), exploring whether the project requirements were met (Questions 9 and 10) was completed on schedule (Question 11.1) and on budget (Question 11.2) and whether those parameters were accurately defined at the beginning of the project (Questions 11.3, 11.4 and 11.5).

## **Project success – results-oriented metrics**

Aiming for a richer assessment of project success and taking user experience into account, the updated DeLone and McLean framework (2003), discussed earlier in **Section 2.2.4**, was used.

A series of questions were developed to address all dimensions of the DeLone and McLean model, resulting in a multiple-indicator measure (Bryman, 2012, pp. 166–167) for project success. Given the potential subjectivity of those dimensions, the questions were presented as a series of statements, with respondents being asked to quantify their

agreement to those statements using a Likert scale (Bryman, 2012, p. 166; Pickard, 2013, pp. 213–214). The resulting questions are listed in Table 3.1 along with the DeLone and McLean dimension they are capturing.

Question	Dimension		
(and question number on the questionnaire)	as per DeLone and McLean (1992, p.		
The product (acruice does what it's supposed to	84, 2003, pp. 23–26)		
	1) System quanty – Osability		
The product (service is available when it's peeded	1) System quality Availability		
	1) System quanty – Availability		
(IZ.Z)	1) Custom quality Deliability		
The product/service is feliable (12.3)	<ol> <li>System quality – Reliability</li> <li>Containing – Reliability</li> </ol>		
The product/service is flexible/adaptable (12.4)	I) System quality – Adaptability		
The product/service is complete (there are no	2) Information quality –		
missing features) (12.5)	Completeness		
The product/service is easy to use & understand	2) Information quality –		
(12.6)	Usableness, Understandability		
The product/service is relevant to the intended	2) Information quality – Relevance		
user's needs (12.7)			
The product/service provides adequate security	2) Information quality – Security		
(12.8)			
The product/service results in overall cost	6) Net benefits – Cost savings		
savings (12.9)			
The product/service results in overall time	6) Net benefits – Time savings		
savings (12.10)			
The product/service results in an increased use of	6) Net benefits – Expanded		
the service my organisation is providing (e.g.	[usage], Incremental additional		
increased number of patrons/loans) (12.11)	[transactions]		
The intended users of the product/service are	4) Use		
using the product/service (13.1)			
The intended users of the product/service are	5) User satisfaction		
satisfied with the product/service (13.2)			
The vendor/team who provided/developed the	3) Service quality –		
product/service is responsive (14.1)	Responsiveness		
The vendor/team who provided/developed the	3) Service quality – Empathy		
product/service understands the needs of my			
organisation (14.2)			
The vendor/team who provided/developed the	3) Service quality – Assurance		
product/service is trustworthy (14.3)			

#### **Final questions**

This research being of an exploratory nature, it was important to leave an opportunity for respondents to share additional aspects of their experience with information technology projects that were not covered by the rest of the questionnaire. Such open questions are recognized to be valuable for exploring new areas, at the cost of additional work during the data analysis phase, as their answers required to be coded manually (Bryman, 2012, p. 247).

One of the major disadvantages of self-completion questionnaires is the inability to collect additional data (Bryman, 2012, p. 235) and to follow-up with respondents whose comments may address issues that were not initially expected. Consequently, an opportunity was given to respondents to voluntarily provide their e-mail address, if they agreed to be contacted to provide additional input on their responses. Thus collected addresses were used to clarify certain responses, and also to identify potential candidates for the interviews that were conducted in the subsequent data-gathering phase.

## 3.4.3 Population and sampling

The questionnaire was aimed at librarians, archivists and other library or archives employees that were involved in the selection or procurement of technology projects. Employees or contractors of library information technology vendors (e.g. ILS vendors, software engineers, library technology consultants, etc.) that were involved in the procurement of such services were also included in the target audience. As the

questionnaire was written in English and distributed on English language media, professionals from English-speaking countries were the primary targets of the study.

The number of professionals falling in the above categories was potentially large and hard to estimate. Global statistics about the number of professionals working in libraries and archives, such as the OCLC Global library statistics (2014) do not consistently track the primary occupation of staff. Since the size of the target population could not be estimated, a representative sample could not be determined. Distributing a questionnaire to a population of an unknown size, and thus without establishing a representative sample of this population, is called nonprobability sampling. Although Sue warns that data thus gathered "may or may not represent the population well", she concedes that probabilistic sampling is "often impractical" in online guestionnaires (2012, p. 43). Tourangeau recognizes that such "unrestricted self-selected surveys" are "very common" in research using web-based data gathering (2013, p. 12; citing Couper, 2000). He cautions however against generalising findings from such data unless the results are corrected for the inherent sampling bias introduced by self-selected surveys (ibid, pp. 23-24). Accordingly, while the questionnaire for this study was openly distributed to a "convenience sample" (Sue, 2012, p. 44) of the target population, the sampling bias introduced by this approach was taken into account when discussing the potential transferability of the study's results.

Library patrons were deliberately not as primary sources in this research. Although they are often the ultimate users of the technologies implemented by libraries and archives to provide their services, it was expected that their experience would be mediated through the information professionals who answered the questionnaire (see Question 13).

## 3.4.4 Pilot

Prior to distributing a questionnaire, it is generally recommended to run a pilot test "to identify potential problems and address them prior to the production survey" (Rothgeb, 2008, p. 583), fulfilling "the mundane but important purpose of quality assurance" (Ornstein, 2013, p. 100). Such an approach is also helpful to "monitor the ease with which respondents complete the questionnaire and also the ease with which [the researcher] can administer and score the instrument" (Fink, 2003, p. 108). Accordingly, a pilot was conducted prior to the wide distribution of the questionnaire with 3 participants in different contexts (academic and public libraries, English-speaking and non-native English speakers) and their feedback was incorporated in the final questionnaire. The pilot participants were known to the author and were chosen for their recent experience in library technology procurement, and their knowledge of research methods, offering "expert review" (Ornstein, 2013, p. 102) of the questionnaire.

## 3.4.5 Online questionnaire software

Several options were considered for conducting the online questionnaire. Survey Monkey ("SurveyMonkey," 2016) and LimeService ("LimeService," 2016)

were first evaluated as potential vectors. The major issue of Survey Monkey is however that its data servers are hosted in the U.S.A. and therefore could potentially be open for investigation by law enforcement agencies without the knowledge of their users. This situation is recognized as a potential breach of the Ethical Duty of Confidentiality principle stated in the Canadian TCPS2 Ethical Conduct for Research Involving Humans guidelines (2014, Chapter 5) that were followed during this study. The guidelines mandate the explicit mention of this issue to all questionnaire respondents (Lavender, 2011) if a solution such as Survey Monkey is used. To avoid this issue, an alternative solution was preferred. The BOS online survey tool ("BOS," 2016) was recognized as the best available option. Its data servers are not hosted on US soil, and moreover, the BOS tool has been licensed by Aberystwyth University and is made available at no cost for students, faculty and staff of the university. Its interface is also more modern and user-friendly than the other alternative to Survey Monkey, LimeService. The BOS tool was tested during the pilot (see Section 3.4.4) prior to the deployment of the final questionnaire and found to be adequate for the live data-gathering phase.

## 3.4.6 Distribution

Among the methods recommended by Sue for recruiting participants to fill out questionnaires are email invitations, social media, offline (word of mouth) methods, as well as placement on websites through hyperlinks and pop-up windows (2012, pp. 107–108), with email being cited by Tourangeau as "the method generally used for contacting and recruiting"

(2013, p. 16). The first two methods were recognized as being the most practical for this study. A list of potential respondents was created from the author's professional contacts, current and former colleagues, and acquaintances from professional conferences, selecting individuals active in public, academic or special libraries, archives or library systems vendors with recent experience of technology projects. Care was taken to not only include developers and system librarians, but also front line staff and managers active in non-IT library departments. A direct email message (in English and in French) was sent to this list to solicit participation in the study, following Sue's recommendation to keep it "intriguing, simple and short" (2012, p. 111) and her best practices for message design (p. 132). Direct messages were also sent on similarly selected professional contacts on the LinkedIn platform. A copy of the invitation email is attached in **Appendix C**. A total of 110 recipients was thus directly contacted.

The invitation was also extended to the members of two email discussion lists chosen for their coverage of technology in libraries: the "code for libraries" mailing list ("code4lib," 2016) and the Library Information Technology Association List ("LITA-L," 2016). A message similar to the direct email invitation was used on those lists, and an example is also included in **Appendix C**.

Sue further suggests that "sending follow-up invitations can help increase the response rate substantially" (2012, p. 132) and accordingly, follow-ups were sent to the direct email respondents, as well as on the email

discussion lists, approximately three weeks before the end of the datagathering period.

Alongside the email invitations, the questionnaire was also posted on social media, using the author's Facebook, Twitter and LinkedIn feeds as distribution channels, and encouraging readers to further distribute the invitation, thus further expanding the sample by the "snowball" effect (Bryman, 2012, p. 424).

#### 3.4.7 Data analysis

At the end of the data-gathering period, results were downloaded from the questionnaire management platform in comma-separated values (CSV) format. The column containing the email addresses of respondents willing to be contacted for further enquiry was separated from the rest of the results and stored separately. Results were analysed using RStudio, and the same software was used to produce graphs and tables to illustrate the Results section of this document. In accordance with the principles of "open and reproducible research" (Stodden, Leisch, & Peng, 2014, p. 169), the scripts that were used to analyse the questionnaire data were published GitHub platform openly the on at https://github.com/timtomch/aber-libtech-data. The data itself was not made public, in accordance to the ethical research guidelines followed and the questionnaire consent form.

# 3.5 Qualitative interviews

To fully explore the primary research question Q1, *what are the major factors that make a library IT procurement project successful*, as well as the exploratory secondary question on the definition of project success, a qualitative approach was chosen to complement the "static" (Bryman, 2012, p. 638) quantitative picture gleaned by the questionnaire (see Section 3.3 above).

## 3.5.1 Interview design

Following the protocol recommended by Creswell (2014, p. 194), the interviews were structured to begin with a general "ice-breaker" question, followed by a short series of questions derived from the "subquestions in [the] qualitative research plan" and ending with a concluding, open question to elicit additional information on the topic. Since the topic to be investigated (success factors in library IT projects) is specific, the interviews were designed following a semi-structured model as "a list of questions or fairly specific topics to be covered" to be asked similarly from interviewee to interviewee. (Bryman, 2012, p. 471). The resulting protocol consisted of a list of questions to be asked in a certain order, with additional prompts based on the responses of the interviewees. The protocol is presented in **Appendix G**.

Interviews were conducted by telephone and in person, depending on the location and availability of the interviewees. In-person interviews were preferred whenever practical as, according to Arskey and Knight, they

generally allow better concentration on the topics being researched, and are more conductive to open and exploratory questions (1999, p. 81). Interviews were recorded and immediately transcribed, with the researcher additionally taking notes, as recommended by Creswell (2014, p. 194). This considerably reduced the time required by the transcription (see also Bryman, 2012, p. 484).

## 3.5.2 Sampling

Interviewees were selected using fixed purposive sampling (Bryman, 2012, p. 418; Creswell, 2014, p. 189), selecting subjects that were either known by the author to have experience with several IT projects in libraries, or by contacting questionnaire respondents that had voluntarily provided their contact information and agreed to be interviewed. A critical case sample (Bryman, 2012, p. 419) was thus constructed, by combining interviewees representing different point of views (librarians and vendors, technical and non-technical persons), although an equal distribution of subjects along those two axes was ultimately not possible due to the availably of volunteers. The final sample consisted of six (n=6) subjects, four academic librarians (with various degrees of experience in IT projects), one developer working for a library IT vendor, and one librarian with a prior experience as a developer and vendor.

## 3.5.3 Interview questions

After having established the informed consent of the subjects (see Section 3.6 below), the interviews started with a series of introducing questions (Bryman, 2012, p. 476), establishing the subjects' experience with

technology projects. A direct question (p. 478) was then asked towards the beginning of the interview to explore the main qualitative research question and gather the subjects' personal definition of project success. Then, interviewees were invited to focus on one or two recent projects, establish their role in those projects, and use them to illustrate their own definition of project success. Probing questions (ibid.) exploring the main factors of project success were derived from Brown et al. (2012, pp. 348, 426), Russel (2007, p. 218) and Schwalbe (2011, p. 15), with inspiration from Olson (2015, pp. 160, 170) and Knox (2011, p. 102). Such questions were only asked if interviewees did not cover similar topics in their prior responses. Ending questions (Bryman, 2012, p. 479) allowed subjects to provide additional input on the explored topics, before thanking them for their participation. **Appendix G** lists the full list of questions prepared for the semi-structured interviewes.

## 3.5.4 Data analysis

Interviews were transcribed by the researcher and identifying information was removed, as per the terms of the agreement signed with the interviewees. The full interview transcripts are presented as **Appendix H**. Following the protocol recommended by Creswell (2014, p. 197), data was then reviewed multiple times in its entirety to provide insights on the "general ideas" brought forward by the subjects. The transcripts were then hand coded (pp. 195, 198) according to a pre-defined rubric designed to explore the research questions, extending the rubric as new topics were identified. The resulting rubric is presented as **Appendix I**. Coding was

also entirely done by the researcher, thus preventing inter-coder variability (Bryman, 2012, p. 212).

A description of the identified themes was then prepared using the coded data (Creswell, 2014, p. 199), before an interpretation of the findings was attempted (p. 200).

## 3.6 Research ethics

This research follows the Canadian *TCPS2 Ethical Conduct for Research Involving Humans* guidelines, which are based on the core principles of "respect for persons, concern for welfare and justice" (2014, Chapter 1, Article 1.1). Further, "an important mechanism for respecting participants' autonomy in research is the requirement to seek their free, informed and ongoing consent" (ibid). Consequently, care was taken to ensure the informed consent of participants to both the online questionnaire and the interviews. As recommended by Sue (2012, p. 28), wording was added at the start of the questionnaire (see Appendix D) to ensure participants were able to make an informed decision about their participation, and were aware of their rights to cancel their involvement at any time. For the interviews, informed consent forms (provided in Appendix F) were distributed to the subjects in advance, also seeking their permission for recording the interviews, following the guidance of Bryman (2012, p. 140).

Another key requirement for ethical research is "protection of privacy, and the corresponding duties of researchers to treat personal information in a confidential manner" ("TCPS2 guidelines", 2014, Chapter 5). The email addresses

of the prospective participants were entered in the BCC: field of the email inviting them to participate in the research. Questionnaire participants were able to respond anonymously, but were offered the option to voluntarily provide their email address if they agreed to be contacted for further investigation. This data was immediately separated from the individual questionnaire results at the end of the data-gathering period. As explained in **Section 3.4.5** above, care was taken to select a survey management tool that ensured complete confidentiality of the submitted information.

Confidentiality was also guaranteed to the interview participants. All identifying information was removed from the transcripts, including personal names, product names, locations, as well as details that might identify the respondents. Personal pronouns were replaced with the gender-neutral "they/them/their". The names and contact information of the interviewees themselves were kept separate from the transcripts and kept strictly confidential.

All data was stored on password-protected personal computers, and all correspondence, including emails, was treated as confidential and was never shared with third parties (including the supervisor of this research) without the prior consent of the subject.

# 3.7 Summary

A mixed methods approach was chosen to address the research questions, combining quantitative data gathered through an online

questionnaire, and qualitative data gained through a series of semistructured interviews. Questions for both instruments were developed within established frameworks for determining project success, and the rationale for each question was established. Potential limitations to the transferability of results due to the sampling methods used were considered. The process for analysing the gathered data was described, as were the precautions taken to ensure that research ethics were respected.

The data derived from the questionnaire and the interviews is presented in the following chapter.

# 4 Results

In this chapter, the results from the two data gathering campaigns, online questionnaire and interviews, are analysed and presented. Due to time and size constraints, only a subset of the results gathered for this study has been included in this report. The potential relevance of results to the research question is further examined in **Section 5**.

# 4.1 Online questionnaire

Results from the online questionnaire were loaded into RStudio (R Core Team, 2016; Wickham, 2009) for analysis. The code used to process the data and produce all the results, tables and graphs in this section is available at https://github.com/timtomch/aber-libtech-data for reference. **Appendix E** lists all questions, types and codes. Codes corresponding to "Don't know", "Not sure" or "Not available" were mapped to the "NA" value. This ensured those results were treated properly in RStudio when computing compound scores and statistical analyses.

## 4.1.1 Response rate

At the end of the data-gathering window, a total of 92 (n=92) valid results were received. 45 responses were sent after the initial invitation. Reminders gathered an additional 47 responses. Since the questionnaire was distributed through email distribution lists and social media outlets, the total number of potential recipients was unknown, and therefore a definitive response rate could not be computed. However, direct

invitations to complete the questionnaire were sent to a total of 95 recipients, either via email or direct messages on LinkedIn. An additional 50 responses were expected through distribution on email discussion lists, personal conversations, and word-of-mouth. Assuming therefore a total target number of responses of 145, a theoretical response rate of 63.4% could be deduced.

At the beginning of the questionnaire, participants were asked a series of brief demographics questions to establish the profile of institutions represented in the responses. The summary of these responses can be seen in Table 4.1. The majority of questionnaire participants reported working in academic libraries (62%). Looking at the size of the institution as measured in staff Full-Time Equivalents (FTE), two thirds of the responses came from smaller organisations (50 FTE or fewer). When answering this question, participants were instructed to include in the FTE count only staff working for the library or archives department of their institution. This is e.g. relevant for academic libraries, ensuring the answering the size of the size of the library and not of the university as a whole.

Frequency	Size of institution (total staff FTE)					
Type of institution	1-10	11-50	51-100	> 100	Total	Percentage
Academic library	5	29	3	21	58	63 %
Public library	1	4	1	6	12	13 %
Consortium/service	2	8	0	2	12	13 %
organization						
Special library	4	0	0	1	5	5 %
Archives	1	1	0	1	3	3 %
Other	0	1	0	1	2	2 %
Total	13	43	4	32	92	100 %

Table 4.1: Survey results demographics

There were two responses on which participants indicated "Other" as the type of their institution, then were instructed to provide their own category. The two "Other" responses were reported as "Scientific laboratory library" and "Academic library and medical library".

## 4.1.2 Project success

Two distinct metrics were used to measure project success. The first used indicators that are traditionally used in project management to measure success (fulfilment of requirements on time and on budget). This metric will be called "process-oriented success" in this section (cf. Olson, 2015, p. 170). The other metric used a multiple indicator approach within the DeLone and McLean (2003) framework and will be called "results-oriented success" in the following discussion.

## Value mapping

The two success metrics were computed by combining values from multiple questions. Questions 9 and 10 produced dichotomous results, while questions 11 to 14 were measured using a 5-point Likert scale. Each response therefore needed to be matched to a value for the purpose of computing a compound score. Table 4.2 lists the responses and the values they were mapped to. Non-indicative values ("Don't know", "Not sure" and "Not Applicable") were ignored when computing compound scores.

Question(s)	Response	Code	Success score $(x_{Qn})$
Q9 (dichotomous)	"All requirements were met"	1	+2
Q9 (dichotomous)	"Some requirements were not met"	2	-2
Q10 (dichotomous)	"Yes, the work was complete"	1	+2
Q10 (dichotomous)	"No, additional work was needed"	2	-2
Q11-14 (Likert scale)	"Strongly disagree"	1	-2
Q11-14 (Likert scale)	"Somewhat disagree"	2	-1
Q11-14 (Likert scale)	"Neither agree nor disagree"	3	0
Q11-14 (Likert scale)	"Somewhat agree"	4	+1
Q11-14 (Likert scale)	"Strongly agree"	5	+2

Table 4.2: Values map for compound scores

## Process-oriented success metric

The success score for the process-oriented metric was defined as

$$s_{process} = \sum (x_{Q9}, x_{Q10}, x_{Q11.1}, x_{Q11.2}, x_{Q11.3}, x_{Q11.4})/12$$

This metric was normalised to produce a continuous score between -1.0 (least successful) and +1.0 (most successful).

#### Results-oriented success metric

The success score for the results-oriented metric (using the indicators of the DeLone and McLean framework) was defined as

$$s_{results} = \sum_{x_{Q12.9}, x_{Q12.10}, x_{Q12.21}, x_{Q12.3}, x_{Q12.4}, x_{Q12.5}, x_{Q12.6}, x_{Q12.8}, \atop x_{Q12.9} / 32$$

This metric was also normalised to produce a continuous score between -1.0 (least successful) and +1.0 (most successful).

## Project success coherence

Even though the results-oriented metric was chosen to measure project success in this study, it was nevertheless interesting to analyse the distribution of the two success metrics and establish whether they are coherently measuring project success. Figure 4.1 represents a scatterplot of the two metrics for all questionnaire response. It can be seen that both metrics appear to be coherent. A linear regression analysis was run across the two metrics, showing a weak but statistically significant correlation between the two scores ( $\chi^2 = 0.4$  at p < 0.001). The fact that both metrics appear coherent is a good indicator of internal validity of the results of the study.



Figure 4.1: Correlation between the two project success metrics
### 4.1.3 Skillset impact on project success

Answering the secondary research question Q2b, *is project success affected by the skills represented in procurement teams*, required analysing the potential impact of specific skills on project success. Respondents indicated whether certain skills were "not well represented", "somewhat represented", or "well represented" in the procurement team (Question 8). In this analysis, this variable was first converted to a dichotomous value for each skill, with "well represented" and "somewhat represented" both resulting to "yes/true" (1), and "not well represented" being matched to "no/false" (0). Non-representative responses ("don't know") were removed from the analysis.

The presence or absence of individual skills in relationship with project success is represented as boxplots (Bryman, 2012, p. 340) on Figure 4.2.







Figure 4.2: Skills represented in procurement team and project success.

To verify the statistical significance of the observed impact of individual skills on project success, a multivariate analysis of variance (MANOVA) was conducted. Analysis of variance (ANOVA) in general is recommended for "designs with categorical information on the independent variable and continuous information on the dependent variable" (Creswell, 2014, p. 178). ANOVA requires the independent variable (in this case the presence of a specific skill) to be categorical or dichotomous, and the dependent variable (here project success) to be continuous (ibid; see also Klugkist, 2008, p. 26).

As a form of statistical hypothesis testing, ANOVA measures whether a null hypothesis can be rejected (Bryman, 2012, p. 347). The null hypothesis was defined for each skill as "there is no relationship between the presence of skill X in the project team and project success".

The results of a multivariate ANOVA run for all skills as identified in Section Error! Reference source not found. are presented in Table 4.3. Only the skills for which there is a statistically significant variance are represented. ANOVA on all other skills was not significant (the Type II risk of confirming the null hypothesis was too high). The p level on the entire set (60 degrees of freedom) was p < 0.05 (n=92).

Skill	$\chi^2$	t-value	p-level (n=92)
Project Management	0.9563	2.177	p < 0.001
Accessibility assessment	1.0388	3.089	p < 0.001
Computer programming	0.2655	-1.800	p < 0.1

Table 4.3: Mulivariate ANOVA of the presence of skills on project success

The above results investigate the impact of skills on project success across all types of projects and procurement methods represented in the questionnaire responses. ANOVA was also conducted separately for the individual project types (Question 4), and the different procurement methods (Question 6), but results were not statistically significant (p < 1).

## 4.1.4 Team roles impact on project success

A similar analysis was also conducted to investigate whether the participation of key staff had in the procurement decision impacted project success. In Question 7, respondents were asked who was consulted when selecting a vendor or product. Figure 4.3 shows a series of boxplots for each of the roles, against project success.



e) End users (e.g. library patrons)

f) External/third parties (e.g. consultants)



Free-text responses mentioning additional team roles were mapped as follows: "central university IT department" was counted as "external/third parties", "budget office in government library" was mapped to "management" and librarian roles were divided into "front-line staff" and "back-office". One response mentioned that the library was not consulted at all in the procurement decision process, and was consequently ignored for this particular analysis.

ANOVA revealed that the only role that had a significant impact on project success was that of "IT specialists" ( $\chi^2 = 0.89$ , t-value 2.072 at p < 0.05).

4.1.5 Procurement method impact on project success

> The distribution of the procurement method employed by each project (Question 6) with regards to project success is presented on Figure 4.4.





Figure 4.4: Procurement method and project success

Free-text responses to Question 6 were mapped to the closest options. "In-house development of an open-source platform" was mapped to "inhouse development" and "multiple vendors selected using different methods" was counted as "other". ANOVA on this variable revealed no statistically significant correlation between procurement method and project success (p < 1).

### 4.1.6 Represented skills

To illustrate whether skills that were not present on the procurement team were available within the institutions that ran the projects, Figure 4.5 displays the baseline representation level of each skill.



Figure 4.5: General skills representation in surveyed institutions

## 4.2 Interviews

The interviews were analysed following the protocol presented in Section **3.5.4** above, first to address the secondary research question Q2a, *what constitutes success for project stakeholders*. Interview responses also helped openly address the primary research question Q1, *what are the major that factors make library technology procurement projects successful*. The coded interviews, as well as the qualitative comments extracted from the questionnaire were analysed thematically.

### 4.2.1 Representation

Interviewees all confirmed current or recent experience with technology projects, in different roles. Interviewees A, C and D were members of academic library IT departments, Interviewee B was a science librarian, Interviewee F worked for a library vendor and Interviewee E was a systems librarian with past experience as a vendor. Most projects referred to by the interviewees to inform their responses were software related. Five were LMS or ILS migrations, three were digital repositories, and the reminder was an electronic resources management system (ERMS), a videoconferencing system and a metadata workflow tool.

## 4.2.2 Definition of success

When asked for their definition of project success, several interviewees mentioned closure as a critical metric:

A successful project is one in which we were able to develop something over a finite period of time and that was actually useful to

its intended users for a certain time before it became obsolete or needs change. A project with a non-zero window of usefulness.

Interviewee A

In my experience, a successful project is one that gets finished. I know it sounds trite, but I know of a lot of projects which either limp along or get cancelled before they become useful.

Interviewee D

As Interviewee A hints above, validation by intended users is also highly rated as a measure of success:

I think the only metric that is worth looking at is usage rate by its intended users.

Interviewee B

For my own personal practice, what I've tried to use as an informal criterion, is to check if a project is still alive and in production, to the satisfaction of its users, after the project manager has left. For example, at [an academic library where I used to work], some of the projects I was working on while there have been completely transformed after I left. Others stayed alive for a long time after my departure. This to me is the measuring stick of project success.

Interviewee E

This approach is coherent with comments made by questionnaire respondents in the free text sections, where one deplored that there was

"not enough emphasis on user experience" in the projects they were involved in.

All interviewees agreed on the importance of a strong methodology to bring a project to completion, echoing the process-driven metrics often cited by project management practitioners discussed in **Section 2.2.4**. Interviewee C's fully embraced those metrics, concluding that project success is synonymous with "a strong project management framework". In contrast, another interviewee noted that project management metrics are to be taken for what they are and should not replace other indicators;

I guess something that's important to keep in mind is that a successful project is not necessarily one that's completed on time. This is not an indication of failure. If the deadline was unrealistic, or not properly defined, it is simply impossible to meet.

Interviewee F

This sentiment was also shared with two questionnaire respondents.

### 4.2.3 Success measurement

While most interviewees agreed on the importance of considering impact on users when defining success, they also reflected that it was hard to measure and generally admitted that the projects they were involved in were not sufficiently taking this dimension into account. When asked if user feedback would be gathered to review a large-scale library management system implementation, Interviewee C admitted:

No. Not formally. Officially, the project will be deemed a success if its objectives are met. This is because of the way it was setup. But you're right, the project plan does not include end user feedback as a measure of success. We plan to organize a way to collect feedback.

Interviewee C

Another element that was mentioned by several interviewees was the importance of clearly stated and measurable objectives against which success could be assessed. Such objectives need to be defined in partnership with all stakeholders, including end users, at the beginning of the project:

In order for [success] to happen, you need to come to a consensus at the beginning of a project, a consensus that has to include stakeholders, users of the final product as well as IT, about what the project is. For me a project that hasn't established that is problematic.

Interviewee D

Failure to set clear objectives is preventing success measurement:

We lack the process to document what the goal of each of [our development] sprints is, but we're working on it. We also lack a way to compare the result with the goal, and assess the success of each sprint. We need a way to measure what works and what doesn't. This should help make the process more transparent to the rest of the library.

#### Interviewee A

An additional problem caused by unclear requirements that was mentioned by the respondents is scope creep:

The thing I learned is that there is a strong connection between project completion and a good definition of scope. It is easier to determine that a project is complete when you are able to master its scope. Once we put barriers, we defined scope more clearly, the status of the project became clearer.

Interviewee D

### 4.2.4 Competencies, communication and process

Through their experience with technology projects, either developed inhouse or procured through a third party, interviewees provided insight on what particular skills in the project teams contributed to project success. In general, the ability to conceptualize problems and separate the end goals from current practices was found to be key:

Distance from what they're doing. That's what's required. An ability to question processes. Why are we doing these things at all? Do we really need them? Separate what we really need, the end goal, from the steps, the workflows that we are used to. For example, look at how acquisitions are managed in a typical ILS. It's odd. It mirrors a very paper-based workflow. Orders being placed, books being shipped, invoices received and paid. This is no longer how things are done. Yet it's what librarians expect because that's what they've always used

Interviewee F

All mentioned that both technological expertise such as computer programming and knowledge of library activities were often useful skills. Those competencies are however seldom found in the same individuals,

and team members that can act as "bridges" between the two perspectives are rare:

What I found is that having people (...) that can act as proxy to the [end users] is good. This reduces barriers in the communication process.

### Interviewee D

We generally lack people with a double competency: library science and technical knowledge. We had a few of these people here, but they have now left and there is now a broader divide between IT and librarians.

Interviewee B

In projects involving a vendor or external developer, physical distance adds to the communication difficulties:

The physical presence, here on site, of a representative from the vendor during the entire project duration would have helped tremendously. (...) You can work better with in-person interactions, we understand each other better. You can show them how you work, explain issues in real-time. Instead, we had to make appointments, list all the issues we needed to discuss, take screenshots to document them, etc. When you have hour-long teleconferences, you are very limited. When the vendor representatives are here, it's easier to collect the missing information, you can go fetch someone that has the required information, Teleconferences etc. make everything more complicated.

Interviewee C

A questionnaire respondent mentioned a similar situation, adding that recording all communication (including teleconferences) was important to resolve conflicts during the project. Difficulties communicating between librarians and technology specialists were often cited as barriers to project success:

(...) the decision was made by people who did not understand how electronic resources are managed. They did not grasp how many particular cases there are. There are too many local specialties for any vendor-provided knowledge base to be accurate enough. But management wasn't aware of that and trusted the vendor.

Interviewee B

Such disconnects can happen between librarians and vendors, or within the same institution, between library departments:

When [the project we developed] was ready we realized nobody wanted to use it. The request to develop it came from someone in the back-office, working in acquisitions, but without consulting the collection development librarians first.

(...) This is a problem that's prevalent in our organization, we have people not taking the broader picture when developing workflows. I'm sure it will happen again.

Interviewee A

The people who understand how the link resolver work are in the IT department. The people who understand how complex e-resources metadata are, are in the e-resources department. There is very little communication between the two. And then you have the people working with the users, on the circulation desk, who are aware of

the problems but don't understand their root causes. On top of that management has other things on their agenda. It's a triangle situation with little information flowing between the three groups. Librarians, IT people, management.

Interviewee B (science librarian)

Both sides of the divide are aware of the problem:

I didn't have the knowledge required to understand the complexity of the process. To me it sounded like simple mapping of fields from one application to another one. I should have delved deeper into the process of cataloguing serials.

Interviewee D (systems librarian)

Several questionnaire respondents reported solutions that were chosen without consultation with technical staff and led to difficulties:

The website redesign referred to here took place as a result of the university's selection of a new CMS (...). The library was not consulted about requirements for a CMS, and was not involved in the selection procedure.

(...) The selection procedures were conducted at higher level in the organization, and largely without consulting any of the technical staff as far as I can tell.

(Questionnaire respondent)

The communication issues mentioned above were all identified in the context of projects that were defined using the traditional "waterfall" method: functional and technical requirements are set by the customer,

then the vendor or developer implements them, followed by a short review process. Requirements that were either poorly defined or misunderstood are only revealed at the end of the implementation, when most of the work has been done and there is little room for improvement. On the other hand, three interviewees recommended a method closer to the "agile development paradigm":

The important skill here is knowing how to express requirements formally. For example using a case management system to register requests, issues. A table that has to be filled for each requirement. Or, as is the case in our current project, writing a test in a formalized language for each functionality. For example, to describe how a login function works, a test can be written to describe all the steps that are expected, and how the system should respond. It might sound tedious, but this is what we use now to describe every functionality. We now have tests for all functions, we can test them every time we deploy a new version.

#### Interviewee F

The system described by Interviewee F asks library representatives who are not IT professionals to use a "formalized language" to describe how the system should work in the form of "tests" that are then used by the vendor to develop functional requirements. A similar approach uses "stories" to describe requirements:

For example, I am currently working with a third party developer on the library's website. Together with staff at the library, I developed user stories to describe the required functionalities. I ordered them according to my priorities, most needed first. Then I discuss the stories with the developer, and they tell me which one is simple to implement, which one is more difficult, etc. Once the stories are ordered according to those two dimensions, we start with what is important to me and easy to implement, then we order the remaining stories according to the resources we have available. We handle everything, all stories, or work packages, as Trello cards. We allocate a certain amount of days of development time for each package. A package is considered finished once the functionality is in place and the code has been committed to GitHub.

Interviewee E

Both methods require multiple back and forth between client and vendor, until the requirements are met to the satisfaction of both parties. Interviewees familiar with this method added that no particular technical knowledge was required from the client side:

[The product managers] are on the library's side. Their job is to translate the requirements of the library to work packages that we can work with. They have been specifically tasked to this project. One is a full-time project manager. One handles the cataloguing aspects specifically. And another two handle the workflow for the other functions of the system. One of them is in charge of enterprise planning, the other of all processes involving patrons. They are each dedicated to different parts of the system.

Only one of them did work at the library before the project. One is a cataloguer, another a professional [librarian]. None of them have a technology background. In my opinion, this is critical, they understand the processes from the library's point of view.

Interviewee F

Those interviewees regretted that the formal procurement process that many institutions are required to follow when outsourcing technology often mandate the "waterfall" approach. It also restricts communications between clients and vendors during the selection process, which can be detrimental:

The main thing I find problematic about RFQs is that it's a very formal process, and it specifically prevents libraries from communicating with potential vendors once the RFQ is out. This is unfortunate, because that would be a time during which communication is crucial, so we can clarify our needs, and avoid later misunderstandings.

Interviewee C

### 4.2.5 Staffing

Regardless of the method that is employed to communicate with vendors or developers and manage a technology project, it requires a certain investment in staff time. Additional resources are valuable:

We were fortunate that we could hire 6-7 people to complement our team. These people are under contract until the end of the project, then the goal is to hire them in fixed positions to manage the network and the LMS.

Interviewee C

But not all libraries can afford dedicated staff to manage technology projects:

We don't have any way to procure additional resources, we can't hire someone to do our day job while we work on this project. While on the [developer's] side, they can define work packages and farm out development to third parties

Interviewee A

Hiring consultants can be an option, a fact that was also mentioned by several questionnaire respondents. However, procuring consultants is a project in its own right, and requires careful planning from the part of libraries:

Using consultants is very common, especially for public libraries. Often they are used for other projects too, not just ILS, for example web sites. This is due to the fact that those libraries rarely have the competencies required to select a vendor for technical projects. Not only in public libraries, many academic libraries are like this too.

(...) There are very good consultants. But we have to be aware of the fact that because the market of libraries is so small, we will inevitably end up with consultants that have existing relationships with vendors. Libraries are not wary enough of that fact. They don't probe into those relationships.

(...) we have to remember that these are business people, their role is to secure contracts to keep them alive. Some have vested interests in working with the same vendors over and over again, it's only natural, once they've worked with the same vendor a couple of times, they have a certain relationship. Libraries are under the impression that consultants are independent, but it's rarely the case.

(...)This what a good consultant does. (...) They start by visiting the library, they analyze local needs and then offer to write up the RFQ. Then they can optionally move on to helping the library assess

responses, and helping them choose a vendor. (...) Much more rarely, the consultant will stay on during the implementation phase.

Interviewee E

### 4.2.6 Limits to outsourcing

Interviewees C and E mentioned projects where outsourcing was used as a way to break a conflict or a political situation, with management (or in one case a local politician) imposing a project and choosing a technology that is unfamiliar to all parties to prevent "favouring" a particular side. They noted that this can result in "spectacular failure" and should be avoided. Interviewee B is cautious of delegating the development of tools to vendors or external developers to better control costs:

I remain persuaded that a local solution would have been better than an "industrial", one-size fits all solution offered by a vendor. It's the same story over and over again, people build their own tools, then someone comes and complains that developing software is not what libraries are supposed to do and then replaces the home-grown tool with a purchased one.

(...) In my opinion, this is because management wanted to avoid having staff working on development projects, they wanted a turnkey solution from a major vendor. The decision came from library management, including the head of library IT. But I don't think they gained much. Our A-to-Z was basically maintained by a single librarian, who indeed was spending most of their time on it. But now, we have the equivalent of a full time working solely on issues involving our link resolver and the discovery layer, with many unresolved issues. So in my opinion, we didn't gain anything.

(...) Home-grown solutions are often there for a reason.

Interviewee B

A questionnaire respondent mentioned a system that was implemented purely "for compliance's sake" and is ill-fitted to the particular situation of their institution. More fundamentally, interviewees E and F questioned the motivations of libraries embarking into large-scale library system migration projects:

Frankly, there is currently no incentive to change systems. If you have something that works for you, keep it. Vendors might say "this system is reaching its end of life" but libraries don't realize the power they hold on those vendors. They depend on the libraries for their existence. If enough libraries tell vendors they'll keep paying them to maintain those systems, they will make them work. There is no end of life.

But libraries like to think that those massive upgrade projects, changing to the next big ILS is what their users want. They do it because it's what expected of them. But it's a tremendous waste of resources. Rather, I think libraries would be better off to keep working on their existing systems, and focus on incremental changes. Take ownership of these products, let them do the background work, and then use APIs to make them interact with front-facing systems that you then build to your own specifications.

Interviewee F (currently working for a vendor)

They also question the approach employed by libraries to procure library systems by defining a set of ideal features that are specific to their own setting, and expecting a vendor to provide exactly what is required:

[Libraries procuring systems are similar to people buying a house.] No matter what, you will end up with a house, not an airport or a cruise ship. You are purchasing a certain type of product. Libraries have to understand that their procurement processes occur according to the same model. They are libraries buying library systems. Library systems are made a certain way. Houses all have a roof, doors, windows, etc.

When libraries run into issues it's when they misinterpret this situation. Vendors have no interest in developing custom solutions. Even if you convince one of them to do it for you, maintaining it will become more and more costly and difficult. It's not worth it. Ambiguity needs to be avoided. I tend to prefer purchasing systems knowing their strengths and weaknesses and working around it.

(...) If you know you will require functionalities that go beyond what a certain product offers, you're better off choosing a modular system. If I know I will have to customize a product, I will design my requirements to look for the most modular system possible. And then I will choose another service provider to do the custom work. I choose a system with a maximum of interfaces, APIs, and then I go looking for someone else capable of leveraging that.

### Interviewee E

To break the perceived tension between vendors and users, libraries need to embrace their role as major users of a handful of enterprise solutions that are very wide spread. Understand the system, the ecosystem. Not just your own install of the LMS, but what your peers are doing, where the vendor is going, how the system is evolving. Understand it, take it as a given, and don't delegate all changes to the vendor. The thing is, when you work with a vendor, they all have a product that they want to push, to sell. And they have a roadmap. You should always look at a vendor's roadmap before selecting it.

Interviewee F

## 4.3 Summary

Two data gathering instruments were used to collect information about recent technology projects in libraries. Ninety-two (n=92) participants filled an online questionnaire, providing feedback about how solutions were selected, what skills were involved in this selection and how successful the projects were. Project success was measured using two different frameworks, one focusing on process, the other on results. Both measures are correlated and suggest that results are internally valid.

Free responses were also gathered from questionnaire participants and were completed by six (n=6) interviews of librarians and vendors, who provided deeper insights into the procurement and management of technology projects they were involved with. Despite the many shortcomings cited by respondents, the majority of projects represented in the questionnaire and the interview appear to have been successful. Results will be discussed further in the next section.

# 5 Discussion

## 5.1 Introduction

This section compares the results of the questionnaire and interviews (Section 4) with trends that were identified in the literature (Section 2). Response elements to the research questions identified in Section 1.3 are identified, their generalization potential discussed and recommendations are developed accordingly.

# 5.2 Project success metrics

As recent reports from technology projects in libraries illustrate, employing an objective measure of project success is not prevalent in library science literature (Caswell & Wynstra, 2007; Dula et al., 2012; Foster Evans & Thomas, 2007; Freivalds & Lush, 2012; Gleasner, 2016; Julich et al., 2003; King, 2000). Project management experts recommend to measure and assess success by primarily focusing on processes, capturing variance from budget, timeline and formal requirements (Ambler, 2014b; Schwalbe, 2011, pp. 14–15; The Standish Group, 1994). The library technology practitioners that were interviewed for this study, however, indicated that the "only metric that is worth looking at" involves feedback from "intended users", noting that a project can be successful even if the original parameters, such as timeline, are not met. DeLone and McLean (2003) propose an alternative framework for project success that places more emphasis on end user feedback. Project success data according to the two approaches was collected in the online questionnaire, compared and shown to be coherent **(see Section 4.1.2)**, keeping in mind Munroe's caution that linear regression models are not a definitive proof of correlation (2016). In general, however, the majority of projects reported by questionnaire respondent appeared to have been successful, which is reassuring.

Looking at Figure 4.1, it is furthermore interesting to note that none of the projects represented in the data set were classified as most successful according to the process-oriented metric ( $s_{process} > 0$ ) but least successful according to the results-oriented metric ( $s_{results} < 0$ , bottom right quadrant). There were however a certain number of projects were the opposite is true and the results-oriented metric indicates a higher success rate ( $s_{results} > 0$ ) while the process-oriented metric indicates a less successful outcome ( $s_{process} < 0$ , upper left quadrant).

This last observation leads to the conclusion that the results-oriented metric is more optimistic. Expressed differently, there are projects that do not meet the "process-oriented" definition of success (they went over budget, over time and/or not all requirements were met at the completion of the project), yet are ranked more favourably when factoring the impact of the project on intended users and the organisation, an observation that is consistent with the interviewees' practical experience.

In conclusion, the response to the secondary research question Q2a, what constitutes success for project stakeholders, was found to be

projects that rank highly on the six dimensions identified by DeLone and McLean (2003): system quality, information quality, service quality, use, user satisfaction and net benefits. Further, successful projects have a well-defined scope and duration.

# 5.3 Team roles and critical competencies in procurement teams

Teams responsible for product and vendor selection in technology projects should include a diverse set of roles and competencies. This recommendation is widely supported by the authors consulted for this study (see e.g. Brown et al., 2012, p. 393; Manifold, 2000, p. 121) and confirmed by the librarians and vendor representatives that were interviewed. Quantitative results from the online guestionnaire showed that teams that included the competencies "project management" and "accessibility assessment" were positively correlated with project success (p < 0.001). The presence of team members skilled in "computer programming", however, does not appear to have a strong positive impact on project success, and results were inconclusive for the other skills investigated in this study. That a strong technical skillset has little impact on project success contrasts with Jetu and Riedl's recommendations (2012, p. 787) and the findings of Dutta et al. that indicated otherwise (2011, p. 20). However, as was noted previously, the latter's measure of success used global ranking of vendors as a proxy for project success, an approach that might not accurately capture success. Interviewees also cautioned that while strong IT skills are important, they are not a guarantee for project success

unless the team also includes individuals that can act as "bridges" between technical and operational staff.

As McGee recommends, procurement should include teams representatives from the "technical, policy and operational aspects of the library" (2006, p. 472) and not only management staff. Interviewees strongly supported this statement, citing examples of projects that were devised without input from intended end users as cautionary tales. Questionnaire respondents also mentioned that projects where no library representatives were consulted proved difficult. Quantitative results from the questionnaire show anecdotal (non-statistically representative) illustration of the lesser importance that representation from library management can have on project success, as can be seen on Figure 4.3.a. A statistically significant (p < 0.05) correlation was however found when teams included "IT specialists", a result that is consistent with Yelton's observations (2015, p. 24).

The fact that computer programming as a *skill* might not markedly improve project success while the presence of IT *specialists* in procurement teams does show a positive correlation with success appears paradoxical. However, it can be interpreted as an illustration that a careful project definition approach, for example using stories or formal tests as mentioned by Interviewees E and F, can warrant a successful outcome without requiring high technical skills when selecting a solution. IT specialists however play a large role as *stakeholders* in technology

projects, and therefore their involvement in all stages of the project, including the decision process, is important for project success.

The answer to the secondary research questions Q2b, *is project success affected by the skills represented in the procurement team*, is therefore found to be *yes*. Question Q2c, *is there a particular skill profile that leads to greater project success*, cannot be definitively answered, although specialists from the literature and those interviewed for this study recommend a diverse set of skills and representation from all stakeholders. Quantitative data indicates that *project management* and *accessibility assessment* are skills that lead to greater project success when they are present within the project team. It also appears that *IT specialists* should be involved early on in the procurement process.

Fortunately, as can be seen on Figure 4.5, the required skills appear to be reasonably well represented in the sample of libraries that was consulted for this study. 17% of respondents indicated that project management was "not well represented" in their institution. Accessibility assessment shows a larger gap, with 38% reporting that this skill was not well represented. A short-term solution for those institutions would be to resort to consultants (Schwalbe, 2011, p. 469; Waller, 2003, p. 17), although, as McGee recommends, investing in training staff accordingly is a more sustainable solution (2006, p. 471).

# 5.4 Procurement methods

Despite the lack of a definitive argument in their favour (Freivalds & Lush, 2012, p. 105), formal procurement methods such as Requests for Proposals (RFPs) are widely used by libraries looking for technology solutions (Hodgson, 2002; Waller, 2003). Quantitative results from the questionnaire likewise were inconclusive. As Figure 4.4 shows, solutions selected through RFP were only marginally less successful than those obtained through an informal process, whether competitive or not. This difference was not found to be statistically significant.

Interviewees reported however that the strict control of communication between libraries and vendors during the procurement phase was potentially detrimental to the process, as it might prevent the "open, back and forth exchange of information" that is required to understand local specificities.

# 5.5 Technology outsourcing strategies

For projects involving software, interviewees however indicated that the development paradigms used in the definition and implementation of the desired products were potentially more determinant on project success than the selection procedure. As Waller previously noted, the current market for commercial library management systems presents a "relative homogeneity" (2003, p. 5) and major vendors all offer a good level of support for metadata formats and technologies prevalent in libraries, an

observation that was supported by interviewees. As a result, they recommended that libraries should not expect major vendors to provide custom solutions to their needs, an observation that was identified early on by Matthews (1994, p. 57).

Recognising this situation, the importance of specifying technical requirements in the procurement process can be questioned. As Breeding observes, libraries stand more to gain by spending less time on technical specifications and more on the level of support they expect from vendors (2015c, p. 25). Interviewees concur with this position, adding that modular solutions should be favoured, that allow for the development of local customisations, for example through the use of Application Programming Interfaces (APIs). Rather than defining product requirements using technical specifications, interviewees recommend the use of "stories" or "standardised tests" in which libraries define how a product should operate in given circumstances.

Where in-house development capabilities are not available, third-party developers can be procured for customisation, as suggested by Dalling (2011, p. 35). Interviewees however warn against the "hidden costs" of outsourcing such developments to third parties, an argument shared by Haddad and Ribière (2007, p. 296) and support maintaining some development activities within the library. Above all, outsourcing decisions should always be justified for technical or operational reasons and not as an attempt to resolve a "political situation", a warning that is echoed by Gantman (2011, p. 68).

Regardless whether software development is conducted in-house or delegated to third parties, interviewees recommend the use of "agile" development methods instead of the "waterfall" approach that is traditionally employed in formal technology procurement projects.

## 5.6 Generalisation potential

Before best practices could be developed from the results of this study, it was necessary to investigate the representativeness of the questionnaire responses. Demographic information on the types of libraries represented in the collected responses (Table 4.1) was compared with the number of libraries for each type of institution as collected by OCLC worldwide ("Global Library Statistics," 2014). The categories in the guestionnaire and in the OCLC statistics report are not equivalent, therefore only figures for Academic, Public and Special libraries are collected and their relative proportion is computed for comparison in Table 5.1. Comparing Table 4.1 and Table 5.1, it appears that the questionnaire presents an overrepresentation of academic libraries (63% of guestionnaire responses, compared to a global proportion of 12%). It must be noted that the numbers presented on Table 5.1 do not include all types of libraries recorded in the referenced source, and therefore are not authoritative figures. They are provided for the sole purpose of comparing the relative distribution of Academic, Public and Special libraries.

Type of institution	Frequency	Percentage
Academic library	42,687	12 %
Public library	287,776	78 %
Special library	39,278	11 %
Total (for those categories)	369,741	100 %

Table 5.1 : Number of libraries worldwide, by type.

Source: ("Global Library Statistics," 2014)

This shift is likely due to the over-representation of academic librarians in the discussion lists on which the survey was distributed. Another potential source of bias was introduced by the use of convenience samples for both data gathering instruments, as discussed earlier in Section 3.4.3.

Conclusions from this report can therefore not be generalised across all types of libraries. They however indicate limited transferability (Pickard, 2013, p. 21) to academic libraries in English-speaking contexts.

## 5.7 Summary

This study's central research question is Q1, *what are the major factors that make a library technology procurement project successful.* Evidence from the literature, and quantitative and qualitative data gathered among practitioners active in library technology projects indicate that the composition of the procurement team, both in terms of skills represented and team roles, is a major determining factor. Teams including a wider representation of skills, including feedback from all stakeholders and warranting sufficient independence from library management are shown

to favourably impact project success. The type of procurement employed was shown to be of lesser importance than the method for defining requirements and managing custom developments.

The transferability of the study results was found to be limited to academic libraries only. Further research would be required to determine if the trends shown in this study are consistent across other types of institutions.

It was also determined that an objective measure of success is rarely included in studies reporting on library technology projects. The framework developed by DeLone and McLean was shown to be a possible approach to obtain such a measure of success while focusing on the benefits for the end-users of the systems that are being implemented.

# 6 Conclusion

This study aimed to explore whether the anecdotal evidence of recurrent project failure in projects involving the procurement of technology solutions in libraries was verified, and if critical factors impacting the success of such projects could be identified.

## 6.1 Objectives

The objectives of this study were

- i To investigate past and current trends in library technology procurement processes;
- ii To establish how the success of technology projects in libraries is defined and measured;
- To explore whether there is evidence of discrepancy between users' expectations and implemented solutions in library technology projects;
- iv To explore what aspects of the procurement process affect project success;
- v To test the hypothesis that the composition of procurement teams is a factor of project success;
- vi To determine what skills should be represented on procurement teams to increase project success.

# 6.2 Literature review

A literature search was conducted to provide a general overview on technology projects in libraries, including an historical perspective on the development of the current marketplace. Studies reporting on recent projects were consulted to identify factors of project success in general, and the impact of procurement processes in particular. It was found that even though there is little formal evidence of their impact on project success, formal procurement is generally recognized as the preferred approach for selecting technology. Sources also reported that a diverse set of skills and roles should ideally be represented in procurement teams.

It was also found that few studies reporting on library technology projects included an objective measure of project success. While the majority of sources consulted recommended evaluating project success as a measure of how well timelines, budget and technical requirements were met, alternative models that measure impact on end users were also found.

# 6.3 Methodology

Research questions were developed to address the above aims, and a mixed method research strategy was defined to collect data and bring elements of response to the research questions. An online questionnaire was developed and distributed to collect quantitative data on the

procurement methods employed, skills representation and success of recent technology projects in libraries and information centres. Qualitative data was also collected by the questionnaire, and completed by a series of interviews. This approach was successful in collecting evidence to answer the research questions, although the data collected was not extensive enough to warrant a wide generalisation of results.

## 6.4 Findings and recommendations

This study established that the composition of procurement teams involved in technology projects in libraries is a major component of success. Teams including a wider representation of skills, including feedback from all stakeholders and warranting sufficient independence from library management were shown to favourably impact project success.

From the results of this study, the following set of best practices to increase the success of technology procurement projects in libraries was developed.

 Assess project success. User-focused goals and success factors should be defined at the beginning of all projects. Once implementation is complete, a thorough evaluation of the end product should be conducted by taking into account its impact on intended end users. A possible method to measure this impact is to use the six dimensions of success identified by DeLone and McLean (2003): system quality, information quality, service quality,
use, user satisfaction and net benefits. This evaluation should include the staff that participated in the project as well as all stakeholders and end users.

- 2. Involve technical and non-technical staff. A diverse set of skills and representation from all impacted areas of the library, including *IT specialists*, is positively associated with project success. Ensure that the procurement team includes individuals skilled in *project management* and *accessibility assessment*. Institutions where these skills are not well represented should consider resorting to third parties (such as consultants) when embarking on new technology projects, or develop internal knowledge through personal development programs.
- 3. Use stories to define requirements. Since there is little technical variability among existing library systems, requirements focusing on metadata protocols and basic functionality are not sufficient to distinguish between vendor proposals. Rather, libraries should define their needs based on desired workflows and processes.
- 4. Aim for flexibility. Major library systems vendor have little incentive to provide customised solutions and procurement projects centred on local specificities face less chances of success. Flexible, modular systems should therefore be preferred, and customisation should be either done in-house or delegated to third parties, preferably using agile development methods.

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### 6.5 Summary

Procuring technology solutions is an intrinsic element in the operation of a modern library, archives or information centre. Methods to manage the selection, decision, development and implementation of technology solutions are well established, although following them does not guarantee a successful project outcome. Ensuring that key stakeholders are involved early on in the procurement process is critical, as is an even representation of technical, non-technical, front-line and back-office staff. Given the relative uniformity of the major vendor solutions occupying the library technology marketplace, institutions are encouraged to select modular solutions and address the customisation of products separately from their selection. This approach, coupled with a greater reliance on nimble development paradigms, offers a sustainable option for libraries in the constant evolution of their service offerings.

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# Appendix A: Bibliographic sources

#### Search terms (and combinations thereof)

- Information technology, technology, IT, ICT
- Automat\*, LMS, ILS, system\*, software, tool?
- Project success, success
- Procurement, selection
- Team composition, team, competenc\*, skill\*, impact, effect
- RFQ, RFP, RFI, tender\*
- Librar\* (only used on sources that are not specific to Library or Information Science)

#### Major sources used

- Library & Information Science Abstracts (LISA), ProQuest
- Library, Information Science & Technology Abstracts (LISTA), EBSCO
- Library Literature & Information Science Full Text (H.W. Wilson), EBSCO
- Library and Information Science Commons, bepress (Open Access)
- ISI Web of Science, Social Sciences Citation Index
- Emerald Insight, Library & Information Science, Information & Knowledge Management
- Emerald Insight Case Studies
- Aberystwyth University Information Services Primo
- Aberystwyth University Cadair, Information Studies
- EPFL Library Books, Ebooks and Articles Search Tool BEAST
- University of Toronto Libraries OneSearch
- Bielefeld Academic Search Engine BASE (Open Access)
- code4lib journal

#### General sources

- Google Scholar
- Google Web Search
- DuckDuckGo Web Search

#### Bibliographies and indirect sources

- Breeding, M. (2016b) Library Technology Guides: Documents, Databases, News, and Commentary
- Renaville, F. (2014). Discovery Tools, a Bibliography
- code4lib mailing list ("code4lib," 2016)
- LITA-L mailing list ("LITA-L," 2016)

# Appendix B: Related research methodolgy comparison

Design	Cross-sectional	Cross-sectional and longitudinal	Cross-sectional	Cross-sectional, observational	Cross-sectional	Cross-sectional, observational	Cross-sectional
Data-gathering instrument	Questionnaire, case studies	Questionnaire	Questionnaire, focus groups	Case study	Questionnaire, interviews	Case study	Content analysis
Research method	Mixed	Mixed	Mixed	Qualitative	Mixed	Qualitative	Quantit- ative
Response rate	52%	N/A	N/A	N/A	46.40%	N/A	N/A
Responses	64	3453	11	N/A	84	N/A	N/A
Sampling	AII	Conveni- ence	N/A	Repres- entative	N/A	Repres- entative	N/A
Sample	124	3453	N/A	-	181	1	237
Population	124	N/A	N/A	-	245	1	030
Research question	N/A	N/A	N/A	N/A	What are the attitudes towards open source LMSs in UK higher education libraries?	N/A	Will outsourcing firms with high internal IT capab- ilities engage with a capable vendor selectively?
Aims	Gather information () to support decisions related to engagement with () rapid fabrication () and makerspaces in general and to inform decisions regarding the types of service offere- ings libraries can provide, resources needed, and evaluation of the service.		"Investigate the beliefs of librarians and vendors about the value of the RFP process (qualitative). Investigate the extent of use of RFPs, the time it took to write them and respond (quantitative)."	-P for Selecting Your Feder-	Investigate whether open-source LMSs are a viable option for UK higher education.	loud Computing LMS	"Explores patterns of ITO strategy, impact of internal IT skills on final decision."
Title (short)	Rapid fabrication/ makerspace services	Perceptions 2015	RFPs: a necessary evil or indispensable tool?	Developing the right RI ated Search Product	Open source, open minds	Implementing a New C	Strategy and Vendor Selection in IT Out- sourcing
Year	2015	2016	2006	2007	2011	2012	2011
Author	Altman et al.	Breeding	Calvert and Read	Caswell and Wynstra	Dalling	Dula et al.	Dutta et al.

Author	Year	Title (short)	Aims	Research question	Population	Sample	Sampling	Responses	Response rate	Research method	Data-gathering instrument	Design
Fisher et al.	2001	Towars a model system specification for the procurement of library systems	Determine the feasibility of developing and dissem- inating a model systems specification.	N/A	N/A	110	Repres- entative	41	37%	Qualitative	Content analysis	Cross-sectional
Foster Evans and Thomas	2007	Implementation of an i agement system at the	ntegrated information man- National Library of Wales	N/A	1	1	Repres- entative	N/A	N/A	Qualitative	Case study	Cross-sectional, observational
Freivalds and Lush	2012	Thinking inside the grid		N/A	1	1	Repres- entative	N/A	N/A	Qualitative	Case study	Cross-sectional, observational
Julich et al.	2003	A case study of ILS mi	gration	N/A	1	1	Repres- entative	N/A	N/A	Qualitative	Case study	Cross-sectional, observational
King	2000	Implementing a new li Bristol University	orary management system at	N/A	1	1	Repres- entative	N/A	N/A	Qualitative	Case study	Cross-sectional, observational
Lampert and Vaughan	2009	Success Factors and Strategic Planning	Understand what factors have contributed to their programs' own success as well as challenges that have proven problematic.	N/A	123	123	AII	30-44	32.40%	Quantit- ative	Questionnaire	Cross-sectional and longitudinal
Metz- Wiseman	2012	Best Practices for Selecting the Best Fit	Developing best practices for discovery layers selection	N/A	31	15	Repres- entative	15		Qualitative	Interviews, case studies	Cross-sectional
Yelton	2015	Coding for Librarians	Help novice and intermedi- ate programmers understand how programs work. Outline political situations that have been faced by librarians who code.	N/A	N/A	More than 50	N/A	N/A	N/A	Qualitative	Questionnaire	Cross-sectional

# Appendix C: Questionnaire invitation emails

The following message was sent to direct contacts, colleagues and professional networks. Slight variations of this message were used depending on familiarity with the target audience. A French version of the same message was also used for contacts in that language.

Dear friends and colleagues,

As you may be aware, I am currently working towards a Master of Information Studies at Aberystwyth University. As part of my course, I am undertaking a research project that explores how technology solutions in libraries are selected.

I am now gathering examples of projects involving technology in libraries, and I would appreciate your help:

If you have 15 minutes to spare, I would be very grateful if you could fill out this short online questionnaire: https://aber.onlinesurveys.ac.uk/library-tech-selection

If you have more than 15 minutes, I am looking for examples of projects that went particularly well, or particularly badly. If you have been involved in such a project and would be ready to spend about 45 minutes telling me more about it, I would love to hear from you! Just drop me a line with a few details on your project and we'll take it from there.

Thank you in advance for your help!

The following message pas further posted to the code4lib mailing list, and relayed on social media:

#### Dear code4libbers

I am currently working towards a Master of Information Studies at Aberystwyth University. As part of my course, I am undertaking a research project that explores how technology solutions in libraries are selected.

I am now gathering examples of projects involving technology in libraries, and I can't think of a better place to look than the code4lib community.

If you have 15 minutes to spare, I would be very grateful if you could fill out this short online questionnaire : https://aber.onlinesurveys.ac.uk/library-tech-selection

If you have more than 15 minutes, I am also looking for examples of projects that went particularly well, or particularly badly. If you have been involved in such a project and would be ready to spend about 45 minutes telling me more about it, I would love to hear from you!

Thank you in advance for your help, and I welcome any comments or feedback on my research topic or the questionnaire (or the meaning of life)...

Regards,

# Appendix E: Questionnaire analysis key



# Investigating library technology selection processes

## Page 1: Welcome

Dear Participant,

My name is <u>Thomas Guignard</u> and I am currently working towards a **Master of Information Studies** at Aberystwyth University (UK). As part of my course, I am undertaking a research project under the supervision of Dr. Hugh Preston. This project **aims to explore how technology solutions in libraries are selected**.

I would be very grateful if you would take the time to complete my questionnaire. It will take approximately 15 minutes to complete. There are no right or wrong answers.

If you choose to take part in this research please read the statements below

#### Consent

- I understand that my participation in this project will involve completing a questionnaire about technology projects implemented at my workplace.
- I understand that participation in this study is entirely voluntary and that I can withdraw from the study at any time without giving a reason.
- I understand that the information provided by me will be totally anonymous and cannot be traced back to me, unless I voluntarily provide my contact information.
- I understand that the data gathered by this questionnaire will be destroyed once the study has been completed.
- I understand that I am free to ask any questions at any time and am free to discuss my concerns at any time with the investigator, Thomas Guignard at teq7@aber.ac.uk or his supervisor, Hugh Preston at hjp@aber.ac.uk.
- I agree that by completing this questionnaire I am giving my consent for the data I have provided to be used for the process of research.

Thank you in advance for your time and help

## Page 2: Introduction

In this study, I am interested in how technology solutions are selected and implemented in libraries. Examples of the technology projects I am investigating include setting up an Integrated Library System (ILS), designing a library website, replacing public computer terminals, selecting a provider for a text-based virtual reference service, etc.

Some definitions:

#### Project

In answering the questionnaire, I would like you to focus on **one particular project** that has been **completed** at your organization.

The project you are answering for can be of any scale or complexity. Also, it does not need to be a project you've been personally actively participating in, as long as you have some knowledge of how it went through.

If you wish, you can provide information about multiple projects by filling out multiple copies of the questionnaire.

#### Your organization

In the questionnaire, when I refer to your organization, I mean the library, archives or library organization (e.g. consortium) you are working for (or were working for at the time that particular project was completed).

If your library is part of a larger organization (e.g. university library), my questions will always refer to the library, not the parent organization.

#### Yourself

I am primarily interested in hearing **your opinion** about the project you are referring to. For this reason, there can be several survey responses for a particular project, coming from different people.

In other words, please try to answer to the questionnaire not as an institution, but rather as an individual.

## Page 3: General information

To begin, please provide some information about your organization.

If you are part of a larger structure (e.g. university, corporation), **please answer for the library or archives only**.

#### 1. What category best describes your organization?

- O Public library
- Academic library
- School library
- Special library (e.g. museum, corporate library)
- Archives (public, private or corporate)
- O Library consortium / service organization
- Other (please specify)

1.a. If you selected Other, please specify:

2. How many employees (all categories: librarians, management, technicians, etc.) work in your organization? If you are part of a larger structure, please answer for the library/archives only. Please give an estimate in Full-Time Equivalents.

- 0 1-10
- 0 11-50
- 0 51-100
- More than 100

З.	To the best of your knowledge, which of the following competencies are
repr	esented in your organization (check all that apply):

	Well represented	Somewhat represented	Not well represented	Don't know/NA
Project Management	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$
Accounting/costing/budgeting	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$
Communication/outreach	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$
Accessibility assessment	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$
Negotiation (e.g. with vendors)	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$
User experience design	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$
Graphic design	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$
Web design (HTML/CSS, use of Content Management Systems, e.g. Drupal)	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$
Computer programming (other than HTML/CSS)	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$
System administration (e.g. UNIX)	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$

# Page 4: Project details

Next, please provide some information about the project you will be referring to for the remainder of the questionnaire.

I am interested here in details about a particular technology project that has been completed already, not about how your organization manages projects in general.

If you are aware of multiple projects that fall into that category, select one to which you will refer to in the following questions.

- 4. Which of the following categories best describes this project? (select one)
- O Integrated Library System / Next generation library management system
- Web-scale Discovery solution
- Digital repository
- Link resolver
- Remote authentication to electronic resources
- Online Inter-Library-Loan
- Web development (e.g. website redesign, custom web development, etc.)
- Electronic Resource Management System (ERMS)
- O Virtual reference system
- O Hardware installation (e.g. replacing public service terminals, or a server rack)
- Internet access (e.g. selecting a new Internet Service Provider)
- Other (please specify)

4.a. If you selected Other, please specify:



5. When did this project run (approximately)? Please estimate the month and year the project started and was completed (either successfully or not).

	Month (MM) <i>Optional</i>	Year (YYYY) Optional
When was the project started?		
When was the project completed?		

## Page 5: Selection process

I am interested now in how your organization has selected the product, vendor, and/or service provider that was deemed the best option to fulfill the project goals.

6. What procurement method was used to select the product or vendor/service provider?

 Formal procurement process (e.g. Request for Quotation RFQ, Request for Proposal RFP)

 Informal competitive procurement (e.g. comparing different options without issuing RFQ/RFPs)

 Noncompetitive procurement (e.g. using a vendor your organization had a preexisting relationship with)

In-house development

Not sure / don't know

Other

6.a. If you selected Other, please specify:

7. Who was consulted when selecting the product/vendor to fulfill the project? Please check all that apply. For example, if the selection was made by a committee, check all categories that were represented on that committee:

#### More info

- Management
- □ IT specialists (e.g. systems librarians, developers)
- Front-line staff (e.g. circulation librarians, liaison librarians)
- Back-office staff (e.g. cataloguers)
- End users (e.g. library patrons, focus groups)
- External/third party (e.g. consultants)

7.a. Is someone missing from the list above? Please complete it here.



*8.* To the best of your knowledge, which of the following competencies were represented in the person/team that selected the product/vendor :

	Well represented	Somewhat represented	Not well represented	Don't know/NA
Project Management	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$
Accounting/costing/budgeting	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$
Communication/outreach	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$
Accessibility assessment	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$
Negotiation (e.g. with vendors)	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$
User experience design	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$
Graphic design	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$
Web design (HTML/CSS, use of Content Management Systems, e.g. Drupal)	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$
Computer programming (other than HTML/CSS)	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$
System administration (e.g. UNIX)	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$

## Page 6: Project success

The following questions aim to assess the success of the project you just described. Please answer the following questions to the best of your knowledge, or based on your own perception of the project's outcome.

9. At the end of the project, were all critical project requirements met?

<ul> <li>All requirements were</li> </ul>	<ul> <li>Some requirements</li> </ul>	🔘 Not sure / don't know
met	were not met	

10. At completion, did the project meet specifications without additional work?

Yes, the work was	No, additional work	🔵 Not sure / don't know
complete	was needed	

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree	N/A
The project was completed on or ahead of schedule	0	0	0	0	$\bigcirc$	$\bigcirc$
The project was completed on or below budget	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$
The project duration was appropriate	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$
The project budget was appropriate	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$
The project requirements were accurately defined	0	0	0	0	0	0
The right people were involved in this project	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$

11. In your opinion, how accurate are the following statements about the project?

The following three questions deal with **how satisfied you are** with the outcome of the project.

Based on **your experience** of the resulting product/service, how accurate are the following statements about the project?

#### 12. The product/service...

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree	N/A
does what it's supposed to do	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$
is available when it's needed	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$
is reliable	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$
is flexible/adaptable	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$
is complete (there are no missing features)	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$
is easy to use & understand	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$
is relevant to the intended users' needs	$\bigcirc$	0	$\bigcirc$	0	$\bigcirc$	$\bigcirc$
provides adequate security	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$
results in overall cost savings	$\bigcirc$	0	$\bigcirc$	0	$\bigcirc$	$\bigcirc$
results in overall time savings	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$
results in an increased use of the service my organization is providing (e.g. increased number of patrons/loans)	0	0	0	0	0	0

13. To the best of your knowledge, the intended users of the product/service...

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree	N/A
are using the product/service	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$
are satisfied with the product/service	$\bigcirc$	$\bigcirc$	$\bigcirc$	0	$\bigcirc$	$\bigcirc$

14. The vendor/team who provided/developed the product/service...

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree	N/A
is responsive	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$
understands the needs of my organization	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$
is trustworthy	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$

## Page 7: Additional information

*15.* Do you have additional comments above the project you just described that you feel were not covered by the questionnaire? *Optional* 

*16.* Would you be willing to be contacted to provide additional information on your answers? If you agree, please provide your email address: *Optional* 

Please enter a valid email address.

# Page 8: Thank you!

Thank you for filling out the questionnaire and helping me in my research!

If you wish to provide information about another technology project you are aware of, you are welcome to fill out another copy of the questionnaire by clicking here!

Feel free to contact me at <u>teg7@aber.ac.uk</u> (or <u>@timtomch</u> on Twitter) for any questions, remarks or suggestions about the questionnaire or my research topic.

With many thanks,

# Appendix E: Questionnaire analysis key

Question	Variable	Values	Кеу	Content	Туре
What category best describes	Q1	1	Public library	Numeric	Nominal
your organization?		2	Academic library		
		3	School library		
		4	Special library (e.g. mu-		
			seum, corporate library)		
		5	Archives (public, private or corporate)		
		6	Library consortium / service organization		
		7	Other		1
If you selected Other, please specify:	Q1_a			Text	
How many employees (all categories: librarians, manage- ment, technicians, etc.) work	02	1	1-10	Numeric	Ordinal
		2	11-50		
		3	51-100		
are part of a larger structure,		4	More than 100		
please answer for the library/					
estimate in Full-Time Equival-					
ents.					
To the best of your know- ledge, which of the following	(Q3)				
competencies are represented					
in your organization (check all					
Project Management	Q3_1_a	1	Well represented	Numeric	Ordinal
		2	Somewhat represented		
		2	Not well represented		
			Don't know/NA	-	
Accounting/costing/budgeting	Q3_2_a	1	Well represented	Numeric	Ordinal
		2	Somewhat represented		
		3	Not well represented		
		NA	Don't know/NA		
Communication/outreach	Q3_3_a	1	Well represented	Numeric	Ordinal
		2	Somewhat represented		
		3	Not well represented		
		NA	Don't know/NA	-	
Accessibility assessment	034a	1	Well represented	Numeric	Ordinal
	~	2	Somewhat represented		
		3	Not well represented		
		NA	Don't know/NA		

Question	Variable	Values	Кеу	Content	Туре
Negotiation (e.g. with vendors)	Q3_5_a	1	Well represented	Numeric	Ordinal
		2	Somewhat represented		
		3	Not well represented		
		NA	Don't know/NA		
User experience design	Q3_6_a	1	Well represented	Numeric	Ordinal
		2	Somewhat represented		
		3	Not well represented		
		NA	Don't know/NA		
Graphic design	Q3_7_a	1	Well represented	Numeric	Ordinal
		2	Somewhat represented		
		3	Not well represented		
		NA	Don't know/NA		
Web design (HTML/CSS, use of	Q3_8_a	1	Well represented	Numeric	Ordinal
Content Management Systems,		2	Somewhat represented		
e.g. Drupai)		3	Not well represented		
		NA	Don't know/NA		
Computer programming (other than HTML/CSS)	Q3_9_a	1	Well represented	Numeric	Ordinal
		2	Somewhat represented		
		3	Not well represented		
		NA	Don't know/NA		
System administration (e.g. UNIX)	Q3_10_a	1	Well represented	Numeric	Ordinal
		2	Somewhat represented		
		3	Not well represented		
		NA	Don't know/NA		
Which of the following categor- ies best describes this project? (select one)	Q4	1	Integrated Library System / Next generation library management system	Numeric	Nominal
		2	Web-scale Discovery solution		
		3	Digital repository		
		4	Link resolver		
		5	Remote authentication to electronic resources		
		6	Online Inter-Library-Loan		
		7	Web development (e.g. website redesign, custom web development, etc.)		
		8	Electronic Resource Man- agement System (ERMS)		
		9	Virtual reference system		
		10	Hardware installation (e.g. replacing public service terminals, or a server rack)		
Question	Variable	Values	Кеу	Content	Туре
---	----------	--------	---	---------	---------
		11	Internet access (e.g. select- ing a new Internet Service Provider)		
		12	Other		
If you selected Other, please specify:	Q4_a			Text	
When did this project run (ap- proximately)? Please estimate the month and year the project started and was completed (either successfully or not).	(Q5)				
When was the project started? - Month (MM)	Q5_1_a			Numeric	Scale
When was the project started? - Year (YYYY)	Q5_1_b			Numeric	Scale
When was the project com- pleted? - Month (MM)	Q5_2_a			Numeric	Scale
When was the project com- pleted? - Year (YYYY)	Q5_2_b			Numeric	Scale
What procurement method was used to select the product or vendor/service provider?	Q6	1	Formal procurement process (e.g. Request for Quotation RFQ, Request for Proposal RFP)	Numeric	Nominal
		2	Informal competitive pro- curement (e.g. comparing different options without issuing RFQ/RFPs)		
		3	Noncompetitive procure- ment (e.g. using a vendor your organization had a pre-existing relationship with)		
		4	In-house development		
		5	Other		
		NA	Not sure / don't know		
If you selected Other, please specify:	Q6_a			Text	
Who was consulted when	07	1	Management	Numeric	Nominal
selecting the product/vendor to fulfill the project? Please check		2	IT specialists (e.g. systems librarians, developers)		
the selection was made by a committee, check all categories that were represented on that		3	Front-line staff (e.g. cir- culation librarians, liaison librarians)		
committee:		4	Back-office staff (e.g. cata- loguers)		
		5	End users (e.g. library patrons, focus groups)		
		6	External/third party (e.g. consultants)		

Question	Variable	Values	Кеу	Content	Туре
Is someone missing from the list above? Please complete it here.	Q7_a			Text	
To the best of your knowledge, which of the following compet- encies were represented in the person/team that selected the product/vendor :	(Q8)				
Project Management	Q8_1_a	1	Well represented	Numeric	Ordinal
		2	Somewhat represented		
		3	Not well represented		
		NA	Don't know/NA		
Accounting/costing/budgeting	Q8_2_a	1	Well represented	Numeric	Ordinal
		2	Somewhat represented		
		3	Not well represented		
		NA	Don't know/NA		
Communication/outreach	Q8_3_a	1	Well represented	Numeric	Ordinal
		2	Somewhat represented		
		3	Not well represented		
		NA	Don't know/NA		
Accessibility assessment	Q8_4_a	1	Well represented	Numeric	Ordinal
		2	Somewhat represented		
		3	Not well represented		
		NA	Don't know/NA		
Negotiation (e.g. with vendors)	Q8_5_a	1	Well represented	Numeric	Ordinal
		2	Somewhat represented		
		3	Not well represented		
		NA	Don't know/NA		
User experience design	Q8_6_a	1	Well represented	Numeric	Ordinal
		2	Somewhat represented		
		3	Not well represented		
		NA	Don't know/NA		
Graphic design	Q8_7_a	1	Well represented	Numeric	Ordinal
		2	Somewhat represented		
		3	Not well represented		
		NA	Don't know/NA		
Web design (HTML/CSS, use of	Q8_8_a	1	Well represented	Numeric	Ordinal
Content Management Systems,		2	Somewhat represented		
e.g. Drupal)		3	Not well represented		
		NA	Don't know/NA		
Computer programming (other	Q8_9_a	1	Well represented	Numeric	Ordinal
than HTML/CSS)		2	Somewhat represented		
		3	Not well represented		
		NA	Don't know/NA		

Question	Variable	Values	Кеу	Content	Туре
System administration (e.g.	Q8_10_a	1	Well represented	Numeric	Ordinal
UNIX)		2	Somewhat represented		
		3	Not well represented		
		NA	Don't know/NA		
At the end of the project, were all critical project requirements met?	Q9	1	All requirements were met	Numeric	Nominal (dichotom- ous)
		2	Some requirements were not met		
		NA	Not sure / don't know		
At completion, did the project meet specifications without additional work?	Q10	1	Yes, the work was complete	Numeric	Nominal (dichotom- ous)
		2	No, additional work was needed		
		NA	Not sure / don't know		
In your opinion, how accurate are the following statements about the project?	(Q11)				
The project was completed on	Q11_1_a	1	Strongly disagree	Numeric	Ordinal
or ahead of schedule		2	Somewhat disagree		
		3	Neither agree nor disagree		
		4	Somewhat agree		
		5	Strongly agree		
		NA	N/A		
The project was completed on	Q11_2_a	1	Strongly disagree	Numeric	Ordinal
or below budget		2	Somewhat disagree		
		3	Neither agree nor disagree		
		4	Somewhat agree		
		5	Strongly agree		
		NA	N/A		
The project duration was	Q11_3_a	1	Strongly disagree	Numeric	Ordinal
appropriate		2	Somewhat disagree		
		3	Neither agree nor disagree		
		4	Somewhat agree		
		5	Strongly agree		
		NA	N/A		
The project budget was appro-	Q11_4_a	1	Strongly disagree	Numeric	Ordinal
priate		2	Somewhat disagree		
		3	Neither agree nor disagree		
		4	Somewhat agree		
		5	Strongly agree		
		NA	N/A		

Question	Variable	Values	Кеу	Content	Туре
The project requirements were	Q11_5_a	1	Strongly disagree	Numeric	Ordinal
accurately defined		2	Somewhat disagree		
		3	Neither agree nor disagree		
		4	Somewhat agree		
		5	Strongly agree		
		NA	N/A		
The right people were involved	Q11_6_a	1	Strongly disagree	Numeric	Ordinal
in this project		2	Somewhat disagree		
		3	Neither agree nor disagree		
		4	Somewhat agree		
		5	Strongly agree		
		NA	N/A		
The product/service	(Q12)				
does what it's supposed to	Q12_1_a	1	Strongly disagree	Numeric	Ordinal
do		2	Somewhat disagree		
		3	Neither agree nor disagree		
		4	Somewhat agree		
		5	Strongly agree		
		NA	N/A		
is available when it's	Q12_2_a	1	Strongly disagree	Numeric	Ordinal
needed		2	Somewhat disagree		
		3	Neither agree nor disagree		
		4	Somewhat agree		
		5	Strongly agree		
		NA	N/A		
is reliable	Q12_3_a	1	Strongly disagree	Numeric	Ordinal
		2	Somewhat disagree		
		3	Neither agree nor disagree		
		4	Somewhat agree		
		5	Strongly agree		
		NA	N/A		
is flexible/adaptable	Q12_4_a	1	Strongly disagree	Numeric	Ordinal
		2	Somewhat disagree		
		3	Neither agree nor disagree		
		4	Somewhat agree		
		5	Strongly agree		
		NA	N/A		
is complete (there are no	Q12_5_a	1	Strongly disagree	Numeric	Ordinal
missing features)		2	Somewhat disagree		
		3	Neither agree nor disagree		
		4	Somewhat agree		
		5	Strongly agree		
		NA	N/A		

Question	Variable	Values	Кеу	Content	Туре
is easy to use & understand	Q12_6_a	1	Strongly disagree	Numeric	Ordinal
		2	Somewhat disagree		
		3	Neither agree nor disagree		
		4	Somewhat agree		
		5	Strongly agree		
		NA	N/A		
is relevant to the intended	Q12_7_a	1	Strongly disagree	Numeric	Ordinal
users' needs		2	Somewhat disagree		
		3	Neither agree nor disagree		
		4	Somewhat agree		
		5	Strongly agree		
		NA	N/A		
provides adequate security	Q12_8_a	1	Strongly disagree	Numeric	Ordinal
		2	Somewhat disagree		
		3	Neither agree nor disagree		
		4	Somewhat agree		
		5	Strongly agree		
		NA	N/A		
results in overall cost	Q12_9_a	1	Strongly disagree	Numeric	Ordinal
savings		2	Somewhat disagree		
		3	Neither agree nor disagree		
		4	Somewhat agree		
		5	Strongly agree		
		NA	N/A		
results in overall time	Q12_10_a	1	Strongly disagree	Numeric	Ordinal
savings		2	Somewhat disagree		
		3	Neither agree nor disagree		
		4	Somewhat agree		
		5	Strongly agree		
		NA	N/A		
results in an increased use	Q12_11_a	1	Strongly disagree	Numeric	Ordinal
of the service my organization		2	Somewhat disagree		
number of patrons/loans)		3	Neither agree nor disagree		
		4	Somewhat agree		
		5	Strongly agree		
		NA	N/A		
To the best of your knowledge, the intended users of the product/service	(Q13)				
are using the product/service	Q13_1_a	1	Strongly disagree	Numeric	Ordinal
		2	Somewhat disagree		
		3	Neither agree nor disagree		
		4	Somewhat agree		

Question	Variable	Values	Кеу	Content	Туре
		5	Strongly agree		
		NA	N/A		
are satisfied with the	Q13_2_a	1	Strongly disagree	Numeric	Ordinal
product/service		2	Somewhat disagree		
		3	Neither agree nor disagree		
		4	Somewhat agree		
		5	Strongly agree		
		NA	N/A		
The vendor/team who provided/developed the product/service�	(Q14)				
is responsive	Q14_1_a	1	Strongly disagree	Numeric	Ordinal
		2	Somewhat disagree		
		3	Neither agree nor disagree		
		4	Somewhat agree		
		5	Strongly agree		
		NA	N/A		
understands the needs of my	Q14_2_a	1	Strongly disagree	Numeric	Ordinal
organization		2	Somewhat disagree		
		3	Neither agree nor disagree		
		4	Somewhat agree		
		5	Strongly agree		
		NA	N/A		
is trustworthy	Q14_3_a	1	Strongly disagree	Numeric	Ordinal
		2	Somewhat disagree		
		3	Neither agree nor disagree		
		4	Somewhat agree		
		5	Strongly agree		
		NA	N/A		
Do you have additional comments above the project you just described that you feel were not covered by the questionnaire?	Q15			Text	
Would you be willing to be contacted to provide additional information on your answers? If you agree, please provide your email address:	Q16			Text	
Submission date		Date			Numeric

## Appendix F: Interview consent form

# Investigating library technology selection processes- Interview consent form

Dear Participant,

My name is Thomas Guignard and I am currently working towards a **Master of Information Studies** at Aberystwyth University (UK). As part of my course, I am undertaking a research project under the supervision of Dr. Hugh Preston. This project **aims to explore how technology solutions in libraries are selected and implemented**. Examples of the technology projects we are interested in include setting up an Integrated Library System (ILS), designing a library website, replacing public computer terminals, selecting a provider for a text-based virtual reference service, etc.

Your participation in this study will involve answering oral questions about technology projects implemented at your workplace. Your name and the name of your workplace will be recorded for the purpose of reaching you for additional details only, but both will be anonymized in the final report. Your participation is voluntary and you can withdraw from the study and interrupt the interview at any time without giving a reason.

If the interview is conducted by phone/Skype, it might be recorded for reference purposes. If the interview is recorded, the interviewer will

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inform you and offer you the possibility of declining to be interviewed. The recording will be deleted at the completion of the study.

At any time, you might contact the investigator, Thomas Guignard at <u>teg7@aber.ac.uk</u> or his supervisor, Hugh Preston at <u>hjp@aber.ac.uk</u> to discuss questions or concerns about this study.

I confirm that I have read and understand the aims of this study.	
I have had the opportunity to consider this information and ask	
questions about it and have had these answered satisfactorily.	
I understand that my participation is voluntary and that I am free	
to withdraw at any time, without giving any reason and without	
my legal rights being affected.	
I agree to take part in the above study.	
I agree to take part in the above study. I agree to the telephone interview being recorded (if applicable).	
I agree to take part in the above study. I agree to the telephone interview being recorded (if applicable). I agree that the data I provide may be used by Thomas	
I agree to take part in the above study. I agree to the telephone interview being recorded (if applicable). I agree that the data I provide may be used by Thomas Guignard for the purpose of the study stated, and within the	
I agree to take part in the above study. I agree to the telephone interview being recorded (if applicable). I agree that the data I provide may be used by Thomas Guignard for the purpose of the study stated, and within the conditions outlined, above.	

I agree to the use of any anonymised direct quotes in the study report.

Name of participant	Signature	Date
Name of researcher	Signature	Date
Thomas Guignard		

### Appendix G: Interview questions

Questions were derived from Brown et al. (2012, pp. 348, 426), Russel (2007, p. 218) and Schwalbe (2011, p. 15), with inspiration from Olson (2015, pp. 160, 170) and Knox (2011, p. 102).

#### Introduction

Ensure participant has reviewed the interview consent form, and verify if they agree to the interview being recorded and transcribed, when applicable

Thank you for agreeing to this interview and for completing the consent form.

If the participant was contacted following their participation to the online questionnaire, verify that they are still aware of the research topic, and offer to rephrase it. If not, explain the context.

As you may recall from participating in the online questionnaire, my research investigates the process by which technology projects in libraries are selected, procured or, in the case of internally-developed projects, defined. In this interview, I would like to focus on <u>your own</u> experience with technology projects in a library context, and particularly how needs and requirements were established and documented, how a solution was chosen to address those needs, implemented and reviewed.

### Context and project success baseline

1 Can you briefly describe your role?

Looking for details on

- Type of institution
- Position
- Responsibility or involvement with technology projects
- 2 What in your opinion and in your own professional practice, defines a successful technology project?

### Project descriptions

- 3 For the remainder of the interview, please think of 1 or 2 projects you were involved with in which this definition of success was particularly well met, or to the contrary exemplify what you consider to be a project not meeting your definition of successful.
- 4 Can you briefly describe the project(s)?
- 5 Can you recall what steps were taken from the conception of the project to its conclusion?
- 6 Was the main component of the project procured from a 3<sup>rd</sup> party (vendor, software consulting firm, etc.) or was it developed at your own institution?
  - a. *If procured:* What type of procurement method was used? How was the product/vendor/service provider selected?
  - b. If in-house: Were different alternatives considered, in-house development or external procurement? If yes, do you remember how the decision to build the tool yourself was made?

- 7 How were the requirements for this project established?
- 8 What was your role
  - a. During the needs assessment phase?
  - b. During the procurement phase (if applicable)?
  - c. During the requirements definition phase?
  - d. During the implementation/development phase?
  - e. During the testing phase?
- 9 What is the current status of this project?
  - a. *If completed*: How was the completion of the project determined?Do you personally consider the project to be completed?
- 10 During this project, what was learned about
  - a. Communication during the project?
  - b. Writing specifications/requirements?
  - c. Staffing, selecting project members?
  - d. Managing conflict or negotiation (if applicable)?
  - e. Monitoring project success?
  - f. Taking corrective action?
- 11 Were you satisfied with the relationship with outside vendors (if applicable)?
- 12 If you had an opportunity to redo the project, what would you do differently?

If more than one project was mentioned in question 3, start again at 4.

# Appendix H: Full interview transcripts

### Interviewee A Transcript [translated from French]

Interviewer (I): Thank you for agreeing to this interview and for completing the consent form. As you may recall from participating in the online questionnaire, my research investigates the process by which technology projects in libraries are selected, procured or, in the case of internally-developed projects, defined. In this interview, I would like to focus on your own experience with technology projects in a library context, and particularly how needs and requirements were established and documented, how a solution was chosen to address those needs, implemented and reviewed.

Can you briefly describe your role?

- Interviewee A (A): I am the systems librarian, head of IT at an academic library.
- I: To begin, what in your opinion, defines a successful technology project?
- A: A successful project is one in which we were able to develop something over a finite period of time and that was actually useful to its intended users for a certain time before it became obsolete or needs change. A project with a non-zero window of usefulness.
- I: Thank you. For the remainder of the interview, please think of 1 or 2 projects you were involved with in which this definition of success was particularly well met, or to the contrary exemplify what you consider to be a project not meeting your definition of successful.
- A: I can think of a handful in every category.
- I: Let's start with one that went well. Can you briefly describe it?
- A: Then we can speak about our institutional repository. Although it is currently in a bit of a difficult state, this is an example of a platform that's been used consistently for a handful of years. It's not perfect, but it's working. Between 2009 and 2011 the product can be said to have worked reasonably well and fulfilled its mission of collecting our university's publications, metadata and full-text versions of articles published by our researchers. In 2010 the university changed its website and there was a new visual identity. We had to adapt our tool to it, it took a while but once everyone got used to it, they began to see its weaknesses and we began to be no longer able to respond. The gap between user expectations and functionalities grew wider. The expectations of the initial users did not change fundamentally, it's rather that new demands began flowing towards the developers, without them being properly documented. With the increased visibility,

the tool suddenly appeared on the radar of the president's office and they began asking us for bibliometric data, which was outside our initial mandate. Also data about how often the authors from our university collaborated with other universities, etc. This new interest had a detrimental effect on the dynamics of the team that was managing the tool at the time. We had a team of librarians who were in contact with faculty, gathering data and helping them onboard the repository, and a team of developers who developed the tool. With the demands from the university president's office, the focus changed towards bibliometrics and the librarians became frustrated, because the feedback they were reporting from faculty, about core functionalities of the system, were being sidetracked by the new developments for bibliometry. The developers had more and more work and couldn't keep up with requests for improvement. Faculty were in turn frustrated when nothing changed, and the librarians found themselves stuck between the two.

- So it was a mix of scope creep, poorly documented additional requirements, and a lack of clear governance. The project had no longer a clear ownership. It started as a project that was, if not officially, at least practically owned and managed by the library to be an institutional repository, and now it was somewhere between that and a tool for the management of research. With no clear ownership.
- Recently, there was a decision to review the technology that's at the core of the tool. We might end up migrating to another of the digital repository software out there. To do that, we have an opportunity to clearly define the scope of the tool, and implement a better formalism for its development. We are moving from a situation where we had a certain amount of resources dedicated to developing the tool, but without a clear definition of scope, to a situation with a clear service definition, with more modest development resources, enough to ensure the continuing operation of the tool, but all further developments will have to be vetted by the university IT, in line with their project management workflow.
- I: What do you think is required to make this transition successful? What did you learn during the course of the project that you think should be avoided, or reproduced?
- A: I regret the initial stages of the project, its startup phase. We had a very fast turnaround, we had dedicated developers, a strong team at the library, we could gather feedback from faculty, feed it to the developers, they would make the changes required quickly. It evolved constantly. Now with this new approach, we will have to move towards a situation where new developments will occur in bursts. There will be stages during which nothing happens, then intense development periods. This might work for the university IT department, but not here at the library, this is not in sync with the way we work. We have a base service that we need to perform on a daily basis, this is our main focus. We serve the students, we deal with circulation, reference, training,

data curation, etc. We have little time left over for projects, and we have many concurrent projects, not all IT projects. Things like retrocataloguing, cleanup operations, etc. So we don't necessarily have the available resources to participate in the development bursts that university IT is envisioning. Not mentioning the time required to document all requirements so they understand what is required. I understand the rationale, I'm not criticizing their approach, but to us, it's one additional burden on top of a lot of tasks.

- This situation, with university IT being in charge of new developments, has been in place for the last 9 months or so. We are finding it difficult, but we make do. It is hard to align the availability of the librarians with the demands coming from university IT. It's a good approach in theory, but in practice it's difficult to align the availability of human resources on both sides, the library and university IT. We don't have any way to procure additional resources, we can't hire someone to do our day job while we work on this project. While on the university IT side, they can define work packages and farm out development to third parties. On the library side, delegating to third parties is difficult, institutional repositories is a very niche domain, there are a lot of special cases, it would be very hard to find freelance people with the right experience.
- I: Can you give me an example of a project that, by contrast to that one, is being developed by your own team. What is working well, and what isn't?
- A: For example, we had to develop two web forms to be integrated on our website, one was for internal use, the other for the public. The internal one had to do with integrating with our acquisitions workflow, it was deemed to be high priority because it was linked with how we were reorganizing the library and our processes. This form was for collection development librarians, an attempt to reconcile print and electronic collection development. The idea was for the people in charge of the selection of materials to fill out this form, then the collection development policy would be followed to determine what format would be acquired, following an online first policy. So we worked to implement this form. And when it was ready we realized nobody wanted to use it. The request to develop it came from someone in the backoffice, working in acquisitions, but without consulting the collection development librarians first.
- I: How would you have done things differently?
- A: In retrospect, we should have better analyzed the established practice. For example, on the collection development librarian was used to prepare spreadsheets with titles that needed to be acquired. They did not want to have to copy paste all titles from that spreadsheet into our form. And when I asked why they would not directly input titles in the form instead of the spreadsheet, I realized that they had an intricate process to generate that spreadsheet, starting from vendor catalogues, and importing data from our catalogue to filter it, etc. Anyways, the acquisitions team did not take the time to properly evaluate if the

solution they proposed made sense. They had to implement a new acquisition workflow, someone had an idea to setup this web form, and they concentrated on what sort of form they needed, rather than first figuring out whether they needed a form to begin with.

- I: Do you have a process in place to avoid this from happening again?
- A: This is a problem that's prevalent in our organization, we have people not taking the broader picture when developing workflows. I'm sure it will happen again.
- I: You said earlier that you had to develop two web forms, that was the one for the internal use, what was the one that was aimed at the general public?
- A: It wasn't for the general public, but for university researchers, outside the library, to streamline the process of requesting funding for gold open access publications. This worked better. I had to decide which of the two projects to develop first, and I chose based on urgency, the other one was more urgent. I should have gone further than dealing with urgency, taken a step back to question the validity of the projects. Neither followed a formal project validation process.
- Going back to the other one, the way it came to be was that library management suggested the coordinators of print and electronic collection development go together to setup a common workflow, and the form became the poster child of that new approach. It wasn't easy, I was happy to see the project come to an end, even if it ended up not being used.
- I: So that project was abandoned?
- A: It was abandoned. There is a silver lining, though: one of our developers got to learn how to use a new template, that will certainly be useful in the future.
- I: Those insights are fascinating. I'm wondering if you could tell me a little about a project where the development was not done in house, but you procured a solution from an outside vendor. Do you have such an example and could you tell me how the selection and procurement process went? How are you communicating with the vendor?
- A: We recently implemented a discovery layer, and a link resolver. It also did not go very smoothly. There are still a lot of issues, it's a very young implementation. We identified several issues from the very beginning, but we haven't yet been able to focus on them because we haven't processed all the backlog yet. Also we had a lot of staff turnover. But I confirm that communication with the vendor is not great. Also between us and the rest of the librarians. Especially once the initial implementation is done and we are moving towards maintenance and further development. During the implementation, things moved very quickly, librarians saw the new interface, new features, provided feedback but now they have the impression that we don't do anything with their feedback. This is not the case, we took their feedback very

seriously, but once we identified what the problems at the root of the reported issues were, there is still a lot of development. Not everything has to do with the software, many issues are related to poor metadata. So we need to fix that. But to front line librarians it may appear as if nothing is happening. It's not because we are not doing anything, it's because we are not yet ready. As a developer it is hard to give feedback to frontline staff on the progress of a task. Also in our case since we've had a lot of changes in the way the library is organized, and staff coming and going, the team is not stable, it's not helping with communication.

- I: What steps are you taking to resolve the communication issues that you've identified?
- A: For the development of the discovery layer, we setup milestones, test phases, etc. But we realize that we cannot work for long periods over some improvements, so now we do "sprints" during which we concentrate of fixing some particular issues. Documenting those improvements is not yet ideal. We lack the process to document what the goal of each of those sprints is, but we're working on it. We also lack a way to compare the result with the goal, and assess the success of each sprint. We need a way to measure what works and what doesn't. This should help make the process more transparent to the rest of the library.
- I: Any more insights?
- A: Communication goes both ways, it's not only we, library IT, not giving enough feedback. For example when we receive mention of an issue from front line staff it's often difficult to work with them to help resolve it, gather the necessary information. It sounds like for them once they've communicated that there was a problem, their job ends. They don't understand that it takes time for us to work on them. We would need to go back and forth between the two groups.
- I: Thank you for your time.

### Interviewee B Transcript [translated from French]

Interviewer (I): Thank you for agreeing to this interview and for completing the consent form. As you may recall from participating in the online questionnaire, my research investigates the process by which technology projects in libraries are selected, procured or, in the case of internally-developed projects, defined. In this interview, I would like to focus on your own experience with technology projects in a library context, and particularly how needs and requirements were established and documented, how a solution was chosen to address those needs, implemented and reviewed.

Can you briefly describe your role?

Interviewee B (B):I am a science librarian at an academic library.

- I: To begin, what in your opinion, defines a successful technology project?
- B: I think the only metric that is worth looking at is usage rate by its intended users. Look at our own library catalogue. We recently implemented a new search interface, and our usage stats are sinking. There was a dip in usage stats in 2012, right when we introduced this new tool. I think there is a correlation between the two events, and so does the head of public services, but this hypothesis is not being tested. Management and IT are not taking this concern seriously.
- I: By usage statistics, do you mean visits to the site, searches?
- B: I mean loans. Book loans. But this metric is not worrying anyone, because books, print books, are no longer a priority. To be clear, I don't think the new search tool is the only cause our usage stats are dropping. This is a longer trend. But there was a marked dip when we introduced the new catalogue search tool.
- I: Thank you. For the remainder of the interview, please think of 1 or 2 projects you were involved with in which this definition of success was particularly well met, or to the contrary exemplify what you consider to be a project not meeting your definition of successful.
- B: The new search tool is a good example. We implemented a resource discovery layer on top of our existing ILS. The tool is provided by the same vendor that runs our ILS. The library network we are part of, and with which we share the ILS also have an instance of the discovery tool, but we choose to have our own instance so we could control better what goes into it. At least that was the goal. It may work well for electronic resources, but it's a disaster for print books.
- For example, look at the classic titles for mathematics. They are multivolume series, and tend to be known more by their author than by their title. They are all called something like Analysis or Algebra, so the author is what really makes the difference. We have all those titles in our collection and there is a steady demand for them. We also have an electronic version, ebook version of several of those titles. Our

discovery layer harvests all records from our catalogue. Then [our link resolver] is queried to identify if an e-book version is available, and adds a link to it if that's the case. The problem is that this query on the link resolver is done by title, because it doesn't handle authors nor ISBNs. So it fails miserably on those math books. If you search by the author name of a well-known math book, only the print version shows up. IT is aware of that issue, the vendor is aware of it, but there is currently no solution other than manually adding the eBook links to the print records. Then comes the problem of the multi-volume titles, some still have a parent bibliographic record, to which the volume records are linked, but the holdings are not linked to the parent record, the one for the series, but rather to the title records. So users are confused when they see a series record and no holdings are shown. I appreciate that these are more cataloguing issues, legacies from a former practice, than purely IT issues, but the bottom line is that users are confused.

- We also have an issue with the library network that requires us to keep a bibliographic record alive even if all holdings have been deleted. This creates more strange search results, even librarians have trouble remembering all those issues, so imagine how the students feel.
- The problem is that library catalogues have all these layers of past and current cataloguing policies. Exacerbated by the fact that we share the bibliographic database with the network and cannot clean up our data. That was the reasoning behind implementing our own instance of the discovery layer, but it did not resolve all issues.
- When we implemented this tool, there was a test period during which we were supposed to be able to send feedback to the vendor. We noted all those issues then, informed the vendor, filed feature requests, but nothing happened. It's been years. The product is totally opaque, and the vendor doesn't seem to care to support it.
- I: Do you have an example of another project that maybe went better, and how would you compare it with that one?
- B: We have a homegrown knowledge base for journal holdings. It's an organic project that grew out of a database I had started to keep track of usage statistics. The first goal of the project was to match COUNTER usage statistics report wit journal holdings, so we could extract cost per use stats. We started with journals, we are not yet dealing with eBooks. We had no reliable knowledge base, a link between journal titles, the years we had access to, and the package they were part of. We had an A-to-Z list and the catalogue, both were out of date. So I had to build my own database, by using vendor reports and public records from SUDOC, a French collective catalogue which makes its data public. It is now the most reliable, cleanest database of our journal holdings. But it is completely standalone, in FileMaker. It doesn't interface with anything. We are thinking of turning this database into a service that not only our library can use, but that can potentially be shared with other libraries, since commercial knowledge bases are often flawed.

- I: What data is tracked in this tool?
- B: It contains all usage statistics for our library, our journal holdings, subscription costs, bibliographic data.
- I: How was this project developed, what was the rationale behind it?
- B: As I said, it was an organic project. Started out from nothing. I just happen to have a manager that is OK with staff spending on it. We now use it for strategic acquisitions decisions. It's been used for renewal decisions for the past 2-3 years.
- Its mandate grew because our A-to-Z, basically the closest we had to an electronic resources management system was abandoned in 2013 because [the link resolver from our ILS vendor] was supposed to take over this role. Our A-to-Z was a locally developed tool and it was decided by management that we had to stop locally developing tools but instead use industry standards. In my opinion, this is because management wanted to avoid having staff working on development projects, they wanted a turnkey solution from a major vendor. The decision came from library management, including the head of library IT. But I don't think they gained much. Our A-to-Z was basically maintained by a single librarian, who indeed was spending most of their time on it. But now, we have the equivalent of a full time working solely on issues involving our link resolver and the discovery layer, with many unresolved issues. So in my opinion, we didn't gain anything.
- I: So what could have been done better? How do you think libraries should answer such "build or buy" decisions?
- B: In this case, the decision was made by people who did not understand how electronic resources are managed. They did not grasp how many particular cases there are. There are too many local specialties for any vendor-provided knowledge base to be accurate enough. But management wasn't aware of that and trusted the vendor. Now we know for a fact that their solution is not working, so we are happy to have this homegrown database to remediate. The vendor was supposed to deliver a service, they didn't, so we had to do it ourselves. But management still doesn't see it that way, they still trust the vendor. There are plans to migrate to their next generation library management system, and supposedly this will resolve everything so there is no use keeping our homegrown tools. But given how this vendor dealt with our issues so far, I have no trust in them. So we ended up with two parallel processes. I would say, local knowledge should never be underestimated. Homegrown solutions are often there for a reason.
- As for myself I mostly use the discovery tool to search the catalogue, not so much for its articles database. This is a pity, because that database, the integration of journal articles, was supposed to be the bonus to compensate all the other issues we're having with it. I think I'm not the only one doing so, academics rather prefer to query specialized databases directly, like MatSciNet or PubMed, or even Google Scholar.

But library management is not aware of the problem. They care for other projects and never questioned whether implementing this discovery layer was a good decision. So if they are not committed to resolve those issues, I'm not confident that they ever will be. The general feedback on the discovery tool is rather poor, but everybody here is pinning their hopes on the next generation library catalogue.

- I: So if management is not aware of the issue, what could be done to remediate it. What does this project tell you in terms of communication within your institution?
- B: The people who understand how the link resolver work are in the IT department. The people who understand how complex e-resources metadata are, are in the e-resources department. There is very little communication between the two. And then you have the people working with the users, on the circulation desk, who are aware of the problems but don't understand their root causes. On top of that management has other things on their agenda. It's a triangle situation with little information flowing between the three groups. Librarians, IT people, management.
- I: If you had an opportunity to redo this project, what would you have done differently?
- B: I remain persuaded that a local solution would have been better than an "industrial", one-size fits all solution offered by a vendor. It's the same story over and over again, people build their own tools, then someone comes and complains that developing software is not what libraries are supposed to do and then replaces the homegrown tool with a purchased one. It's what happened 15 years ago when the our library network's ILS was migrated from a homegrown tool to a major commercial ILS. They wanted to get rid of the local developers. But you still need a lot of people to handle these tools, even commercial ones. I'm not sure there are less people now having to work around the commercial tool than there were developing our own solution. On top of that, who's to say if those vendors will still be there in a couple of vears? They keep being bought over and traded by pension funds who need to make a guick buck. They are under tremendous pressure to create value for those owners, who need so much money to pay their pensions. How can such a system be sustainable and beneficial to libraries? I don't trust any of the major vendors out there, for this reason.
- I: Are there any things that can be done locally by libraries, to mitigate their dependencies on such vendors?
- B: We generally lack people with a double compentency: library science and technical knowledge. We had a few of these people here, but they have now left and there is now a broader divide between IT and librarians.
- I: Thank you very much for your input.

### Interviewee C Transcript [translated from French]

Interviewer (I):

Thank you for agreeing to this interview and for completing the consent form. As you may recall from participating in the online questionnaire, my research investigates the process by which technology projects in libraries are selected, procured or, in the case of internally-developed projects, defined. In this interview, I would like to focus on your own experience with technology projects in a library context, and particularly how needs and requirements were established and documented, how a solution was chosen to address those needs, implemented and reviewed.

Can you briefly describe your role?

- Interviewee C (C): I am Head of IT at an academic library. I am also the project lead for a large scale ILS migration to [a next generation LMS]. This migration not only affects my library, but also other academic libraries in the same political jurisdiction, as well as all school libraries in that jurisdiction.
- I: To begin, what in your opinion and in your own professional practice, defines a successful technology project?
- C: When a strong project management framework is in place. For example, I am the general project manager for the [next generation LMS] migration. It is a big project as we are moving away from a regional library network and building our own, at the same time we are migrating from our previous ILS to [the next generation LMS]. So there are political and organizational aspects too, not just technical.
- We have a full-time consultant who is the project manager for the technical part, the migration to [the next generation LMS]. We also have a part-time consultant (0.3 FTE) who is responsible for risk and guality assessment. According to good practice, the person in charge of risk management should not report to the project manager but to the project sponsor, who mandated the project, directly. But in our case, that would have meant reporting directly to someone in a political office, which is unpractical, so the risk manager reports to me, the project manager. This is problematic because they might not dare identify something that's not right. But apart from that, their role is very important. For example, they reported that we were not following the project management guidelines that are in place for public projects in [this country], committees were missing and the reporting structure wasn't properly implemented. Following their comment, a steering committee was empaneled. They also insisted that minutes be taken at all meetings, agendas be prepared in advance and archived, complete with records management guidelines for all reports, a communication plan, etc. They make sure we follow the rules and if something is missing, an issue is opened in a tracking document, where it will stay until it is resolved.

- I: How are identified risks resolved? By whom?
- C: We have a risk management document tracking identified risks, together with impact, probability of occurrence, what needs to happen to resolve the situation, etc. The goal of that document is either to avoid a risk, or to react if it happens. This document also determines who is responsible.
- I: Thank you. Within that project structure, how is success defined?
- C: When the project was established, a set of objectives were identified, by the project sponsor. This is a public document, and under scrutiny. We are obliged to fulfill those objectives. At the end of the project, we will compare the resulting situation with those objectives.
- I: Who will determine if the objectives are met?
- C: The project management team, together with the project sponsor.
- I: Will there be formal validation from the end users, for example library staff or library patrons?
- C: Not formally. Officially, the project will be deemed a success if its objectives are met. This is because of the way it was setup. But you're right, the project plan does not include end user feedback as a measure of success. We plan to organize a way to collect feedback.
- I: Thank you. For the remainder of the interview, we will focus on this project, unless you would like to discuss another one.
- C: No, I think this one is the most relevant to your questions.
- I: Can you briefly describe the way the project was established? I'm especially interested in how the solution that you are implementing has been chosen.
- C: In 2014, a decision was made for all libraries in this jurisdiction to quit the regional network we were until then part of.
- I: Who took this decision?
- C: It came from [the highest local political office] directly. The official reason was that the network had governance issues. They had been without direction, without a strategy, it was being redefined for the past 8 years, so we were tired of waiting. Because of this situation, where nobody was in charge, it was impossible to take decisions, and therefore to make necessary investments. Without a governance body, all members essentially had to make decisions by consensus. This was highly contentious, because historically, members were paying largely different membership fees. Nobody wanted to upset the situation.
- The officious reason for leaving the network was also political, as a retribution for other common initiatives that did not work because of budget distribution issues. But in practice, as librarians, our biggest issue with [the ILS that was in place with the network] was that there was no solution to manage electronic resources. We had a homegrown tool that was insufficient. And [the ILS that the network was running]

was not offering this option. That ILS was also quickly becoming obsolete.

- So the decision was taken in 2014. The project was setup with 3 separate sub projects:
- An IT project: we would migrate from the old ILS to a next generation tool. A deadline of August 22, 2016 was chosen for this step. It set the timeline for the other project elements, and a sense of urgency.
- A library management project: how should this new network we are creating be defined? What bibliographic frameworks should we using, subject indexing schemes, etc.
- A governance project: as we are building a new network, we need a governance model, a system so that decisions can be taken, a business plan. The deadline for this step is January 1<sup>st</sup>, 2017.
- The project requirements were established based on feedback from about 100 libraries that will form the new network, out of them 70 are school libraries. The mandate to implement this project was given to my institution, the largest academic library in the region. We are in charge of implementing all three parts of the project. It took about 3 months to prepare the technical requirements, about 30 people were involved. We ended up with a list of over 200 requirements.
- We also hired a senior consultant to help us prepare the RFQ. They helped us write down the requirements and manage the procurement process. They made sure we followed the rules for public procurement, which are very cumbersome. For example, you are not allowed to communicate with prospective vendors. Also, the rules mandate that the total cost weigh 30% in the final score. There is a formula that produces a final score, we didn't make it ourselves. A low-priced offer is automatically privileged. To compensate this and ensure we only got serious proposals, avoid lowball offers, we included exclusion clauses. For example, we stipulated that we would only consider proposals about an existing software product. There should be at least one install already in production, with a library network, and academic libraries. Also we clearly stated we wanted a cloud-based solution.
- I: Who was involved in the definition of the requirements?
- C: The identification of requirements was delegated to the line managers in the libraries. Cataloguing, acquisition, circulation, etc. They were instructed to work with their teams to come up with requirements in their area of expertise, then we, the project management team, with the consultant, coordinated the results.
- I: Thank you. I know the project is not over yet, but so far, what are the lessons learned, the things you would maybe do differently in another project? For example, in the process of identifying requirements that you just mentioned.
- C: It's not a lesson learned, but we were very careful when preparing the requirements to avoid having to accept a proposal that would involve a

custom designed system. Also we sort of knew who we wanted to end up with. At some point we were afraid they wouldn't answer to the RFQ.

- I: Do you think this informed the way you defined requirements? Did you define them around the product you were envisioning?
- C: No, I think we did a good job of identifying requirements based on our needs. It's rather around the exclusion clauses that we sort of put barriers so as not to end up with something too far away from what we were envisioning.
- I: Thank you. What about staffing, the people who were chosen to work on this project. Any recommendations, lessons learned?
- C: We were fortunate that we could hire 6-7 people to complement our team. These people are under contract until the end of the project, then the goal is to hire them in fixed positions to manage the network and the LMS.
- I: What profiles are those extra staff you were able to hire? Librarians, IT developers?
- C: 1.5 FTE are developers, and we have 4-5 FTE that have more like a systems librarian profile, the rest are professional librarians, to help with our questions around indexing schemes, cataloguing formats, service offerings, etc.
- We did however run into a budget issue when hiring this extra staff. We made a budget request in December 2014 to hire staff during the project, but it was not accepted until November of the next year. Only then were we able to hire them.
- I: Moving on to other aspects of project management, is there anything you learned around managing conflict or negotiation?
- C: There were a handful of misunderstandings with [the vendor]. For example, one of our requirements was that everything, the software, online help, etc. be available in French. They provided very poorly translated online help, with screenshots in English. This is not what we were expecting, but [the vendor] initially refused to revise this. We had to negotiate with them for a while before they accepted to revise the online help. We avoided having to amend the contract but we worked it out by moving deadlines. This was an issue not only because online help is useful, this was also a legal issue. If we had accepted the implementation without this requirement being met, and it was an important one, we could face legal challenges from other vendors.
- I: What about within the network, among the libraries involved in the project, were there any issues?
- C: There were few problems, we mostly had to manage concerns about the new system. [One library] that was a member of the previous network took advantage of the project to get out of both networks. But they had their own reasons, it wasn't because of problems with our

project. The fact that our governance model was clear from the beginning, [my institution] is in charge of the project, helped a lot.

- We are also in charge of training the librarians across the network. The vendor does not offer training, and it was not part of the RFQ, so we do this ourselves. We have a training session every day from the beginning of May until the end of July. We have a total of about 400 librarians that have to be trained, we can't train them all at once and also there are different topics to focus on. We train them by groups of about 20.
- I: What was learned from dealing with your vendor, or any other outside parties?
- C: There were examples of specifications being misunderstood. [The vendor] sent an army of representatives during the RFQ presentations, they did an excellent job presenting their product. Then, we worked with their French representatives. Having a francophone contact point was part of our requirements. Since they are based in another country, we had to do most of the communication via conference calls. They came here about a dozen times for workshops, to handle specific issues.
- The physical presence, here on site, of a representative from the vendor during the entire project duration would have helped tremendously. Doesn't need to be full time, but I would say at least 50% of the time. You can work better with in-person interactions, we understand each other better. You can show them how you work, explain issues in realtime. Instead, we had to make appointments, list all the issues we needed to discuss, take screenshots to document them, etc. When you have hour-long teleconferences, you are very limited. When the vendor representatives are here, it's easier to collect the missing information, you can go fetch someone that has the required information, etc. Teleconferences make everything more complicated.
- We told [the vendor] about our issues with teleconferences, and after that they came more often. They actually went beyond what they were contractually obliged. So my take home is to ask for more in person meetings, ideally with a local representative with the client that's there most of the time.
- I: If you had an opportunity to redo the project, what would you do differently?
- C: You talked about communications earlier. We didn't manage internal communications very well. For example, we recently received a letter from representatives from the faculty in my institutions. They had only recently learned of the project and were concerned that we were planning to mix academic and school libraries within the same network. It turned out they did not have all the required information, since there will be two separate instances of the LMS in our network, one for academic libraries. That information was unbeknown to a significant part

of our users, faculty, and we realized we hadn't communicated properly. It's not clear to us how and when we could have better sent this information. But we realized we did not sufficiently think of the general public in our communication plan. We did organize public information seminars, but rather lately.

- We followed the communication plan as mandated by the project management framework we fall under. But when identifying audiences, we forgot the general public. The professionals, the librarians members of the future network, were well informed, with demos, newsletters, meetings, etc. With the hope that they would relay the information to their users. But we got very little feedback from them, and we realized they did not inform their users. So this is definitely something we would try to do better for future projects. It was a bit disheartening, this whole project is for the benefits of the university, of our main users, and the university not only was not aware of it but got worried.
- I: And around the procurement process, any recommendations?
- C: The main thing I find problematic about RFQs is that it's a very formal process, and it specifically prevents libraries from communicating with potential vendors once the RFQ is out. This is unfortunate, because that would be a time during which communication is crucial, so we can clarify our needs, and avoid later misunderstandings.
- I: Thank you for your time and for your input!

### Interviewee D Transcript

Interviewer (I): Thank you for agreeing to this interview and for completing the consent form. As you may recall from participating in the online questionnaire, my research investigates the process by which technology projects in libraries are selected, procured or, in the case of internally-developed projects, defined. In this interview, I would like to focus on your own experience with technology projects in a library context, and particularly how needs and requirements were established and documented, how a solution was chosen to address those needs, implemented and reviewed.

Can you briefly describe your role?

- Interviewee D (D): I am the Discovery Systems librarian in an academic library.
- I: To begin, what in your opinion and in your own professional practice, defines a successful technology project?
- D: In my experience, a successful project is one that gets finished. I know it sounds trite, but I know of a lot of projects which either limp along or get canceled before they become useful. In order for this to happen, you need to come to a consensus at the beginning of a project, a consensus that has to include stakeholders, users of the final product as well as IT, about what the project is. For me a project that hasn't established that is problematic.
- I: Thank you. For the remainder of the interview, please think of 1 or 2 projects you were involved with in which this definition of success was particularly well met, or to the contrary exemplify what you consider to be a project not meeting your definition of successful.
- We will focus the interview on those projects, but if you have other anecdotes from other projects or your professional practice in general that complement my questions, please feel free to include them as well.
- D: OK, I can think of two, one good and one bad.
- I: Can you describe them?
- D: An example of a bad project was the implementation of a thesis deposit workflow for the faculty of graduate studies at [my institution]. It involved setting up a system to take over their typical workflow. Their typical workflow, the goal of this project was for them to use our system for the whole process of accepting, managing, granting theses. We implemented this by customizing existing software.
- By contrast, an example of a project that went well is we wrote an application to automatically connect our e-journal holdings with our catalogue. In this case it was much better scoped, the requirements were better understood, and we had an end point we could agree on.

I: So if I understand correctly, both projects were developed in house, by your team?

D: Yes.

- I: Thank you. Let's focus on one of these projects for now, I'll let you decide which one. Can you recall what steps were taken from the conception of the project to its conclusion?
- D: Sure. For the thesis workflow, it came to be because the idea that the faculty of graduate studies needed a repository to handle their theses came about at the same time as the library realized they needed an institutional repository. The two groups came independently to the same conclusion. But early in the project, we ran into issues, even though we were speaking to each other. But the communication was not strong. We [at the library] did not know what kind of questions to ask, in order to get the right kind of information so we could develop the software accordingly. Still, we led an environmental scan, and ended up selecting [an open source digital repository solution]. With the understanding, that we knew from the start, that [the chosen product] only met some of our requirements and that it would need to be customized for our needs.
- We installed [the product] quickly, when we started to be bogged down was when we started working on the custom developments. They were not well defined. Also we didn't correctly define what constituted a satisfactory solution for the end users.
- But in the end, even though it was difficult, it turned out to be a benefit to both of us [the library and the graduate studies faculty], because the library knew we wanted to expand on this project and develop an institutional repository founded on this e-thesis pilot. Also the graduate studies knew they needed a tool to handle their workflow and they got it in the end.
- I: Do you recall how this particular solution was selected?
- D: We looked around at what the options were, then we tried deciding which would offer us a possibility to customize. We knew no existing software would do all we wanted, so from the get go we were looking for a solution we could customize. [The repository software] offered us that option. The fact that it was free and Open-Source software made it the front runner. Also because it was free software, we didn't need to go through competitive procurement.
- I: Even though you did not formally acquire this product because it was free, was there still a project plan and budget, in staff time and duration, set for this project?
- D: No, the library did not formally allocate a fixed amount of resources, a time or dollar budget to the project. It was added to our list of active projects and run as such, but it wasn't properly defining as a project having a beginning, a middle and an end. The requirements gathering

didn't work well because the project wasn't properly scoped out. Because of this.

- I: What was your role during this project? Beginning during the needs assessment phase?
- D: The way we did it was by meeting with library staff and representatives from the graduate studies, we asked what their existing workflow was, identified the steps in their workflow. Rather than digging deeper, or going back and forth between development and asking for feedback, what we now do in our agile development process, we just assumed we knew what was needed for each step in the workflow and then went ahead and developed it. We started with a conversation and we let the conversation end when we thought we had heard enough. We did not validate formally what we had understood. And then during the development phase, we did not communicate often enough.
- I: When was this project run?
- D: About 5 years ago.
- I: Moving on, what was your role during the development phase of that project?
- D: Because we have a very small staff dedicated to this type of project, my role was both project manager and developer. I carried the project along with another person. At a higher level, the project was supervised by my boss, but they did not intervene in the process per se. They made very high level decisions.
- I: And once you had determined that the development phase was over, what happened, did you validate the result with the users? What was your role?
- At that point, I think the project had been going on for longer than the grad studies had expected. There was already some friction with them because of that. It was hard for us to get feedback from them, and this is when we uncovered that some of the assumptions we had made about this project were wrong. After a few months of this, the library hired a person in charge of scholarly communications. It wasn't linked with this project, it just came to be at that time. That librarian became involved on a day to day basis with the graduate studies, and they also started using the workflow we had just developed for them. Because that person was stationed at the library, they were able to interact very closely with us, the development team. This person became the missing link. A proxy for the graduate studies, the end users, inside the library.
- But the project was never properly finished. We never ended up drawing a satisfactory line under the whole thing, but because thanks to that librarian we were able to speed up the feedback look with the end users, we were able to fix up enough of the workflow we had developed to make it usable for the intended users. We ended up not meeting all the requirements but we got to a point where everyone

was reasonably happy. It was then used for a while before being replaced by another solution. The replacement happened as a part of another, wider range migration to another system.

- I: What, did you learn about the requirements gathering phase, how to do so better in the future? Were you able to identify a methodology that would work better?
- D: What I found is that having people within the library that can act as proxy to the external stakeholders is good. This reduces barriers in the communication process. In earlier projects, such as this one, we did not use modern communication tools such as GitHub issues, Slack, etc. We did meetings over the phone. For recent projects, we now use GitHub extensively. When our stakeholders review work that we have done, they have the ability to open issues in GitHub, it reduces friction.
- I: If I understand correctly, you have asked all end users to use GitHub to provide feedback on recent development? Non-technical staff, librarians, users outside the library?
- D: We have asked library staff involved in such projects, end-user staff to open GitHub accounts, yes. They have learned to use GitHub.
- I: How did this process go? Were end users open to use GitHub?
- D: There was an initial fear on their side, and they initially did not want to have to open yet another account. But it's working well now. Once they've started using it, they understand the process to open issues on GitHub and record their feedback there. We intend to use it for other projects still. We also want to try out other tools, such as Slack.
- I: What about defining product specifications, what did you learn, how would you do better?
- D: This is an area where we still don't do a particularly good job. I'm not sure I totally understand the reason why this is so. This is an area that we still tend to overlook.
- I: Is it overlooked by the management of the library, or at your level?
- D: Both, but mostly at our level. At the development level. What we want to do is get working immediately, and we tend to forget to properly document needs.
- I: Whose responsibility do you think it is to realize this issue and look for improvements?
- D: In our organization, this responsibility is split between the Associate University Librarian and people at my level. I feel that if I raise the issue, if I have ideas on how to do better, they [library management] would be OK with it. They don't understand enough of the process to grasp what the issues are, what is problematic. But they recognize that and don't interfere. If I'm driving, if I'm in charge, they trust me to make my own decisions. If they are driving, they might not be willing to change their process. So it makes it possible to evolve.

- I: Was the choice of the other people involved in this project yours?
- D: No, it was a given. There's only the two of us to do this kind of projects.
- I: Was there a point during that project that you would define as a conflict, between the developers and the end users? And how did you handle it?
- D: There was no conflict, really. More like points of friction. We were frustrated, on both sides. We overcame it by communicating better.
- I: At the end of the project, how did you measure its success?
- D: Again, a lot of it came out of conversations with the end users. When the graduate studies staff began to see that the software could be used, they told us we could go live. They then started using the workflow in production. At this stage, it was entirely my call to decide to continue with the project or not. Mine, and the scholarly communication librarian. The decision was about, was it OK to stop the development now, rather than declaring the project as completed.
- I: If you had an opportunity to redo this project, what would you do differently?
- D: Two main things. One is to always have a either direct, fast, communication with your end user, either face to face or via good communication tools. If you can't have that, then have a proxy, someone working in your organization, close to you, that represent your end user. Also be more clear about defining roles. Users need to know who they're working with.
- The second thing is to spend more time in the specifications. Define development projects in phases and do one step at a time.
- I: Have you looked at specific project management methodology to help you with that?
- D: I've started reading some books about how to define specifications. I have now an idea of the methodology to use and I plan to use it for our next project, that of a digital scholarship center.
- I: Thank you. Moving back to the other example you described, it sounds like one where you had fewer such issues, do you mind using it to explore the challenges that were raised with the previous project?
- D: That's a good idea. That other project, the e-journal links, was an internal facing one. It was built for the library, with no obvious visibility to external users. The staff from serials cataloguing did not want to keep maintaining duplicate holdings in our link resolver and in our catalogue. We set out to write a program that would extract holdings information from the link resolver and then updates the catalogue records accordingly. It was easy enough to understand conceptually. But we faced difficulties during the requirement gatherings again, as we started meeting with the serials cataloguers, I didn't have the knowledge required to understand the complexity of the process. To

me it sounded like simple mapping of fields from one application to another one. I should have delved deeper into the process of cataloguing serials.

- Another problem was that once the serials cataloguers found out what was technically feasible, what we could do, the scope of the project started to creep.
- I: Can you recall what steps were taken from the conception of the project to its conclusion?
- D: They [the serials cataloguers] came to us [the developers] with their problem. I met with them to scope their requirements. I didn't probe enough, as I said. My role was to split the work into work packages. But the physical proximity, the librarians were one floor above me, the proximity helped the communication, the feedback.
- I: Do you recall how the particular solution you ended up implementing was selected?
- D: It was an informal process. I talked to the only person at my organization who has programmatic access to the catalogue. The only approach to automate the process was to get them the data they needed to update the catalogue, in the format they needed. I had to use that format. At first it looked as if I could write the queries to update the catalogue by hand. They and I talked about what format we would need, then we both worked on our end of the project. We didn't map out how the different pieces would work together.
- This is also when scope creep started happening. Once the serials librarians understood the process we were envisioning, they asked for reports on the quality of the records in the catalogue. They wanted reports when there was a mismatch between the information extracted from the link resolver and what was already in the catalogue. Instead of overwriting the information that was in the catalogue as we had initially planned, they now wanted a web app so they could compare both sets of data, and select which to keep. Because we had no formal project management process, it was hard for us to say no.
- I: What was your role during the needs assessment phase?
- D: I liaised between the serials team, generally trying to understand how the technical solution would work. We all thought the project was small enough that it did not require formal project management.
- I: What was your role during the development phase of that project?
- D: I worked on extracting information from the link resolver, processing this data in the format required for input into the catalogue.
- I: Once the project was over, how did you validate the result with the users?
- D: We did it constantly during the course of the project, alternating between development phases and validation with the users. Not formally the agile development method, but basically that.

Library management, the Associate University Librarian is the one that drew the line to finish the project, resolved the scope creep issue.

- I: What was learned in this project in terms of communicating between users and developers?
- D: This one went relatively smoothly. It was beneficial to work with an internal unit as the customer. Also we used an approach I've set up recently, using GitHub to keep track of everything. This process allows for asynchronous communication, better than a phone call or a meeting, because the entire discussion is kept. Still, we did not have the required formality to avoid scope creep. But at least thanks to GitHub, we had a "paper trail", a way to come back to earlier issues or discussions and determine what decisions were made then and stick to them.
- I: What was learned in terms of writing specifications?
- D: Try to avoid scope creep. Gathering positive feedback on the requirements, what works, is one thing, but make sure you capture what's not in scope in the feedback you receive.
- I: Was there flexibility in choosing who you were working with in that project?

D: No.

- I: Were there any conflict situations, how did you resolve them?
- D: This time there was a bit more conflict. As the serials team came up with new reports and new functionality that they wanted, there was a conflict between what we were able to to accomplish and what they wanted. We needed to manage their expectations, especially about the time it took us to implement a new functionality. The Associate University Librarian was able to arbitrate in those cases.
- I: How did you evaluate or monitor the success of the project?
- D: The thing I learned is that there is a strong connection between project completion and a good definition of scope. It is easier to determine that a project is complete when you are able to master its scope. Once we put barriers, we defined scope more clearly, the status of the project became clearer.
- I: What will you do to overcome those issues in the future?
- D: We will spend more time working on requirements gathering. Also implement a more formal project management process. Our track record isn't great.
- I: Would you like to see these improvements implemented for all new, or even exiting projects?
- D: Ideally yes. If there was a way to regain control of existing projects that would be great. The problem is that there isn't enough awareness at the higher level, on the library management level, that this approach is

needed. For any new project, a project manager would be required. Someone full-time, who can dedicate time to it. Not me.

- Some level of project coordination is required. I think this should be a new position in our organization. Someone whose job it is to know what all the projects are, who is involved with each project, and is able to allocate resources according to needs.
- On a day-to-day level, we need to make a distinction between people who are project managing and those who are programming. For example, I like to program and it is my job to do this anyway, but because I'm senior enough in my organization I ended up doing project management as well. I should have said no. This needs to be someone distinct than the one doing the work.
- I: What do you think is the ideal profile, or the skillset of that person? The projects coordinator?
- D: A lot of what's required is learned through experience. Not formal training. For example, I took a project management class. This helped me put the right name to things I had already identified through my work. It helped me with the language, but it didn't help me take control of my projects. The experience is what drove it home. I don't think we need specific skills, but a higher level decision about who we support.
- I: If you had an opportunity to redo the e-journals project, what would you do differently?
- D: I would have liked to have one the serials cataloguers assigned to my project team. Also the ability to concentrate on that particular project and finish it. We have multiple projects at once and that's a problem. It would be better if we were able to work on a single project for a shorter period rather than in parallel.
- I: Is this realistic?
- D: I think it is. I think it's important enough that institutions should consider acting on it. I have brought it up with my management, but I don't think they will act on it. It didn't get much traction.
- I: Anything you'd like to add?
- D: A method we've been talking a lot here is scrum. We try to be scrum. We try to assess the pros and cons of traditional upfront project development and agile development. What's clear to me is that in a library context, a balance of both approaches is necessary. In scrum, the total duration of a project isn't known beforehand. In a library context, you need to know when a project is done.
- I: Why do you think specific deadlines are needed?
- D: For organizational reasons. You need to know for how long you are going to assign staff to a project. The organization needs to know when those people will be free to work on something else. On the personal side as well, not knowing when a project will end can be soul destroying. We're still thinking it through.

I: Thank you for your input.

### Interviewee E Transcript [translated from French]

Interviewer (I): Thank you for agreeing to this interview and for completing the consent form. As you may recall from participating in the online questionnaire, my research investigates the process by which technology projects in libraries are selected, procured or, in the case of internally-developed projects, defined. In this interview, I would like to focus on your own experience with technology projects in a library context, and particularly how needs and requirements were established and documented, how a solution was chosen to address those needs, implemented and reviewed.

Can you briefly describe your role?

- Interviewee E (E): I am a systems librarian an academic library. Prior to that I was a partner in a company that developed solutions for libraries using open source software. But my background is in libraries, with an English major.
- I: To begin, what in your opinion and in your own professional practice, defines a successful technology project?
- E: For my own personal practice, what I've tried to use as an informal criterion, is to check if a project is still alive and in production, to the satisfaction of its users, after the project manager has left. For example, at [an academic library where I used to work], some of the projects I was working on while there have been completely transformed after I left. Others stayed alive for a long time after my departure. This to me is the measuring stick of project success. But not at the time the projects move into production, rather for long-term project success.
- In my country, there is very little formalism in technology projects in libraries, except for the procurement process. Procurement in the public sector is very formal. For example, my current institution recently bought a videoconference system. We are a multi-site institution. Three rooms were equipped over 2 sites. We had to go through a formal procurement process because the value of the project was over \$20,000. But the technical requirements were very succinct, about 3-4 pages. They had to describe both what we were looking for and the vendor's service provision, for example training, the documentation has to be in a particular language, etc.
- In my country this formalism is legally mandated. RFQs have to include maintenance, not only implementation. The law mandates the concept of the "unity of service provision". A vendor has to provide training, not only the product. This is written in the law for public sector markets. This is a very constraining legal framework, especially for international vendors. They have a lot of paperwork to fill, so much that they typically need to hire local administrative support, people with prior knowledge of this process. For example, the law mandates that vendors have to abide by the labour code, prove that their employes
receive social benefits. This is difficult for a vendor based in another country.

- Every procurement tier adds more such constraints, not only to the vendor. For the organization, the library putting out an RFQ, depending on this value, the law mandates how the RFQ must be advertised. On the lower tiers, getting quotes from 3 vendors is enough. On the higher tiers, there is a requirement that the RFQ be published on the library's website for at least 1 month, then above a certain amount it has to go on a national bid database, etc.
- The law mandates the paperwork very closely, but is silent on the technical aspects of the process. Typically universities will have a unit handling public market procurement, but they will only take over the administrative part of the process, expecting the library to handle the technical requirements. The administrative part of the RFQ has to include how proposals will be evaluated. Typically, there is a requirement to indicate the weight the quoted price will carry in the evaluation. This weight is often mandated by law, depending of the project type. To go back to the videoconference example, the quoted price had to account for 40% of the final evaluation score. Meeting the technical requirements carried another 40%, and the remaining 20% were covering project management aspects, documentation and training. In the end, since all vendors were pretty much offering the same thing, the price ended up being the defining factor. We were careful to add in the RFQ requirements a request for vendors to include details, their service record, references, etc. This background information is crucial. For example it allowed us to determine that while one of the vendors was offering us a well-known [teleconferencing] product, they had no experience with it, or this kind of system.
- The problem here is that since it's a very small market, there are rarely local vendors submitting proposals. Large international vendors rarely have a local representative. Therefore a lot of local providers will negotiate exclusivity contract with international vendors, and then represent them locally. They will handle this vendor, together with a lot of other things, as a result they don't have the technical competencies to handle maintenance. If there is a technical issue, they are incapable of handling it. Vendors are not interested in opening a representation here because it is a remote location, and a small market. Plane tickets are expensive, there are time zone issues, etc. For example, when my current institution implemented RFID technology, they selected a local vendor on a behalf of a well-known library RFID manufacturer. They were chosen because they had handled implementation of RFID in supermarkets. They installed the technology, but did not invest in training the local vendor representatives because we would have been the only customer and they didn't feel it was worth it. It was a disaster.
- I: Were you involved in this project?
- E: When I arrived, they were transitioning from the implementation to a maintenance contract. We refused to sign it because the local vendor

was clearly incompetent, and their service offer was ludicrous. Instead, we tried negotiating a direct maintenance contract with the manufacturer but we couldn't because the local vendor had an exclusivity clause. In the end, we cheated. We got the manufacturer to visit our location once a year, supposedly on a cost-recovery basis, but they overcharge the trip costs and in exchange they provide remote support over the year.

- This is an example of a project that failed because of market constraints. Our market is too small, it prevents us from dealing with real service providers. Instead, we are forced to use intermediaries. This is a recurrent problem for libraries in [our geographic situation], I have spoken with [another university in a similar situation] and they have the same issues.
- I actually happen to know this situation from the vendor perspective very well. When the public library of [another similar geographic area] wanted to implement an ILS, they wanted a local provider. At the time I was working for a consultancy that was providing services implementing [an open-source ILS]. They chose us a provider, but they insisted we provide knowledge transfer to a local provider. We installed [the ILS] and handled data migration, trained everyone. We completed our part of the contract, which was implementation, data management and knowledge transfer, then we left. The local provider was supposed to handle maintenance. It was a disaster because this was the only instance of [the ILS] they were managing. The maintenance contract was not enough to support a dedicated engineer, it was barely for a couple of hours per week, not enough for any single person to maintain the system while staying current on [the ILS] developments and updates. As a result, that ILS is in a frozen state, it has not been updated. If they wanted to get out of this situation, they would need to choose a provider that has experience handling [this particular ILS]. [redacted]
- Another example, [a particular library vendor] does not have representatives in Portugal, but they deal with a local intermediary. There was a time several Portuguese libraries had very well-run instances [from that vendor], but the local intermediary did nothing else but transfer support tickets back to [the vendor] because they did not have the skills to respond directly. This is a very common occurrence in small markets.
- This is less of an issue with electronic documentation. There is no local aspect, no local particularisms with online resources. But as soon as there is software and hardware involved, this issue arises. I don't know how to resolve this issue. Maybe with library systems moving to the cloud, to software-as-a-service models, this could help. For example with [a commercial next generation Library Management System]. Once a library has migrated all their metadata to [that product's] cloud, local [vendor] intermediaries will do nothing else but provide training sessions for library staff, they won't have to handle any technical

issues anymore since those would be handled directly by [the vendor], who's running the instance.

- When, as a vendor, you invest on a market, you have to invest time, energy and resources. But currently the opposite is happening. Vendors that used to have local representatives are centralizing. For example, [the French office of a large library vendor] is gone. I mean, there used to be a time where tickets for French customers were exclusively handled by [that vendor's French subsidiary]. But a couple of years ago, all employees [from that subsidiary] were transferred to an international service pool. They didn't necessarily fire employees, but now all requests go to an international pool and are treated indiscriminately by international service staff. This has created a situation with libraries that used to have a good relationship with the vendor, on a local level, find themselves in a situation where the vendor is very far removed. This opens the market to smaller, local service providers who could offer this proximity again.
- Long story short, there are huge project constraints that are entirely linked with local markets.
- I: So how can you mitigate situations when the vendor is removed and you feel they don't pay enough attention to your needs? For example in your situation, in your particular market, do you add certain clauses to your contracts for measuring service quality?
- E: You don't always have that option. You can add financial penalties, linked with certain service provisions that the vendor fails to meet in a given time. But this has to be part of the proposals that vendors submit in response to the RFQ. For example, if in the RFQ you specify that data migration has to be done after 4 weeks, the vendor can indicate in their response that they will do it in 6 weeks and be within their rights. However, if they go beyond their own self-imposed goal, you can impose financial penalties, like \$50 per day of delay, etc. In this framework, however, you cannot determine that a goal has been partially met, for example met at 80%. You have to either declare the goal not met and let the vendor keep working on it, or accept it as completed. Once you accept the goal as met, you have to pay the vendor and move on. Or impose penalties. However, when writing the RFQ, you can split deliverables into distinct work items, and indicate that certain items are firm, while others are optional or conditional. Firm items have to be implemented by a certain time, once it's done, the customer pays the vendor. For project involving ILS implementations, almost the entire project is a firm item. The system must be up and running at the end of the phase, this is necessary for the project to be successful. It is rare that the firm item be minor. Optional items, on the contrary, are steps in the implementation that the customer is unsure will have to be carried out or not. For example, in [the academic library ] used to work for], when we implemented [a commercial ILS], we were not sure we wanted the interlibrary loan (ILL) module. The firm item was the implementation of the ILS, minus the ILL, the ILL was an

optional item. At the end of the procurement process, we granted the contract for the firm item to [the ILS vendor]. Since we were not convinced by their ILL offer, we opted against it. We had the right to do so because we had described the ILL module as an optional one in our RFQ. This decision has to be made when attributing the product to a vendor, and only if the RFQ was designed that way. You cannot do it after an RFQ is out, or after signing with a vendor.

- Conditional items describe an operation B that will only be implemented if option A is successful. I once experienced it as a vendor. [An academic library] had written out an RFQ for an ILS. The firm item was a life-size implementation of the ILS, including full data migration, but only for a test instance. The conditional item was the actual ILS implementation, in production. They were very careful, needed more guarantees than a vendor demonstration, or a small test installation were able to provide. Their idea was good, the problem was in how they carried it out. They were very careful, also because they needed to merge 3 different library system in the process they put data migration in the firm item. But their situation was so complex, the work package for the data migration alone was priced at around \$200,000. The problem was that if their project didn't work out, if the test failed, they were out of money, they didn't have the resources to try a different vendor. Everybody was aware of it.
- As the vendor, we made them aware of that, and were able to convince them that it was foolish to invest so much only for a test instance. The situation was so complex that a lot of resources needed to be invested in the data migration, that it would have been a waste not to use them. When difficulties started to arise with the data migration, we convinced them to let us implement the real ILS, what was in theory the conditional item, by explaining that in the end it would work out. And it did. In the end, we delivered the full ILS, in production.
- In retrospect, their idea was good, but they should have made the firm item a smaller part of the project. For example the data migration of only one of the 3 libraries they were merging. If the plan was to get a feel of how we worked, they could also have put user training in the firm item. Valued at \$50,000 instead of \$200,000. But in this case, since we realized the project did not make sense without the conditional item, we, the vendor, had to seek legal help to figure out how we could still work on the conditional item even though technically the firm item had not yet been completed. The situation was that both sides, the library and us the vendor, had underestimated the project's difficulty. In the end, we ended up losing money on this project... They had deliberately chosen an open source ILS software, for political reasons. They were merging 3 libraries that so far were independent. To resolve a situation in which nobody wanted the merger, they had decided to start the process by merging the ILS. They were incapable of agreeing about the other aspects of the merger, the situation was that there were 3 project managers that were arguing. Everybody

invested too many resources, including us. The project lasted for 3 years instead of the initially planned 1 year.

- In conclusion, their idea was smart, but badly implemented. I've never seen anything like that again, nor have I heard about it. In general the big part of the project is the firm item. But in this case, they wanted to start with a smaller project, which was interesting, but in the end they had put too much in the firm item, plus they had their management issue. Their goal was for them to keep the option to get rid of the vendor if they were unhappy, but in reality, they invested too many resources to afford choosing someone else.
- This is another example of project failure for non-technical reasons. Here, they were using a technical project to resolve a political problem. This is a classic. The 3 ILS managers each were convinced they were right, and their system was the one to go with. None of the existing ILS was [the open source ILS they implemented], they chose [that product] so everyone had to migrate. Nobody wanted [that product].
- I: If you had been in their situation, on the library side, what would you have done instead?
- E: I would have picked one of the existing three ILSes. I would have tried establishing which of the three teams was working the best, and gone with that one. The idea being not to loose everything that had been invested already. And simplify the project. That's the thing, even if librarians like to grumble about ILSes, it's their core piece of software, and it's specifically designed to make libraries work. If you don't overly complicate things, an ILS will always fulfill the basic needs of a library. You can always implement additional layers on top of it if you need special functionalities, in a second step, once people are used to it. But here, they wanted to do everything in one go. They used the project as a proxy for political change. Me, I would have simplified, I would have taken more time. If they wanted to change the ILS, I would have taken one of the libraries, migrated them to [the open source ILS], seen if it worked, then moved on to the second one, etc. This would have been less politically charged. They had chosen [that open source ILS] to be the neutral ground, to favour nobody, but to placate everyone they had promised that massive local developments would be made so that everyone would end up with a system that did exactly what the initial one did.
- We as a vendor ended up working entirely on that project, and hence we were not available to answer to other RFQs. Nobody knew who we were. Or if they did, we were associated with that huge mess of a project. We were able to resolve this by getting a contract for [another academic library], we pulled all our developers from the previous project, put them to work on this new one, and in 6 months we successfully implemented the ILS. People then realized the problem was not with us but with the client. After that, we started getting other contracts.

- For [the academic library with the problematic implementation project], we had initially refused to respond. That particular project had been put together by a consultant. The consultant was able to convince us, telling us that no matter what, if we responded to the RFQ we would get the contract. However in that case, the consultant was being dishonest, because they knew that they would keep being employed by the project during the entire implementation phase. Usually a consultant leaves once a vendor has been selected. In this case, the consultant followed their own interest. Their recommendation was in their own interest, in a smaller measure in our own interest, but definitely not that of the libraries.
- I have an issue with many consultants I have encountered. There are some that do a great job. But we have to remember that these are business people, their role is to secure contracts to keep them alive. Some have vested interests in working with the same vendors over and over again, it's only natural, once they've worked with the same vendor a couple of times, they have a certain relationship. Libraries are under the impression that consultants are independent, but it's rarely the case.
- Using consultants is very common, especially for public libraries. Often they are used for other projects too, not just ILSes, for example web sites. This is due to the fact that those libraries rarely have the competencies required to select a vendor for technical projects. Not only in public libraries, many academic libraries are like this too.
- I: Do you think it is justified for those libraries to seek external help to compensate such missing competences?
- E: Totally, and there are very good consultants. But we have to be aware of the fact that because the market of libraries is so small, we will inevitably end up with consultants that have existing relationships with vendors. Libraries are not wary enough of that fact. They don't probe into those relationships. But at the same time, I don't see how they could do it, it requires a lot of research to be aware of those relationships. The external consultant system usually works well for small libraries as long as their needs are not too complicated. Without specific needs, nobody will look for complex solutions. In such cases, a consultant is a perfect partner. Often they will have RFQs that are pretty much ready-made, that were used in past projects, and their role is to help the library navigate the procurement process, and make sure they end up with a fair contract. It's pretty much the only solution for public libraries. It's the same as when you buy a house at a new development. You will meet with the real estate agent, they will listen to what you are looking for in your new dream home. Their job is then to fit your dream to an existing home model. For library RFQs it it's the same situation. Libraries have to end up with one of the few existing vendors, the existing systems. So the role of a good consultant is to guide a library so that their requirements fit within the model of existing systems.

- This what a good consultant does. [Cites the name of a consultant as an example]. They start by visiting the library, they analyze local needs and then offer to write up the RFQ. Then they can optionally move on to helping the library assess responses, and helping them choose a vendor. Not everyone does that. A library is often capable of choosing on their own. Much more rarely, the consultant will stay on during the implementation phase. In academic libraries, consultants tend to be less prevalent.
- I: Getting back to writing requirements for an RFQ. How can conflicts stemming from poorly defined needs be avoided?
- E: Let's go back to my example of buying a house. No matter what, you will end up with a house, not an airport or a cruise ship. You are purchasing a certain type of product. Libraries have to understand that their procurement processes occur according to the same model. They are libraries buying library systems. Library systems are made a certain way. Houses all have a roof, doors, windows, etc. When libraries run into issues it's when they misinterpret this situation. Vendors have no interest in developing custom solutions. Even if you convince one of them to do it for you, maintaining it will become more and more costly and difficult. It's not worth it. Ambiguity needs to be avoided. I tend to prefer purchasing systems knowing their strengths and weaknesses and working around it. When you purchase SFX, you know what it does and what it does not. If you want something else, you buy something else. Nowadays there are more and more open and modular products. If you know you will require functionalities that go beyond what a certain product offers, you're better off choosing a modular system. If I know I will have to customize a product, I will design my requirements to look for the most modular system possible. And then I will choose another service provider to do the custom work. I choose a system with a maximum of interfaces, APIs, and then I go looking for someone else capable of leveraging that. I might be OK choosing the same vendor to provide the base software and do the custom work, but then I would insist that all custom work be done on open and documented APIs, I don't want them to adapt their software for me. Most of the custom work in libraries is around public interfaces. Library system vendors are typically not the ideal provider for this type of work.
- I: I am aware of a project in which a vendor has been precisely tasked to do custom work on an existing system to implement a missing API. How do you think this case should be handled?
- E: The devil is in the details. I would be OK with this approach if the goal is to develop an open and publicly documented API. But if a vendor is developing an API just for me, it's a hack, the vendor is altering their product just for me, and that's not sustainable.
- I: But such hacks already exist. How would you deal with them? For example how would you make sure an existing hack is still maintained by the vendor, especially if you don't have the skills locally to

understand what customizations were done? What methodology do you recommend to ensure continuity for custom work?

- E: Well, with proprietary software, clients cannot modify the code, by definition. It's the vendor's job to maintain what they write. If the vendor writes a bit of code on the client side, for example some JavaScript in a web interface, to which the client has access, then it might be the responsibility of the library to maintain this code and sure it can be migrated. But on the vendor side, it's their responsibility. There are best practices to ensure portability. Serious vendors will follow them.
- When custom developments are handed off to a third party, there are best practices too. What I tend to insist for custom developments is to have everything open source, also when I'm delegating development to a third party. We agree on work packages, on a certain time to make the development, and I budget enough for the developer to do the work and keep working on it until it works. The code is under version control (e.g. using git), we keep all versions of the code and we review them with the developer. All is transparent. It's all part of a whole, the important is not so much documenting custom code. The whole workflow needs to be in place, from the specification of the functionality, to the specific development methodology that is followed (e.g. agile), how sprints are monitored, how code is shared, e.g. on GitHub, etc.
- I: Can you give me an example of one such project and how you are managing it?
- E: For example I am currently working with a third party developer on the library's website. Together with staff at the library, I developed user stories to describe the required functionalities. I ordered them according to my priorities, most needed first. Then I discuss the stories with the developer, and they tell me which one is simple to implement, which one is more difficult, etc. Once the stories are ordered according to those two dimensions, we start with what is important to me and easy to implement, then we order the remaining stories according to the resources we have available. We handle everything, all stories, or work packages, as Trello cards. We allocate a certain amount of days of development time for each package. A package is considered finished once the functionality is in place and the code has been committed to GitHub.
- For this project, I hired a freelance developer over a certain number of labour-hours. We both agreed on an amount over a certain period. When I need them, I asked them to work on a specific work package. This is in sharp contrast with the traditional way technology projects are managed in libraries, with a beginning, an implementation period, an end. We call this "waterfall" development. The problem with this approach is that it doesn't allow for iterative development. When needs evolve over time, you're better off with an iterative methodology. There is a cartoon that is often used to describe the difference between

waterfall and agile development methods. You want to build a car. The waterfall method would start with building wheels, then a chassis, then an engine, etc. Only once all parts are there can you start the car and begin travelling. With an agile approach, you start by building a scooter, then a bicycle, then a motorcycle, etc. You gradually move towards the car, the end goal, but you can start travelling from the very beginning of the project. It works better if you are able to start with a minimum product, then gradually build functionalities.

- The typical agile methodology is to start by gathering end users, define what you want in a certain development cycle, then the developer evaluate how hard it will be to implement those requests, then choose what they will actually develop by attributing points to each work package, using a method called burn-down. Developers and clients determine what can be done for a certain amount of points, then work is done. At the end of each cycle, the code is in production. It works best when you know your project will last for a while. The difficulty with the agile method in a library context is having to deal with formal procurement methods that are required by law. The solution is not to agree on functionality but on labour-hours. For the website, I did a minimal RFP, explaining the context, that we have a Drupal website, and explaining the development project in broad strokes, what the technical constraints are (e.g. we need to integrate an LDAP directory, etc.), that we aim to work using the agile method, and that all code will be shared on GitHub. Among the requirements, I asked respondent to prove that they are using the agile method, and to show me their existing projects on GitHub. This allows me to determine how developers are working. I chose a service provider on the basis of such an RFQ, then I establish a contract for a certain number of labour-hours. Say 80 days of work over a period of 12 months, regularly spread. Once this is in place, I start establishing work packages using Trello cards, I define required functionalities as stories. For example, one card describes a user logging in on the system, being authenticated by LDAP and be recognized as a librarian. Or a student connecting and accessing the list of books on their library account. Then for each story, the developer estimates the number of days required, and we determine together what to start working on next. If a task is determined to be too big, we split it up into smaller subtasks.
- I: So this agile method is what you would recommend to libraries looking for custom development work?
- E: It is certainly my preferred approach. If I know a system will require customization, I would put in the RFQ that I'm looking for a standard system, but be very strict on the availability of publicly available APIs. Then for the custom work, I would enter into another service provision, using the agile method.
- I: Can you recommend resources for librarians with little technical background wanting to learn more about this method?

- E: I can certainly provide a few resources. The particular methodology I'm using is called scrum.
- I: Thank you very much for your input, this was fascinating.

## Interviewee F Transcript

Interviewer (I): Thank you for agreeing to this interview and for completing the consent form. As you may recall from participating in the online questionnaire, my research investigates the process by which technology projects in libraries are selected, procured or, in the case of internally-developed projects, defined. In this interview, I would like to focus on your own experience with technology projects in a library context, and particularly how needs and requirements were established and documented, how a solution was chosen to address those needs, implemented and reviewed.

## Can you briefly describe your role?

- Interviewee F (F): I work in the public-sector department of a consultancy company with about 300 employees. I am a consultant and also do sales for my company. Typically, I respond to Requests for Information (RFIs) from prospective clients. I am in the group that develops applications having to do with the semantic web and big data, business applications. The project I'm currently involved with is with a public library. I am the Lead Developer on this project. I am responsible for system architecture, defining the work processes, and I also participate in the development per se. The aim of our project is to replace the current commercial Library Management System (LMS) of that library.
- What you have to understand is that in my country, the landscape of business applications is dominated by a cartel of 3 suppliers, which are semi-public organisations but with some private ownership. Most of their customers are public organisations. If you are in the public sector, you have to buy a system from one of these suppliers. In a sense they have a monopoly. Those suppliers worked with libraries in the early days of library automation, and back then they decided to use a dialect of MARC that is now difficult to translate to other systems. I used to work for a group that had to implement an interface around this format.
- The bottom line is that because of this cartel, or monopoly really, it is difficult in my country for libraries to purchase a system that is not exactly what you already have.
- The project I am currently involved with aims to build an LMS for our client that is based on [an open-source library management system] but makes use of the existing database that is holding the metadata. We are translating this data towards a linked data model, to restructure the data. The system uses [the open-source LMS] for transactions with patrons and to manage items. All the bibliographic data is stored in RDF format, and is managed outside of [the LMS].
- I: And the aim is build a complete LMS, including for example acquisitions, management of electronic resources, etc?
- F: Exactly. The result will be an LMS that includes all functions, like acquisitions. But it wont handle electronic resources, those resources are less prevalent in public libraries.

- I: Thank you for this description. To begin our discussion, what in your opinion and in your own professional practice, defines a successful technology project?
- F: For me, a successful project requires a very clear definition of what's expected. At the start, a project needs this clear definition so we [the developers] can move forward without having to do much research to finalize requirements. For example, in the project that I'm currently working on, the project owners' team wasn't in place when we started, so the start of the project was delayed. As a result, we [the developers] had a bit too much time on our hands and we did a few silly things. Just because we had too much time. So you increase the productivity by defining all work packages, define what they consist of, how much time is allocated to each of them, etc.
- I: Do you think the responsibility to establish this framework lies with the vendor or the customer?
- F: For example, with a project with another public library, they had published a RFI but they weren't sure of what they wanted. This is a common occurrence with libraries, they think they know what they need but cannot express it. This is because customers are used to getting a black box product, with established functionalities and workflows. Our company is used to build custom products and establishes workflows for the customer. So they [the customer] didn't seem to get, to understand what they needed to define. They struggled to define what they wanted, to fit their workflow.
- I: Do you have an example where this process was better established?
- F: Now in [redacted city], our current project. It's better. The product managers are in place, they do a lot of the triage, define what needs to be done before it gets to the developers.
- I: Who are the product managers, are they part of your team?
- F: No, they are on the library's side. Their job is to translate the requirements of the library to work packages that we can work with. They have been specifically tasked to this project. One is a full-time project manager. One handles the cataloguing aspects specifically. And another two handle the workflow for the other functions of the system. One of them is in charge of enterprise planning, the other of all processes involving patrons. They are each dedicated to different parts of the system.
- I: And are they librarians, or project management professionals, were they hired specifically for this project?
- F: Only one of them did work at the library before the project. One is a cataloguer, another a professional [librarian]. None of them have a technology background. In my opinion, this is critical, they understand the processes from the library's point of view.
- The important skill here is knowing how to express requirements formally. For example using a case management system to register requests,

issues. A table that has to be filled for each requirement. Or, as is the case in our current project, writing a test in a formalized language for each functionality. For example, to describe how a login function works, a test can be written to describe all the steps that are expected, and how the system should respond. It might sound tedious, but this is what we use now to describe every functionality. We now have tests for all functions, we can test them every time we deploy a new version.

- I: Who wrote those tests?
- F: The product managers. The librarians. The client.
- I: Did they have to undergo specific training to be able to write them? Is it like computer code?
- F: No, it's plain English. You do have to follow a certain formalism, but it's easy to follow. One of the project owners writes all of them for our project.
- But it's not always the case. Typically a library doesn't know what it wants. They don't understand the processes that are behind the systems they are using. So they cannot imagine them working better, differently.
- I: So what do you think are the skills required, on the library, the client's side, to overcome these difficulties and maybe implement the methodology you just described [test writing]?
- F: Distance from what they're doing. That's what's required. An ability to question processes. Why are we doing these things at all? Do we really need them? Separate what we really need, the end goal, from the steps, the workflows that we are used to. For example, look at how acquisitions are managed in a typical ILS. It's odd. It mirrors a very paper-based workflow. Orders being placed, books being shipped, invoices received and paid. This is no longer how things are done. Yet it's what librarians expect because that's what they always used.
- Another benefit of distance with processes is accepting bad choices. Past choices. That were not necessarily bad at the time they were made. We should not be afraid to choose badly, what's important is to choose a system that's flexible enough so we can change it once, inevitably, things are different.
- There are systems that have been designed from the ground up to be modular. Look at our own design. Our system is defined through configuration, can be altered through configuration. You can change the way the system work via an XML configuration file. This is very powerful. There are vendors who are willing to alter the way their solutions work for different clients through such mechanisms. For example using Docker, they can deploy different versions of the same system, for different customers, with custom functionalities, etc. while keeping the core clean.

- Look at [a large library vendor]. They will never do massive customization for their clients. What they will do is develop custom solutions on the outside, on the interface, like JavaScript on their web clients. But for them to alter the way the application is designed in the inside, they would struggle too much. Their setup isn't like that.
- I: Speaking of such customizations, from the outside as you call them. One of my other interviewees warned against such "patches" that vendors provide to their clients, to respond to particular demands. They said that in the long run, those patches accumulate, resulting in unstable systems. The client isn't aware of how those customizations were implemented, and sometimes that knowledge is lost on the vendor side too.
- F: Well, documentation is usually how you resolve these situations. Document every custom bit of code. However, the sad reality is, that often even documenting these kind of things is a waste of time. Why? Because documentation typically does not include the purpose of those customizations. This is why I think writing requirements in the form of tests is better. Those tests are around user stories, they are inherently about the purpose of functionalities, not about how they are implemented.
- Let me give you an example. One of the tests we are using is about the login process. The test tells the system to open [the LMS], go to the login page, click on the login button, enter certain credentials that are in a database. And analyze what comes back. This tests that the functionality is in place. Sometimes, those tests fail and then it's interesting for us to investigate why this is so. For example, recently those tests failed after we pushed a new release of [the LMS]. We investigated and we found out it was because of a change in the way the database was structured. We were the first in the [community of users of that open-source LMS] to identify this issue, and we were able to develop a fix and push it so it could benefit everyone. We identified the problem thanks to such a standardized test.
- The thing with hacks such as the ones you described is that it's only a hack for you as the outsider. If I'm the person writing it, it's not a hack, it's a patch. But you're right, there are examples of this kind of things causing problems, especially when the base software is updated and ceases working because of such local changes. This actually happened to [a public library] recently. They had a outage of two weeks because their ILS ceased to work after an update. It turned out it was linked to a "hack" the vendor had done in JavaScript on their website. But as we software evolves, especially web interfaces, we now implement more robust systems. Take markup language, like the move from XML to JSON. I personally don't like JSON that much, but having good libraries to parse such formats mean I don't have to hardcode what fields I am looking for in my code. The title field is called "title", it's not in some arcane numbered field. You just parse the file and look for the "title" field.

- Open source software also reduces such issues. But then you need developers who commit code and participate in the community. They need to have a deeper understanding on the product they are working with, be part of the community. You can use [open source LMS software], but if you understand the project, and are an active developer, your install will be more robust because you understand how it works.
- This brings me to a more philosophical note. Libraries haven't understood their role as major users of software. When you use a system, you define the requirements, but you don't necessarily use all the features of the systems you end up implementing. They have misunderstood that the software they base their operations on, their LMS, is their enterprise software. A Library Management System is essentially an enterprise resource management system that just happens to expose part of its database to users.
- So to break the perceived tension between vendors and users, libraries need to embrace their role as major users of a handful of enterprise solutions that are very wide spread. Understand the system, the ecosystem. Not just your own install of the LMS, but what your peers are doing, where the vendor is going, how the system is evolving. Understand it, take it as a given, and don't delegate all changes to the vendor. The thing is, when you work with a vendor, they all have a product that they want to push, to sell. And they have a roadmap. You should always look at a vendor's roadmap before selecting it.
- I know what I'm talking about, I'm a vendor myself. But I'm not a good sales person because I tend to avoid lying to my prospective customers. Instead of saying "yes we'll do that for you" to every demand, I'll rather say "I don't know" or "that's out of scope of our software so no we won't do this". But by being honest, I've won every project I ever prepared a bid for. People understand I'm not just trying to sell them something. My nightmare scenario is a unhappy customer. I'm committed to see a project through. I'm not sure the majority of vendors work that way.
- In that vein, [cites a library vendor] is not a bad vendor. They are genuinely interested in finding out what the customer wants. Their development approach is not as modern as it should be, but I'm impressed by their commitment.
- I: You speak about libraries needing to do more research about vendors before signing on with them. How do you think they should approach this, especially regarding their existing vendors? How can they take a step back and assess vendors?
- F: I used to work for an academic library, with my team we had created a platform to describe our entire technical system. What were the moving parts. Making that overview made it easier to find out who had the knowledge of the different parts of the system.
- I: Who made this systems description?

- F: We made it, that is the systems people. So that we knew what we had, and so that it would be understandable by third parties. And so that we could use it when talking to a vendor, to describe our system. Unfortunately, the library management didn't really support this project, and it wasn't used as we had hoped it to be. But it demonstrated that we can do things differently. When talking with vendors, our responsibility is to properly describe what we have. With this model, we were able to abstract things, and we realized that certain elements were more complex than we would have thought. From this, we were able to describe how we wanted our system to evolve, what we wanted from vendors. We made recommendations. We went so far as to describe an entire "beta library" that we reimagined to be very customer-focused.
- Anyway, even if our recommendations were not followed, what came out of this project was that we increased the technical competence of the entire library staff. Working on the model made us realize that staff was not keeping up with technology, with what the students were using. So we used problem-based learning to design courses to bring the missing knowledge. We had staff use the available technologies that were booming at that time, wikis, blog platforms, mobile devices, even SecondLife. After the courses, many staff members kept using these tools, because it made them realize the possibilities that were out there. It also gave them an understanding of computational thinking. The job of a computer developer is to understand what the possibility and the limits of a system are. If you are aware of the possibilities and limitations, it makes your job easier when talking to developers.
- I: And is there something that vendors can do too to reduce the gap?
- F: The main problem with vendors is that they should do more honest with their customers. Not try to make them happy with empty promises, rather manage their expectations from the beginning, and then deliver on what they had actually promised. Also they should build their systems to be more modular, allow customers to choose functionalities they actually need. Build a modular platform. Also learning, more should be invested in learning, by libraries to train their staff, but also by vendors. Vendors should setup courses for customers so they understand in depth how their software works. Not just a workshop to use an interface. A true, in-depth explanation of their system.
- Going back to the things libraries need to do better, management should delegate technical decisions to competent staff. They should trust them to select tools and solutions, and then support them, sign the paperwork but let them do their job. Management in libraries need to empower staff. Your problem in libraries is attracting good engineers and making them stay. You don't do that by throwing paperwork at them.
- But yes, a good thing to learn when choosing a vendor is seeing if they publish their work. A vendor that publishes code openly is more

trustworthy. If you commit to publish everything, all your code, you will never be tempted to do anything that is supposed to remain secret.

- Also don't build a too tight relationship with your vendor and your system. For example when the academic libraries in [this country] migrated from their historic ILS to [a commercial ILS], many librarians chose to retire rather than having to live through that change. They had lived all their life with that system, all their professional life, it defined how they worked. But that's too much ownership. You need to understand workflows, adapt around them.
- I: Recently there has been a lot of mergers among library software vendors, the difference between their systems isn't that big.
- F: Right, and the result is that, frankly, there is currently no incentive to change systems. If you have something that works for you, keep it. Vendors might say "this system is reaching its end of life" but libraries don't realize the power they hold on those vendors. They depend on the libraries for their existence. If enough libraries tell vendors they'll keep paying them to maintain those systems, they will make them work. There is no end of life. But libraries like to think that those massive upgrade projects, changing to the next big ILS is what their users want. They do it because it's what expected of them. But it's a tremendous waste of resources. Rather, I think libraries would be better off to keep working on their existing systems, and focus on incremental changes. Take ownership of these products, let them do the background work, and then use APIs to make them interact with front-facing systems that you then build to your own specifications.
- I: Do you think libraries have the technical skills to do so? Also are there enough APIs in place to enable libraries to develop custom interfaces?
- F: It's true that vendors have been reluctant to develop these APIs, but if enough customers ask for them, they will comply. It's in their benefit. For example, after [a library vendor] released an API, I developed modules for [the discovery service from that vendor] using it. [The vendor] then contacted me and asked if they could use them for other customers. What vendors need is to become ecosystems, encourage such local developments but have a platform, a system to distribute such solutions and enable others to use them.
- This is actually what [a major vendor] has in mind with [their open-source LMS platform]. The basic idea is to setup a marketplace for modules, where libraries can share bits of code, to further customize to their own use. This is an excellent idea, and it might resolve some of the issues we talked about.
- I: Thank you so much for your insights, it's been a fascinating conversation. Is there one more thing you'd like to say on the topic of systems selection, implementation, and project success, that we didn't touch on?

- F: I guess something that's important to keep in mind is that a successful project is not necessarily one that's completed on time. This is not an indication of failure. If the deadline was unrealistic, or not properly defined, it is simply impossible to meet.
- I: Thank you.

## Appendix I: Codes for interview analysis

Categories	Sub-categories	
Project success	Success measurement	
	Situation analysis	
Development paradigms	Waterfall	
	Agile	Modularity
Outsourcing	Procurement methods	RFQ
	Vendor relations	
	Outsourcing problems	
Project management	Needs definition	Scope creep
		Requirements
		Reframing
		Work specification
	Project team	Skills
		Team roles
		Workflow
		Consultants
	Time management	
	Politics	
Change management	User expectations	Disconnect
	Communication	
	Ownership	
	Systemic issue	Outsourcing to break systemic issue