Understanding the experience of smaller New Zealand academic libraries implementing discovery systems

by

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Submitted to the School of Information Management,

Victoria University of Wellington

in partial fulfilment of the requirements for the degree of

Master of Information Studies

June 2017

Abstract

Research problem

For smaller academic libraries that are considering implementing web-scale discovery, there is a lack of relevant literature specific to their context which library directors can use to guide their decision making.

This research project addresses this gap by exploring the experiences of selected small and medium-sized academic libraries in New Zealand that have implemented web-scale discovery.

Methodology

The research uses a multiple-case study method to study three small or medium-sized academic libraries. Six participants were interviewed using semi-structured interviews. Themes were identified from the transcripts, and compared using cross-case analysis.

Results

The participants identified several benefits from their discovery system, including making searching easier and more intuitive for students, and increasing use of electronic resources. However, they also experienced challenges in terms of changing roles for staff and increased workloads for those dealing with technical issues. The research identified specific challenges for very small libraries implementing web-scale discovery without in-house technical support.

Implications

Although the research is exploratory, it provides some recommendations which can assist directors of smaller academic libraries in making decisions about this technology. Further research over a wider range of institutions would be valuable to confirm the findings. The report also identifies the importance of staff of smaller libraries sharing their experiences of discovery systems.

Keywords

Web-scale discovery, discovery systems, academic libraries, small libraries, multiple-case study

Acknowledgements

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Introduction

Academic libraries have increasingly implemented some form of web-scale discovery (also known as a discovery system), with the aim of creating an intuitive interface for users that utilises the familiar environment of a web browser. From the perspective of the library, expected benefits from web-scale discovery could include increased use of electronic resources and increased ease of use for library users (Brigham et al., 2016; Ellero, 2013; Evelhoch, 2016). However, discovery systems present some challenges for smaller academic libraries. Such libraries generally have lower budgets and fewer staff, so the challenges of implementing such a system can be greater, and larger benefits will be required to make the system cost-effective.

Because of these challenges, smaller academic libraries may hesitate to commit to implementing a discovery system. As one research participant considered prior to implementation, "once my students get to have [web-scale discovery], it's very hard ... to pull them out from it" (Library C). This research project explored the outcomes from the implementation of web-scale discovery systems at selected small and medium-sized academic libraries in New Zealand, in order to compare their experiences.

Research problem

Existing case studies of discovery systems in libraries focus almost exclusively on large academic libraries, and there is very little literature on web-scale discovery in smaller libraries where the implementation and ongoing costs make up a larger proportion of the library budget. In addition, existing research has focused on the planning and decision making process prior to implementing a web-scale discovery layer (such as Ellero (2013)) or the usability of web-scale discovery (Cassidy, Jones, McMain, Shen, & Vieira, 2014). To date there is little research that evaluates the process from the library perspective once the system has been implemented. In the limited cases where a web-scale discovery system has been evaluated after implementation, cases most often come from large academic libraries in the United States, (see Deodato (2015) and Vaughan (2012)), which may not translate to the New Zealand environment.

As Stake (2006, p. 90) observes, leaders making complex judgements depend on the "reflected experience" of others in similar situations in order to make wise decisions. This research provides an insight into the benefits and challenges of implementing a discovery system from personal experiences of the staff. The outcomes of this research will contribute to the knowledge of small and medium-sized libraries that are considering a web-scale discovery system, helping them to assess whether implementing such a system will be cost-effective within their context.

Research Questions

My research examined similarities and differences in the experiences of selected small and medium-sized libraries in New Zealand that have implemented web-scale discovery systems. It explored the following questions:

1) What are the benefits and challenges for small libraries implementing a discovery system?

2) What can smaller libraries who are considering web-scale discovery learn from the experiences of those who have already implemented a discovery system?

Definitions

Small or medium-sized academic library

For the purposes of this research, small or medium-sized academic libraries will be identified based on the definition used in the Electronic Purchasing in Collaboration (EPIC) bands C and E, those whose equivalent full-time student numbers (EFTS) and total number of academic staff are less than 5000 ("EPIC cost allocation model ").

Web-scale discovery/discovery system

Web-scale discovery, also known as a discovery system, discovery tools, or 'discovery layer', is a software product that allows ''users to search across multiple databases at the same time" (Djenno, Insua, Gregory, & Brantley, 2014, p. 264) enabling the library "to provide access to multiple collections through a single search interface" (Djenno et al., 2014, p. 264). Unlike earlier federated search technology, which searched multiple databases in real time, web-scale discovery systems interrogate an index of data from component databases, enabling users to retrieve results very quickly (Brigham et al., 2016).

The four major brands of web-scale discovery are:

- EBSCO Discovery Service (EDS), supplied by EBSCO
- Summon, supplied by ProQuest
- Primo, supplied by ProQuest
- WorldCat Local, supplied by OCLC

Abbreviations used in this report

DOI   Diffusion of Innovation, a model for explaining adoption of new technology in organisations

EBSCO Vendor that provides academic publishing services, including EBSCO Discovery Service. Named after its founder, Elton Bryan Stephens, but usually referred to by its acronym.

EDS   EBSCO Discovery Service, a web-scale discovery service provided by EBSCO

EFTS   Equivalent Full-Time Students, a measure of student numbers used in New Zealand tertiary institutions

EPIC   Electronic Purchasing in Collaboration, a New Zealand consortium to enable to member libraries to purchase electronic resources at partnership rates

LTL   Library, Teaching and Learning, a service combining library resources, academic support for students and teaching resources for staff

MARC Machine-Readable Cataloging, a set of standards used in cataloguing.

OCLC   Originally Ohio College Library Center, now officially named OCLC Online Computer Library Center. Usually referred to by its acronym, OCLC is the vendor for OCLC WorldCat Local discovery service.

OPAC   Online Public Access Catalogue, an alternative name for a library catalogue.

Literature Review

Web-scale discovery has been adopted in libraries since approximately 2009 (Vaughan, 2012), and has continued to develop and improve based on feedback from libraries. For this reason, literature from 2009 onwards was considered the most relevant for this study. Information was sought from Google Scholar and from relevant library databases, including LISA, LISTA and Library Literature and Information Science Fulltext, using combinations of the terms "web-scale discovery" OR "discovery service" OR "discovery layer" OR "discovery tools" and evaluation OR satisfaction OR experience OR impact. Additional articles were identified from those which referenced a relevant article, thus providing links to more recent research. Articles chosen were those that researched some aspect of the experience of libraries or librarians introducing web-scale discovery. Articles which focused only on usability studies outside the experience of a specific library implementation were excluded, as were those that explored the experience of a consortium or a public library. Most of the articles available on web-scale discovery came from an academic library context, reflecting the primarily undergraduate target market for this type of service (as noted by Bull, Craft, & Dodds, 2014; Calvert, 2015).

Use of electronic resources

One of the expectations of web-scale discovery is that electronic resources would be more identifiable and would be used more often. Research in this area has produced mixed results, and reveals a number of factors that can influence usage levels.

Individual case studies described by Way (2010) and Calvert (2015) both report an increase in use of electronic resources. Calvert (2015) further confirmed these results by comparing their library usage metrics with that of similar academic libraries without discovery systems. However, Evelhoch (2016) reported an unexpected decline in full-text retrievals. The difference in recorded results could be accounted for by Evelhoch's (2016) indirect recording of usage, and further investigation would be needed to understand the local factors that impacted on his results.

Levine-Clark, McDonald, and Price (2014) conducted a longitudinal survey of libraries internationally, including samples from libraries that implemented a discovery system, and a sample of libraries with no discovery system. They identified that all groups experienced some increase in journal usage over time, but this increase was slightly higher for all libraries with a discovery system. However, the rate of increase was quite variable depending on which type of system was used and the individual characteristics of the library. As with Evelhoch's (2016) study, their findings highlight the importance of libraries monitoring the effects of their system on their planned outcomes, and making adjustments if patterns of use did not fit their goals.

Significantly for library managers, Calvert (2015) observed an unanticipated sharp decline in print circulation statistics after implementing web-scale discovery, which has implications for the

allocation of library budgets. However, for institutions that are moving to electronic resources where possible, this effect makes discovery systems a positive tool.

Factors of importance to small libraries

The case studies that are available on discovery systems in smaller libraries highlight specific areas of interest and concern to these libraries. These cases report common themes relating to the need to prioritise financial resources and staff time. Bonner and Williams (2016) note that the first priority in their decision making was the budget available, and some options were eliminated immediately for this reason. They ultimately chose a system based on reported studies of search results, compatibility with their existing library software, and support available for implementation, so that staff time could be focused on students (Bonner & Williams, 2016). Gromatzky (2014, p. 56) also commented on their small library's reliance on the vendor to set up and customise their system, as they did not have the expertise available amongst their staff.

A case study reported by Colson and Allen (2015) of a smaller library, observed that while they did have staff available with some technical skills, their discovery system required ongoing attention to issues, as well as the need to continually update metadata, all of which added demands to staff time.

While Pepperdine University is slightly larger than the target size for this research, they chose to resolve some of the issues of cost and technical adjustments by selecting a cloud-based discovery system. This has reduced their hardware costs, and ongoing maintenance is provided by the vendor, which may be appropriate for some smaller libraries (Dula & Ye, 2012).

Experiences of early adopters of discovery systems

Two significant examples from the literature provide an initial framework for exploring library satisfaction with discovery systems. Vaughan (2012) and Deodato (2015) have documented their exploration and evaluation processes in detail, and each includes a comprehensive questionnaire which was sent to early adopters of web-scale discovery. The questionnaires invite others who have already implemented a discovery system to describe their experience of web-scale discovery after implementation. While the responses received are not included, Vaughan (2012) does provide some sample comments, and both reports provide ideas for interview questions to explore post-implementation evaluation.

User experiences with discovery systems

One measure of satisfaction with a discovery system is user experience. After implementing Primo at the University of Birmingham, Bull et al. (2014) examined the views of both staff and students using surveys and follow-up focus groups to understand their perspective on the system. While the low participation rate means the results need to be treated with caution, the study indicated notable differences in perspectives between the staff and student groups, with the staff having a more negative view of the system. In spite of the small samples, the study helped the university to understand what users do with the system, and what they like about it. Users largely reported that the discovery system was preferable to the former federated search system or the library catalogue for finding resources, with undergraduate students finding it the easiest to use out of all groups surveyed. Students liked having a single source to find all resources, but did mention the large number of results was unhelpful. Bull et al. (2014) also identified that the system was less suited to the needs and expectations of academic staff.

Lundrigan, Manuel, and Yan (2015) surveyed the views of graduate and undergraduate students on whether their library discovery system was easy to use and whether they did actually use it. Although response rates were also low in this study, the majority of users in both groups were satisfied or very satisfied with the service, and would use it again. More graduate students described the service as 'very easy to use', but graduate students were also slightly more likely to indicate they were 'not at all satisfied' with the service. Graduate students that participated in the focus group indicated that they preferred to use individual databases, which suggests that the discovery system does not fully meet their needs at this level.

Librarians' views on web-scale discovery

The views of librarians are a significant factor on whether a system is implemented in a particular library, and how widely it is integrated and promoted. Buck and Mellinger (2011) examined some of these views of librarians towards discovery systems, using an international survey of librarians involved in reference or instruction. The survey explored whether these librarians chose to teach the use of discovery systems and how useful they perceived them to be. Respondents were self-selected, which may have encouraged responses from those who had the strongest opinions, as the authors noted that viewpoints ranged from very positive to very negative. Librarians who chose to teach the discovery systems commented on the ease of use for students, and appreciated that one system was quicker to teach than multiple databases. However, the study did identify some specific issues, including gaps in coverage of particular disciplines and student difficulties with managing the large volume of results. Some respondents expressed opposition to teaching discovery systems at all (Buck & Mellinger, 2011, p. 168), but most would introduce it selectively with some types of students or for particular disciplines. The authors concluded that librarians were generally positive about discovery systems, but did not systematically integrate them into library instruction.

Librarians at Edith Cowan University also demonstrated resistance after a discovery system was implemented in 2009. At the time, the university was one of the first in Australia to implement such a system. Howard and Wiebrands (2011) discovered that initial impressions were somewhat negative, as librarians had concerns about the breadth of coverage provided, and the over-simplification of the research process meaning students lost what the librarians considered key research skills (a criticism that was also noted by Guthrie and McCoy (2012)). Significantly, it appears that librarians at Edith Cowan University were not widely involved in selecting and testing the system, and little training was provided on the system, as it was perceived to be intuitive. While the authors noted benefits for the students, they recommend more involvement from librarian users as key stakeholders, in order for the implementation to be well received.

Research on the views of librarians in this area indicates that discovery systems are not yet universally accepted. For those who are implementing discovery systems, it is important to be aware of personal factors that will affect a librarian's willingness to adopt and use new technology. Research cases identify important personal and organisational factors that may make librarians more resistant to fully using discovery systems.

Theories of technology adoption in organisations

Rogers (2003) theory of Diffusion of Innovations discusses the process of adoption of new ideas or technology by individuals or organisations. A significant contribution from his model is the idea that the adoption process involves uncertainty. Rogers observes that innovations can be disruptive to

existing process and cultures, which may foster resistance to the idea being introduced (2003, p. 426).

Potential users of a new innovation seek information to reduce their uncertainty (Rogers, 2003, p. 6) and to learn about the benefits that might result from making a change (Rogers, 2003, p. 14).

According to Rogers (2003, pp. 15-16), new technology is more likely to be adopted if it:

1) Is seen to be better in some way than existing technology (Relative advantage)
2) Is compatible with current systems and values (Compatibility)
3) Is not perceived as difficult to understand and use (Complexity)
4) Can be tried out before committing to use (Trialability)
5) Has benefits that can be observed in action (Observability).

Rogers (2003) also describes organisations that are more likely to adopt innovations, observing that generally larger organisations are likely to be more innovative, as they have more overall resources available (2003, p. 408). Having 'slack', or available resources to spare, promotes innovation, and Rogers observes this is more likely to occur in larger organisations.

While the DOI model seems to favour larger organisations in some ways, Roger's five criteria for adoption can be achieved in any organisation. Smaller libraries considering a discovery system can reduce uncertainty by learning from the experiences of others, and through learning about how the system works and how it will fit with their existing ways of operating.

The literature on web-scale discovery systems explores a range of factors that are relevant to small libraries, including the impact on existing resources, the perceptions of library users and librarians, and the demands of technology on budgets and workloads. While there is little research directly available from smaller libraries, the case studies that are available have identified some areas of particular concern and interest to this group.

Rogers' theory suggests some key factors for discovery systems to be implemented and well-received. His model can be applied to smaller libraries, and offers insights for further research.

Research Design

Methodology and Methods

My research investigated a situation through the personal perspectives and experiences of the participants, which Leedy and Ormrod (2015) suggest is most appropriately explored using qualitative methods. For this research, the variables being studied were not able to be identified at the outset, so qualitative methods enabled in-depth exploration of significant factors, without pre-defining what these would be.

The research question focused on the experience of those being studied, and the context was an important element of the research. Gagnon (2010) notes that case study is a useful methodology in this situation, particularly when there is little existing research that addresses the research problem. Yin (2014) also observes that case studies can be used to draw implications for other contexts. Previous research on discovery systems in academic libraries has often used a single case study (for

example, Cleverley & Morris, 2011; Dula & Ye, 2012; Wrosch, Rogers-Collins, Barnes, & Marino, 2012).

One of the limitations of a case study of one organization is the lack of generalisability to other settings (Gorman & Clayton, 2005, p. 51). In order to identify any themes that might generalise to other settings, I have chosen a multiple-case study method to study three small or medium-sized libraries, comparing similarities and differences in their experiences.

Population and sample

Only a small number of organisations in New Zealand fit my criteria of a 'small or medium-sized academic library which has implemented web-scale discovery', which limited the options for sampling. Potential cases were identified via the New Zealand Libraries directory, using the most recent publicly available information on Equivalent Full-Time Students (EFTS) and staff numbers from the institutions' websites to create a potential target list to approach.

The available sample for the study included a range of different discovery systems, and variations in library size and resources. Target libraries were measured by the size of the parent institution (by EFTS), and ranged from 130 EFTS up to just over 4000 EFTS (based on 2015 figures, which were the most recent published figures). This variation allowed me to assess whether results are replicable across a variety of smaller libraries (Yin, 2014). Stake (2006, pp. 25-26) notes that for multiple-case studies, variety and the opportunity to learn about the population of interest are more important targets than sampling of attributes. Within the available cases, I have approached the smallest libraries that fit my criteria, as these were considered to be the most likely to reflect any unique experiences of smaller libraries implementing web-scale discovery and to "illuminate the research questions" (Yin, 2014, p. 28). One library was reserved for use as a 'pilot case' to test interview questions, as recommended by Yin (2014).

Data collection

Because the research question explored experiences and viewpoints rather than direct observation, my research took the form of an interview case study (Gorman & Clayton, 2005, p. 49). Directors of each target library were provided with information on the proposed research and permission was requested from them to carry out research in their institution. With the assistance of the library director at each institution, I identified between two and four people in each organization, who were able to talk in depth about the implementation of the discovery system, or who could discuss the value of the system to the library in their area of expertise. Appropriate interviewees varied depending on the structure of the organisation, but included library directors, librarians responsible for electronic resources, and staff involved in teaching information-seeking skills using the discovery system.

Overall, six participants were interviewed from the three libraries. One additional person was unable to take part in an interview due to illness and planned leave, but this participant agreed to provide answers to questions by email. The interview questions were adapted for the email format and the participant's specific role, and are included in Appendix B.

Interviews were conducted via Skype and recorded using Callnote software so they could be reviewed and analysed later. The interview format was a semi-structured interview of approximately 30 minutes. Initial questions were based on those used by Deodato (2015) and Vaughan (2012) to

survey early adopters of web-scale discovery systems. Participants were asked if they could be contacted by email or additional interview if further clarification of their experience was needed, and all participants indicated they were willing to do so. Some participants provided to me by email additional material on their discovery system, such as public presentations on their experience or examples of how the system is used in teaching students.

The guide used for the interviews (found in Appendix A) includes sample semi-structured interview questions which were designed to explore potential areas of interest identified in the literature, while allowing interviewees to speak from their own perspective and cover any other topics that are relevant to their setting. Interview questions were adjusted depending on the role of the interviewee, and the information that was publicly available on the discovery system.

Participants were offered the option to have a summary of research results sent to them at the conclusion of research. This was very popular, and nearly every participant commented that they would be interested in learning from the experiences of other similar libraries.

Ethical considerations

As the research involved human subjects, approval from the School of Information Management Human Ethics Committee was sought and granted prior to collecting data.

Participants completed a consent form explaining the purpose of the research, and were able to withdraw participation prior to the data being analysed. Participation was voluntary, and one person who had initially agreed to take part chose to formally withdraw before the interview, citing time constraints.

As the study involves smaller organisations that could be easily identifiable throughout New Zealand, the results have been reported in aggregate, rather than identifying responses with a particular institution. Where it is valuable to mention a specific comment, individuals or organisations have been referred to by aliases to preserve confidentiality.

Assumptions relating to the research methodology

The chosen research methodology identifies target institutions by size and type, without specifically analysing other variables, such as discovery system type, length of time since the discovery system was implemented, or subject areas taught by the parent institution. In focusing on the experiences of small and medium-sized academic libraries, it is assumed that size is the significant factor in the libraries' experiences of discovery systems, and that conclusions can be drawn about the target population that will apply irrespective of other characteristics of the libraries.

In an interview case study, the methodology also assumes that participants have sufficient knowledge to speak on the topic, and feel comfortable to speak frankly and in sufficient detail about what they know.

Limitations of the research

The sample for this research was limited by the organisations that meet the research criteria and were available to participate. Participating institutions employed between three and 13 staff across all library-related roles, which limited the numbers of potential participants to be interviewed. In addition, although libraries were approached early in the research process, the timing of interviews

was near the start of semester at many institutions, which may have limited the number of staff who were available to participate.

At one library, only one participant was available and willing to participate during the research timeframe, and I was unable to speak with someone in a leadership role in that institution, which restricted the information I could collect on some aspects of the library. A second library only had two participants that were suitable to interview, due to the size of the library. However, staff at all participating libraries held responsibilities for more than one function, so a small number of staff were able to provide information on several aspects of the library.

The process of recruiting participants involved library directors suggesting staff who may have relevant roles and experience, and then the staff responded to the research invitation if they wished to participate. It is possible that staff who chose to participate could have had a more positive experience with the discovery system than those who elected not to take part. However, the voluntary nature of the research means some self-selection is inevitable, and the interviews expressed both positive and negative experiences with the discovery systems overall.

Within the scope of the study, it was not possible to explore some factors which could have had an influence on the findings of the research. These include differences in experiences that have arisen due to the specific discovery system implemented in each setting. Customisation factors may have also influence the experiences of each library, and these have only been addressed in general terms, as this is not a study of technical implementation.

While it would be ideal to confirm the research findings using a variety of methods, this has not been feasible given the timeframe of the research.

Data Analysis

Interviews were recorded for accuracy, and transcribed by the researcher as soon as possible after each interview was completed. A copy of the transcript was sent to each participant for comment or correction, and minor corrections were made in one case as a result of this process.

Interview transcripts and supplementary materials were coded according to preliminary themes and grouped into similar comments to identify patterns. Themes were generated from the data, which is considered a suitable approach for exploratory research (Guest, MacQueen, & Namey, 2012). Boyatzis (1998) notes that this approach also increases research validity, as other researchers can see the themes within the raw data. Preliminary themes were then analysed to identify relationships between codes, such as codes that may be combined into a broader theme. For the purpose of discussion of the research questions, themes were grouped conceptually by related characteristics (Boyatzis, 1998), according to the perspectives of different user groups, which for this study were information literacy librarians, staff with responsibility for information technology, library management and library users.

Cases were then analysed with cross-case synthesis (Yin, 2014) to identify common or contrasting themes. Themes were compared across cases to identify whether they were found in more than one case (Guest et al., 2012), and were assessed to see if they were supported by other research.

Themes that occurred in more than one case, and were supported by other research were considered to be more robust (Stake, 2006).

Themes that were unique to a single case were also identified. These were also considered significant to the research, if they illuminated the research questions for a particular situation. For this research, comments by the smallest library studied highlighted some unique experiences that may be of interest to other libraries.

All analysis was done by the researcher, to maintain consistency and to protect privacy.

Validity

To ensure valid results, data was not collected from organisations with which I had a prior relationship, so that my previous knowledge would not affect my analysis of the results in that setting. As I have previously worked with an organisation that fits my research criteria, this organisation was reserved as pilot case, and was not included in the analysis.

Validity was also achieved by assessing multiple cases to observe whether conclusions could be applied across different organisations. Within each organisation, interviewing several informants helped to establish whether individual perceptions are reflective of the 'reality' of the organisation (Gagnon, 2010). Results were also compared with other published case studies, as a means of confirming the findings, or to identify alternative explanations that may account for the results (Gagnon, 2010).

Case Study A

Library A is part of a smaller university, with a small number of pre-degree students, but most students are studying at undergraduate and graduate level. Total EFTS were 3616 in 2015. Separate figures for academic staff were not available, but the institution had a total of 682 full-time equivalent staff. The library operates as part of a wider Library, Teaching and Learning (LTL) service, and has 13 staff in library-related roles.

Institution A was one of the earlier institutions in New Zealand to adopt web-scale discovery. Their first discovery system was Summon, (an Ex Libris brand, recently acquired by ProQuest), which was implemented in 2010, alongside a separate catalogue. In August 2014 this was changed to the Primo discovery system (also a ProQuest product), with an integrated catalogue. The change to the second discovery system was made when the catalogue needed to be upgraded, and the provider was able to offer an integrated solution at a lower cost than the previous system. The change was promoted to students as an 'upgrade' with a new interface.

The initial motivation for implementing a discovery system was to take advantage of a technology that had matured beyond federated search and was now a useful technology that the library believed should be embraced, as the interviewee expressed it, to "keep up with the twenty-first century".

The server is hosted and maintained by the provider, ProQuest. Within Library A, the discovery system is supported by a combination of university IT staff and staff with responsibilities for digital content within the LTL service. Staff from the LTL look after areas such as customisation, ensuring

links are working effectively, and the 'look' of the site. University IT staff provided additional support for implementation, in areas such as firewalls, and project management. In addition several staff in LTL have been trained to make minor changes to the discovery system if needed.

Because the discovery system contains the catalogue, it is the centre of library instruction, and is used to demonstrate skills that can then be applied to individual databases if needed. Instruction is focused on understanding and shaping a research question, rather than the technical aspects of the database. Information literacy is introduced primarily through core classes that are taken by most of the students, and all students are required to pass an information skills assessment in their first semester, which requires using the discovery system.

Customisation of the system has focused on making the results more relevant for students. This includes suppressing some of the free content that is available from members of the Primo user community, but which is not considered good quality, or isn't provided in full-text. Where results are available in more than one database, the discovery system allows students to select which one their results should come from. This feature has been altered by the librarians so that it prioritises and automatically provides results from those databases, rather than asking students to select from a list of sources. The interviewee commented that they observed another university discovery system that provided students with a choice of databases for results, but they considered that providing multiple options was not "user-friendly", as they believed that getting a result quickly was more valuable to students than choosing where the result came from.

The interviewee expressed general satisfaction with the system, acknowledging that every system has quirks, and that it performs well against expectations for those who understand how a discovery system works. The interviewee observed that one particular benefit for users is that it "doesn't require as much system knowledge as the old OPACs [library catalogues] did", in the sense that users do not need to know as much library jargon to use it effectively. Overall, this participant describes having a discovery system was "vastly better" than before.

Case Study B

Library B is part of a polytechnic, with students at foundation (pre-degree) and undergraduate level. In 2015, total EFTS were 3791. Separate figures for academic staff were not available, but the institution had a total of 363 full-time equivalent staff. The library has eight staff members listed on their website.

Their discovery system is EBSCO Discovery System (EDS) provided by EBSCO, which was introduced in 2015. This vendor was chosen in part because of Library B's familiarity with other small libraries that had implemented this brand, and because it was compatible with their library catalogue Liberty, provided by Softlink, and also with their Moodle Learning Management System.

Customisation and resolution of issues at Institution B are managed by the library director, who had a previous role as the electronic services librarian. The director continues to perform these functions, taking responsibility for managing technical issues for the system. Library B has customised their system, hiding search facets that they believe would not be useful for students, and promoting the 'advanced search' option that encourages students to log in before searching. Logging

in prevents students from conducting a search and then losing their saved results when they close the search window, which the librarians felt was important for their students.

Library B was motivated to implement discovery as they observed that students were having difficulties with accessing material from the various databases. They discovered that when electronic resources were mentioned in user guides, the usage increased significantly, which suggested that students weren't aware of how to locate these resources independently. They also believed that directing students to individual databases limited student searching, as students either needed to search multiple databases individually, or tended to looking in only one subject-specific database, running the risk of missing out on cross-disciplinary information (for example, nursing students might use just the CINAHL database, and miss out on important research on mental health).

Implementing the discovery system has shifted the focus of information literacy, from teaching individual databases related to each subject area, to teaching a process for research, and helping students to better understand the academic research process. Less work is involved in teaching a single system, which frees up staff to teach students how to get the most out of the special features of the discovery system, such as the 'Cite' function and the link to Google Scholar. They have also managed to spend more time teaching referencing, whereas teaching time in this area was very limited when multiple databases had to be covered.

The library director indicates that the "core problem hasn't been completely solved, but it has been improved".

Case Study C

Library C is the smallest library studied, with only three library staff (all part-time), and a total of 16 full-time equivalent staff. Overall the institution had 135 EFTS as of 2016. Students are predominately undergraduates, with a small number studying at Masters level. Their discovery system is EBSCO Discovery (EDS), which was implemented in 2015. The library director had considered implementing a system prior to this, but the cost was prohibitive. EDS was taken up after the library was approached and was offered a reduced price for the first year if they signed up for three years. The library director also identified that EDS performed well in comparative analysis of different discovery systems.

A significant motivation for implementing a discovery system was the ability to get access to e-journals which were not included in their subscription databases. Because they only subscribed to two major databases, offered by different providers, they anticipated that the discovery system would increase their resources and bring all electronic journals and ebooks together under a single search.

The library does not have staff with technical expertise for the discovery system, so support for issues and customisation is provided by the vendor. This has presented some issues for the library, as most technical support is provided from the United States. The time difference means they have to wait for a response, which may then be received outside of library hours, giving a further delay before the actions can be checked. The director also commented that they appear to have had a lot of issues that other libraries have not experienced. Having to manage technical issues has changed the library director's role significantly, and creates additional work. However, the system does save

some time for other staff, who no longer need to scan and send as many documents to their distance students now that information is available electronically.

Since the library implemented EDS, the director has become aware of OCLC offering a basic version of its discovery system without cost to Te Puna members [a partnership through the National Library of New Zealand], which is something the library director would consider, because "I can get lots of things for that money".

At Library C, the discovery system has not had a significant impact on teaching of information literacy. The same introductory classes are held to familiarise students with the library systems, and because the students were already being taught to use individual EBSCO databases, the training process was similar for the discovery system. However, library staff are spending more time creating resources to get students confident with using the system. The library is very positive about the impact for students, as one staff member commented, "students always want instant information, and this is the closest thing they've had to it".

Cross – case discussion

The significant themes that were identified in the research have been analysed and discussed in the sections below, according to their impact on significant roles within the smaller library.

Observations that are relevant to all user groups

Web-scale discovery generally meets expectations

In every library studied for this research, the system met expectations overall, in spite of issues or difficulties in individual settings. No-one who was interviewed has indicated that they wished they had not implemented it, or that they think it is more trouble than it is worth. Staff are generally realistic about what it can do, and have moderated their expectations accordingly. The overall impression is that the expected benefits are realised:

> It does pretty much what I was expecting it to do and what most people who were well aware of what a discovery layer was, was expecting it to do, of course people who weren't particularly familiar might have felt it was going to the be the all-singing, all-dancing wonder of perfect perfection, or were surprised that it was actually as good as it was… in general I think it's done exactly what we expected it to do – there's quirks, but any system has quirks (Library A).

Change is difficult

Change can be difficult in all organisations, but smaller libraries in particular may lack additional spare capacity in terms of funding and personnel to manage change, making the implementing of new technology more difficult (Rogers, 2003). The challenge inherently involved in change was acknowledged by participants at two of the libraries. One commented that "the people who complained the most were the academics" which the librarian attributed to them being "older, they grew up in a different technological environment basically, and they are more familiar with the idea of a stand-alone catalogue", as well as an attitude that "I've done it this way for fifteen years, what do you mean I have to change?" (Library A).

A participant at a Library B mentioned that the change was also difficult for library staff. Although this librarian is now very positive about the system, initially the challenge of preparing information literacy resources for a completely new process, without fully knowing how the process would work, was quite daunting:

> We got it live going in December… so I just had December and January and part-way through February to entirely revamp the way I was going to teach things, except I …couldn't try it yet. So that was a challenge … when you know that everything you do is going to change, but you don't quite know how to deal with it! You know, that's a tough thing …so, I'm beyond that now.

Once the system was implemented, the librarian noticed that the change was challenging for other library staff as well, "In some respects, a little bit more resistance to using it than I expected, from librarians …suddenly, our whole library landing page was transformed…but still they were doggedly going to the subject pages for the databases" (Library B).

As librarians at this institution have now adopted the new processes, this participant attributed the librarians' initial behaviour to their familiarity with the former system and processes, rather than a dislike of the new system.

Reducing the uncertainty of new technology

It is interesting to note that none of the librarians in this research mentioned any concerns from themselves or colleagues about discovery systems reducing the research skills of students, or providing poor subject coverage – areas which caused significant concern for the participants studied at Edith Cowan University (Howard & Wiebrands, 2011). Unlike Edith Cowan, which was one of the earliest universities in Australia to implement a discovery system (Howard & Wiebrands, 2011, p. 5), two of the institutions in this study implemented discovery systems relatively recently, so their librarians were likely to have been more familiar with the concept and with other libraries that had used a discovery system.

According to Rogers (2003) new technology introduces uncertainty for organisations about what the benefits of the new technology will be (Relative Advantage), whether the benefits can be seen in action (Observability), whether it will work with existing systems and fit well with organisational culture (Compatibility), how easy it will be to use (Complexity), and whether it can be tested before implementation (Trialability) (Rogers, 2003, pp. 15-16). Organisations and individuals attempt to reduce this uncertainty by gathering information about the technology before and during implementation, in order to confirm their decision. Unlike larger institutions, smaller libraries are less likely to have the spare resources that Rogers (2003) identifies as important for enabling new innovations. This means that ensuring that the decision will suit their needs and meet their expectations is particularly important for these libraries. All of the institutions that were studied undertook some activities to learn about discovery systems prior to, and shortly after, implementation.

A summary of activities that were mentioned by staff at each institution are shown in Table 1 below.

Table 1: Activities mentioned by library staff which would help to reduce uncertainty

Activities*	Library A	Library B	Library C
Hearing about discovery systems at conferences	✓		
Looking at other library websites			✓
Talking to other librarians		✓	
Talking to one or more vendor representatives	✓	✓	✓
Reading literature that compared different systems			✓
Librarian testing of different systems	✓	✓	
Student testing prior to implementation			✓
Using vendor-supplied training resources		✓	✓

* Other activities may have been undertaken that were not mentioned during the interviews.

One library manager mentioned looking at journal articles to find out which systems performed well. "I have read a few academic journals, I think EBSCO is still ranking the best" (Library C). Another library had staff complete training once the discovery system was implemented so that they were aware of what it could do. "EBSCO provides what they call a 'bootcamp' thing where … you've got this series of exercises that you can do" (Library B).

These activities helped the libraries prepare for, and accept the challenges that they faced when the system was implemented:

> …they don't quite work as well as they're supposed to, we kind of knew that going in because we, I'd talked to a lot of other library managers and that, so I wasn't surprised, in fact it probably worked better than I'd expected (Library B).

The activities that were undertaken in each library varied, but each library covered several of the factors that Rogers (2003) indicates would help new technology to be adopted and accepted.

Findings from information literacy roles

Changing roles for information literacy staff

Implementing discovery systems created significant changes for the teaching of information literacy. Unlike many of the organisations studied by Buck and Mellinger (2011), all of the participating academic libraries integrated their discovery system into the teaching of information literacy. Introducing the discovery system required the librarians to adjust the content of their teaching significantly. Participants mentioned that in some aspects the teaching process was easier and saved them time:

getting discovery changed enormously how I do that, because before we would have all of these different databases, and depending on what the subject was… I would talk to people about the library resources on our shelf, ebooks as a separate thing, and whichever database applied to them mostly and so I couldn't really cover all of that in one session so I'd have to have a series of sessions focused on the different resources… [discovery system] certainly has made life easier for me (Library B).

This change has freed up time for teaching other skills, such as understanding the academic research process, referencing, and how to choose suitable resources. Staff also mentioned that the systems created new areas that students need to be taught, such as how to use features of the discovery system that help them optimise results or manage their resources more easily.

At Library C, one interviewee commented on the impact of having electronic resources easily available to serve their distance students:

we found a couple of reference books [available as ebooks]… a couple of those that we've always had hard copies … it's just happened, but that will make a huge impact on our work, because for distance students we've had to scan entries from that sort of thing, and that was just quite time-consuming.

Implementing the discovery system increased workloads for information literacy librarians initially. Interviewees spoke of having to create new resources for teaching classes and new guides to help students find their way around the system. This was time-consuming, although one person commented that for their students "it's not like a totally different [system] … we've been using EBSCO databases so [the search process] has not totally changed" (Library C).

Special features add value for students

Most librarians identified particular features of the discovery system that they felt added value for the students. Comments from library staff included:

- "when [students are] doing their APA referencing they like the permalinks, so that's one thing" (Library B).
- "The Refine Results is great, much easier to narrow results quickly" (Library B).
- "what we do know that nearly 50 per cent of searches use at least one filter of some sort, down the left-hand side, it could either be a date, material type, peer review, subject" (Library C).

Other items that were mentioned included the ability for students to email articles to themselves and the facility to connect course resources from the discovery system as clickable links into the Learning Management System. One library worked with Google to set up links to Google Scholar, whereby a search could be constructed in the discovery system using its advanced search features, and then would use Google Scholar's search algorithms to find additional results across the databases. While a few of these features were set up deliberately (such as the Google Scholar example), in some cases, staff were not expecting the benefits that these features would provide for students. "[Our discovery system] has this 'Cite' tool and so students jumped on that for helping them with their referencing so that was…an unexpected benefit, we hadn't thought about" (Library B).

Findings from technology roles

Increased workload for staff with technology responsibilities

Two of the staff members that were interviewed have responsibility for technology at their libraries. Both are directors of their respective libraries, and both commented on the increased workload that they have experienced since implementing the discovery system. As also reported in the study by Colson and Allen (2015), the discovery system has involved significant time commitments, not just from implementation but also with ongoing work from customising the system to their individual environment; sorting out issues with access and links; and ensuring that resources are added and displaying correctly.

One library director elaborated on some of the issues:

> Staff time, definitely we spend a lot of time trying to fix it… and also the way that I have to be quite strategic about what I want with my journals, so before I purchase any e-journals, I have to make sure that… they will be able to be authenticated, they are searchable through EDS, and indexed in here… students it doesn't really affect them too much, but it's the staff, the workload.

> …What you see on-site and off-site is quite different. Because of the site's IP [address]. So at times I have to check it at home or get someone to have a look at home for me. To check which off-site issues have been resolved (Library C).

The director adds, "it's just changed my role quite significantly… like how to navigate around EBSCO [support]… recently I had to chase around EBSCO ebooks… saying, "When's it going to be live on EDS"" (Library C).

The library director at Library B added, "[one] drawback of it is the amount of… overhead in terms of work. …[you] have to keep it up to date", as metadata from their library catalogue and from ebooks supplied by other providers needed to be uploaded every day to keep the discovery system current.

For both staff members who had technical responsibilities, the technical role is not their primary responsibility. This adds additional challenges, as one library director expressed, "with me having the…two roles, it does make it hard to find the time to probably do both properly and of course the electronic services side is the one that will always get squeezed over the management side" (Library B). This is a particular challenge when working in a smaller library.

Regarding implementation, the director recommends:

> we could have done less, but we think that probably helped us further on, so … I'd say make sure you dedicate enough time up-front - over the couple of months that you're planning to implement it… I'd make sure you have enough time to kind of get your head around it and get it set up, 'cause I think for it to be a success you need to … understand how it works, and you… need to make sure how it's set up works for you and for your users (Library B).

Having technical expertise in the library makes a difference

Related to the time involved in the technical oversight of the discovery system, interviewees also commented on the expertise needed. Of the two library directors who have responsibility for day-to-

day technical issues, one has a background in electronic services, but the other one does not, and so is reliant on the vendor to provide technical support. This can have an impact on the value that the discovery system provides, as one library director observes:

> I know some of the things that smaller libraries grapple with… is having someone with… both technical expertise but also the time to actually… maintain it and have it running properly so that's probably an issue, I know [another polytechnic], they have one, but speaking to the library manager there, she said she felt they didn't get much value out of it because no-one had kind of ever taken the time to learn it and use it properly, and so they'd kind of just taken it out of the box (Library B).

The director's recommendation is to have technical support in the library if possible:

> I think if the library can have someone doing it it's much better because I.T. don't understand it… they'll be able to do the technical side… but they don't understand what the library is trying to achieve and the moment say, a vendor starts talking about MARC fields or something… I.T. staff will be completely lost (Library B).

For the institution that does not have technical expertise in the library, support plays a significant part in their experience of the discovery system. This library director mentions difficulties such as the time difference between the library and the technical support:

> Because we're dealing with … the U.S., so there's a time difference. For some things, I might not hear until tomorrow, early morning – when I'm [viewing the response] a bit later, four or five hours later. So anything urgent – too bad! … now I think that EBSCO in Australia is picking up some issues, but not all of the time (Library C).

Other areas of concern for this participant were identified as:

> mainly the authentication…knowing that we have to check every single e-journal, and link and change the URL, and then the support is quite important, and of course the layout, you know, the customisation and now we have more and more open source e-journals and e-resources, it would be quite good to see how many of those can be indexed in because we have a few…core ones that I think, oh yes, my students, I know would like to read this (Library C).

Effects of competition between vendors

Participants commented that discovery is promoted as an 'all in one' system for all of their resources, but having various vendors with different types of access to electronic resources means that this is not the reality that they have experienced:

> in the ideal world you search for something, if you have it it's available, the user clicks on it and gets it, and in reality if it's in the EBSCO infrastructure they get it, if it's in another infrastructure they'll probably get it but it's not as straight forward (Library B).

As the librarians observed, this is not always helpful to the students:

> one thing I'm quite disappointed in is that it's not listing all my ProQuest Religion databases, they haven't been carried forward… which means sometimes my students might miss

something… that was very relevant in ProQuest but it's not showing in [EBSCO-provided] EDS (Library C).

…there are a few journals that are not indexed at all …in EDS. [I expected that] students can just put in a search, and any keywords that they put in, any titles that match that… it would come up, but it doesn't do that, in a few journals. So that was a big disappointment to me. Because my main [reason for] having discovery is so that my journals would be accessed (Library C).

Even the results that are supplied may depend on the vendor who provides the system. For example, one user of EDS, supplied by EBSCO, noted that it is "very EBSCO-focused, even the results, the ranking … they rank EBSCO [journals] first (Library C).

Finding relating to library management

Impact on use of electronic resources

One anticipated benefit of discovery systems was increasing the use of electronic resources, which helps to justify the investment in both the discovery system and resources such as ebooks. In line with the research conducted by Way (2010) and Calvert (2015), all participating libraries indicated that use of electronic resources had increased since the discovery system was implemented.

- "it's increased usage of electronic resources quite a lot, so we've had large increases in both ebooks and full-text access have both gone up a lot since bringing in the discovery" (Library B).
- "Regarding journals, yes I think it has increased the usage, definitely. And as we scan things for distance students, and [from] students asking questions, we know that a lot of the e-journals are now being used" (Library C).

Discovery systems also had an added benefit, as one librarian noted. Results that pointed to ebooks encouraged students to use ebooks where they previously did not see a need to make the leap to a new technology. This has resulted in more queries related to how to access ebooks:

[Discovery provides] more ability to get people to use different things, like we've got our search – I think the first things that come up are ebooks, so you're going to get people looking in those that might not have otherwise chosen to look in an ebook. So.. you're actually introducing them to something (Library B).

Research by Calvert (2015) reported that the increase in electronic resources was accompanied by a decline in the use of physical items. This did not appear to be the case in the institutions surveyed for my study:

- "I wouldn't say it would affect, or has affected my print copies" (Library C).
- "there wasn't like a sharper fall-off [in use of physical resources] after we brought in discovery…if you graph it, it's a kind of gradual decline that's just continuing" (Library B).

Findings relating to library users

Benefits for students

Generally librarians reported that students were positive about the discovery systems in their institutions, although one librarian observed that often "you only hear the complaints" (Library C). Students were not surveyed for this research, but the librarians reported a number of benefits that they had observed for students.

Librarians who were surveyed noted that the discovery system was more comparable to Google, which was one of the goals for many libraries who implemented web-scale discovery (Deodato, 2015; Vaughan, 2012).

One librarian summarised the benefits for students in this way:

> You know, and so I'm this 19-year old who's been through school, and I've got my cellphone and everything, and I know the internet, and I want to be a nurse and I want to help people, and suddenly like, 'oh, I've got to use this – what is this?' … it was hard, you know, it was really hard to leap straight in … so at least [our discovery system looks] more like Google and what they are used to (Library B).

Comments from other librarians reflected similar observations:

- "it's now much more intuitive" (Library A).
- "you just pop in your keywords like you would for Google or anything else, which everyone's used to doing, and then, bingo, here's your results! (Library B).
- " [Previously] it was really hard to compete with Google! And Google Scholar." (Library B).

Librarians also identified that the system was easier for students to use, which the students themselves had reported in the study by Bull et al. (2014). Some of the comments from librarians are included below:

- "One thing that I do feel is good… is it does not require as much system knowledge as most old OPACs did in terms of being able to understand library jargon, MARC type fields, all those sorts of things" (Library A).
- "Some students who've hardly ever used computers can just type in a couple of keywords, and get something…And that's wonderful" (Library B).
- "Definitely it's easier for students, definitely I have no doubt about that" (Library C).
- "I feel that maybe more students have now got the ability to find their own information, and better information, than they would have before" (Library B).
- "I just get a general impression that … [students] are using the online resources more successfully" (Library C).

Bull et al. (2014) also found that students liked having a single source for information, and the librarians that I interviewed reported similar comments:

- "Rather than going here, there, and everywhere to find something that you want, you can just type in your key words" (Library B).

- "It is great showing full text articles as options, alongside print books and ebooks" (Library B).
- "students always want instant information, and this is the closest thing they've had to it, really" (Library C).
- "you've got things available, and new ebooks available straight away…except maybe for the occasion when something's embargoed, you've got journal articles available… right directly when you want them" (Library B).

All of the librarians that were surveyed reported that the system overall was an improvement for students:

- "[Prior to the discovery system] students would come to us struggling to find stuff, or give up using the library because they either wouldn't know the right databases to use – or they would use perhaps the right database, but they're missing what would be held in other databases." (Library B).
- "students have been happier – so it's improved student satisfaction" (Library B).
- "We did a survey about a year after it was implemented, or a year and a half after it was implemented, most of them [students] were very positive" (Library C).
- "vastly better than before" (Library A).

Each library made different observations about the benefits for their students. Table 2 below shows which libraries commented on each benefit for their students, and which benefits were most widely reported:

Table 2: Reported benefits of discovery system for students

Reported benefits	Library A	Library B	Library C
Easy for students to find information	✓	✓	✓
Intuitive/competing with Google	✓	✓	
Direct process for searching		✓	✓
Immediate access to latest resources (currency)		✓	✓
24/7 access		✓	
Encourages use of cross-disciplinary resources		✓	
Move with the times	✓		
Access to more resources than before			✓

A small number of negative comments were reported by librarians from their interactions with students. "I think the main thing that I hear is, 'too many results'" (Library C), which was also mentioned in the study by Bull et al. (2014). A couple of other librarians observed that the students had difficulty using their discovery system to find the physical location of the book, because the link to the catalogue was not obvious, or the students did not understand the terminology used (such as 'retrieve catalogue item'). However, feedback from the students was largely positive overall.

Academic staff perspectives on the discovery system

As this research was focused on the experiences of the library staff, interviewing academic staff was outside of the research scope. However, some library staff did provide feedback they had received from academic staff. Interestingly, the feedback differed between the institutions, with the two libraries that served primarily undergraduate students reporting neutral or positive comments.

- "Staff have seen it as evidence of improvement" (Library B).
- "we still have tutors here who are excited by it, so that's a good thing" (Library B).
- "just with talking to tutors… I think they think it's really good. Anything that's going to help them and their students is good" (Library B).
- "I know [academic staff] use it, but they didn't have much feedback about it" (Library C).

In contrast, Library A, which has both undergraduate and graduate students reported that "the people who complained the most were the academics". One interviewee at an institution where the discovery system was well received observed that "I know talking to other libraries, particularly… university libraries a lot of faculty really didn't like it, and we were expecting some pushback, and we didn't actually get it," adding that:

> also what I got talking to people before implementing it was that the discovery was really great at that kind of undergraduate level, and once you start moving beyond that individual databases have a lot more value, but I mean at [Library B] we teach from Level 2 to 7, we don't have any postgraduate courses so it was quite ideal for us.

The interviewee's observations fit with the comments from Bull et al. (2014) and Calvert (2015), who both note that web-scale discovery is targeted at undergraduates in academic libraries, and also align with the research by Lundrigan et al. (2015), who reported that graduate students interviewed in focus groups expressed a preference for using individual databases.

Although only one institution with graduate students was included in my research, comments from participants support the indications already observed in the literature, that web-scale discovery may be better suited for the needs of undergraduate students. Further research over a wider variety of institutions would be needed to confirm whether or not this is the case.

Decision making at the smallest library

Library C was the smallest library surveyed, and had some unique comments to make based on their experience of implementing discovery systems in a library of their size. In some aspects, their experiences echoed those of the small libraries described in the literature, but they also provided other observations which have not been identified in previous literature.

Weighing up cost versus performance

One significant observation from the director of the smallest library in the study, was the impact of the cost of the discovery system on decision making, something which was also reported by Bonner and Williams (2016) at Chowan University in North Carolina. The director of the smallest library in my study described that when discovery systems first became available, "ProQuest came to me and talked about it, at that time it was really expensive…. and basically I just said, "Look, I'm sorry… we just cannot afford that"", but remembers thinking since that time "it's good to have [discovery]", and chose to take it up several years later when EBSCO offered a special price. However, as the

director observed, "I'm still thinking, 'should I be renewing next year?' knowing that the cost is so much, because, I can get lots of things for that money" (Library C).

The director reported that research suggests that their current system performs best in published comparisons of discovery systems, in terms of "customisation and holdings". However, this participant also noted that the library would consider switching to an alternative system, which may not be as highly ranked in the research, in order to save money. "About… one and a half years ago we found out that OCLC was providing free OCLC discovery to Te Puna members, the basic package is free, and of course anything you need to customise, you can pay more. That makes me kind of think, 'Oh, wow!'" (Library C).

Discovery extends access to additional resources

Discovery systems are normally limited by the databases to which the hosting library subscribes. However, for Library C, which subscribes to only two major databases, one each provided by ProQuest and EBSCO, their discovery system gave them access to additional valuable content through EBSCO's access to a range of e-journal content. This was an area where they were missing content from, "some of the core [e-journal providers], like Sage, and Taylor & Francis, and Brill". This benefit was not mentioned by other libraries in the study, and has not been reported in the literature, but could be an additional benefit for the smallest libraries.

Conclusion

This research provides an insight into the benefits and challenges of implementing a discovery system, so that directors of smaller libraries can make an informed decision for their own setting. It has identified some areas of disappointment with how the discovery systems have worked, when compared to what was expected, particularly around vendor licensing and technical issues. However, it has also identified a number of features that provided unexpected benefits for the students in these libraries.

Some aspects of discovery systems are particularly challenging for smaller libraries, particularly those that affect the key resources of funding and staff time. In spite of these challenges, libraries have reported that the system is valuable overall for their students. It does meet the goals of making resources easier for students to use, and it provides an intuitive system that works for students who are used to web browsers. Librarians report that it makes electronic resources easier to use, and more likely to be used.

In terms of Rogers' (2003, pp. 15-16) model of factors that influence implementation, the study demonstrates that librarians have been able to assess most of the factors to confirm their decision making.

1. *Relative Advantage* is demonstrated by the benefits that web-scale discovery provides, with all interviewees agreeing that it is better for students than what they could previously offer.
2. *Compatibility* depends on the selected vendor's technology and licencing agreements. Librarians mentioned that compatibility affected their choice of system. Incompatibility between vendors providing different systems and licencing was identified by librarians as a source of disappointment. Librarians also mentioned how well the technology was accepted by different types of users, reflecting fit with organisational culture.

3. *Complexity* reflects how easy to use the technology is perceived to be. Librarians mentioned that students found web-scale discovery easy to use, although there was resistance by academic staff in one institution.
4. Some *Trialability* was possible before implementation, although the study identified that librarians did experience unexpected technical issues once their systems were implemented.
5. *Observability* was possible for this group, as the technology is established in other libraries. Some participants spoke about learning from the experiences of others to find out about possible benefits and challenges of implementing a discovery system.

What can other small libraries learn?

- Web-scale discovery has benefits for students, in terms of satisfaction and simplifying the research process.
- Discovery systems do encourage users to make the most of the library's electronic resources.
- Discovery appears to be most likely to be accepted at undergraduate level or below.
- Librarians are encouraged to check whether the vendor can integrate all of the resources that they expect their students to be able to access. Vendors may also provide access to additional free resources, which could be of benefit if they are useful to students, or may require sorting and suppressing if they are not high quality.
- Library directors should be aware of how much the implementation can change the library's roles and workloads. Getting staff on board with the changes and making sure they know what to expect and are supportive of the technology is an important part of implementation.
- Implementation and ongoing maintenance involves a lot of work to get the best value out of discovery. If libraries don't have technical expertise, consider carefully where support will come from, and whether the library has the additional time and money to make it work.
- Librarians will benefit from finding others from whom they can learn and with whom they can share experiences.

One of the study participants offers a recommendation, in spite of the challenges, "I would be encouraging other small libraries to go along with something like this, because it has been good" (Library B).

Recommendations

A number of comments were received from research participants across a variety of library roles expressing interest in the topic of this research. These fell into two groups – those who expressed encouragement about the value of this research for smaller libraries, and those who expressed eagerness to learn about the experiences of other libraries in relation to problems that they may have in common, or whether other staff could offer tips for improving their system:

- "I think it's a good thing to be researched" (Library B).
- "I think it's a very admirable topic you're doing, so it's going to make interesting reading" (Library B).
- [Discussing the difficulty that students had with using discovery to find a book's location] "so I don't know whether…that's the way ours is set up, or whether other people's would work the same way" (Library B).

- "[other study participants] will probably have some things that would be really useful to add to discovery" (Library C).

Although there is a lot of available information on discovery systems in academic libraries in general, participants in this study appeared to identify their experience as somewhat distinctive, thus were seeking to find others from whom they might learn and with whom they could compare experiences. Library directors in the study did mention learning from the experiences of other librarians, but this ability to share knowledge may be less available for staff in other roles.

One option to address this need could be the establishment of informal networking specifically for staff of smaller libraries to exchange ideas and experiences. As staff needs and skills will differ, a central point such as a group on social media could be a solution that allows everyone to contribute as they can, and does not require intensive group maintenance and leadership.

This study has also identified that smaller academic libraries can struggle to implement discovery systems in a way that is useful to them. There is an opportunity for vendors to explore ways to provide access to discovery systems in ways that are cost-effective for these institutions, and ensure that librarians are equipped to make the most of discovery features.

Areas for further research
This exploratory study was limited in scope due to time and resource restrictions. To confirm these findings, additional structured research encompassing a wider number of institutions would be useful. In particular, this study suggested that the level of acceptance of web-scale discovery differs between undergraduate students, graduate students and academic staff. Further research to confirm this indication would be valuable for library directors as part of their decision-making.

This research did not explore why some libraries might choose not to implement discovery systems. That topic would complement research carried in this study, and would provide further information for library directors who were deciding whether or not to implement web-scale discovery in their specific context.

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Appendix A: Interview Guide

Introduction

Check Skype is running and Callnote is connected to Skype. Start recording when call is connected.

Greet participant, thank them for being willing to participate and assist with the research.

Ensure call is being recorded.

Check whether they have any questions about the research. Explain my background and my interest in the topic if appropriate.

Potential interview questions

1. Can you tell me about your role in the library (or information service)?
   How do you work with the discovery system? (if not already mentioned)
2. For library directors, replace question 1 with 'What was the motivation for implementing a discovery system?.' Probe how they found out about discovery, what prompted them to consider it.
3. How were you involved in the decision making about the discovery system? (if relevant).
4. How much is the discovery system integrated into classes/information literacy?
5. What sort of feedback do you get about the system from students? From teaching staff?
6. Has the system changed any of the library staff roles or tasks? (or for non-library directors – has the discovery system changed what you do, or how much you need to do in your areas of responsibility? Check whether it saves or increases workloads, or requires changes in how things are done.
7. Are there any quirks in coverage or results returned that you have noticed?
8. Is there anything that it doesn't do that you wish was available?
9. Have you experienced any challenges with the implementation process? (if these haven't been already mentioned)
10. Thinking about what you expected when it was implemented, how does the discovery system compare to what you expected?
11. Overall, how has the discovery system affected the library since it was implemented? If not already mentioned, ask if it has changed use of electronic resources/print resources
12. Is there anything else that you think would be useful for me to know?

The questions above are based on those developed by Vaughan (2012) and Deodato (2015).

Thank the participant for their time. Check they are happy to be contacted if I need to clarify anything or have additional questions at a later stage.

Explain that I will transcribe the recording and send them a copy to check and comment on, and once the research is complete, I will send them a summary of the results.

Stop recording

Structured background questions (which may be able to be answered via email if they don't come up naturally in the interview):

1. How long has your discovery system been in place?
2. Who is the supplier? What have you named the system?
3. Have they changed systems – if so why? How long have they had each, and what is the reason for the change?
4. Where do you access technical support for implementation/customisation or resolving issues? (in library/parent organisation/vendor support only)?
5. Has your library performed any customisation of the system to suit your local setting?
6. Have you conducted any analysis of how the system may have affected the use of library resources? (are results available to view?)

Appendix B: Interview Questions Via Email

Note: Prior to the interview I was aware that the participant in this email 'interview' did not have any leadership role or technical responsibilities in the library. At this stage I also had background on the library from other participants, and from a previous presentation, so some questions from the interview guide were not considered relevant.

Hi X,

Thanks for your willingness to 'talk' to me via email. I've adapted and expanded the interview questions, to make them easier for you to answer without my input – but please feel free to let me know if you'd like any clarification.

When answering the questions, it would be helpful if you thought about how you might respond if someone was speaking to you directly. Please feel free to give as much detail as you like within the time you have available. I appreciate that writing is often more time-consuming than talking.

If there are any questions that don't apply to you, or that you can't comment on, feel free to note that and skip those questions.

1.   Firstly, can you tell me about your role in the library?

2.   In your position, in what ways do you work with the discovery system?

3.   What part did you have in the implementation of the discovery system? (if any). Were you involved in decision making about whether to implement a discovery system, and what it should be able to do?

4.   In what way does the discovery system impact on or change any of your tasks? For example, does it mean you do different tasks, or the same tasks in a different way? Does it make some things easier or more difficult?

5.   Have you noticed any quirks or anything unusual that it does?

6. Is there anything that the discovery system doesn't do that you wish was available?

7. How does the system compare to what you expected it would be like when it was first implemented?

8. Overall, how has the discovery system changed the library since it was implemented?

9. Is there anything else that you would like to tell me that I haven't asked about?

Thank you very much for taking the time to share your experience and to contribute to my research. If I need any clarification, or if I'd like to know more about any particular areas I may be in contact once you return from holiday.

Regards, Heather

Appendix C: Data Coding Schema

Table 3: Sample codes from code book

Number	Relevant group	Code	Definition	When to use	Code relationships
12	Admin/ director	Reducing uncertainty	Activities undertaken to increase understanding of the system	Use to code activities undertaken by staff to increase their understanding of positive and negative aspects of the system.	
13	IT	Need IT expertise	Libraries needing IT expertise in-house to manage discovery systems	Use for comments about needing specialist expertise in the library to manage discovery systems.	Use code 14 for comments about workload
16	IL	Change in teaching roles	Changes in roles of information literacy staff	Use for any positive or negative changes in roles of information literacy staff that occurred as a result of the system.	
23	Students	Easy to use	System is easy for students to use	Use for comments about ease of use for students being an outcome from the system or a reason for its introduction.	Comments relating to the system being intuitive for users should be coded as 28.
28	Students	Competing with Google	System competes with Google, or is familiar in the same way as a search engine	Use for comments relating to the system being an alternative to Google, familiar or intuitive.	Use code 23 for comments about the system being easy to use.
32	General	Change is hard	Negative responses to change	Use when the process of change is the source of negative experience.	