ANALYTICS PROVIDING A CONSTANT STREAM OF POSSIBILITIES

ABSTRACT

Deakin University Library plays a pivotal role in enabling learning, teaching and research in the digital environment. The current higher education environment, and local institutional responses to the federal government agenda, requires libraries to demonstrate the value of their activities to the university and to the university's partner enterprises and communities. Effective analytics can help us demonstrate the success of our innovative projects, the benefits of employing emerging technologies to streamline and optimise operations, and the consequent contribution to the university's agenda.

The ability to aggregate and visualise a comprehensive dataset around business processes provides valuable opportunities to enhance business intelligence and support decision making within the library organisation.

Digital Library and Repositories within Deakin University Library embarked on a massive aggregation of data project in 2012, and since then has made significant progress in aggregating data around our business processes. In 2013 another project was initiated to review the Library's data generation, curation and usage practices and deliver recommendations to improve reporting and business intelligence.

The Library is using JIRA[1] with the aim to consolidate data and enhance reporting using innovative visualisation and dashboard design. The first service to be piloted was the inter-library loan (ILL) document delivery service.

This paper provides an insight into multiple projects running within Deakin University Library to consolidate the data across major Library services, in a cost effective and sustainable way. The overarching strategy is to develop a comprehensive dataset supporting business decisions, and in so doing allow the Library to optimise operations and services for the benefit of our clients. To effectively communicate these benefits, the Library recognises the need to tell qualitative stories using quantitative data.

PAPER

BACKGROUND

Deakin University Library is part of a young organisation, which celebrates its 40th anniversary this year. Despite its relatively short history, the Library has a long tradition in collecting and analysing data to understand client needs and inform service improvements. From the mid-1970s the insights and findings gained through these processes have been shared in research publications, many of which made an important contribution to national and international efforts to develop high-quality distance education library services.

Today the student experience sits even more firmly at the forefront of the University's strategic agenda, *LIVE THE FUTURE: Agenda 2020*. A "brilliant education" that

[1] JIRA is a proprietary issue tracking product, developed by Atlassian. It is also used for project management.

supports and retains students, empowering them for the jobs and skills of the future are on offer for students undertaking studies at a university that is driving the digital frontier.

In common with other organisations, Deakin University library faces a substantial challenge in demonstrating to its institution that it makes a unique contribution to the student experience. Further, it must also demonstrate how University investments in new-generation library learning spaces and resources are contributing to institutional strategic imperatives and global competitiveness.

The power of data, complemented by the insights gained from analytics, provides organisations with the tools needed to help them demonstrate value. An organisation's ability to collect and curate data to answer the "right" questions; to extract understanding from that data, using the facts or business intelligence to improve the quality and speed of decision making, can enhance performance and business outcomes (Kennerley & Mason 2008, p.2). In the higher education environment those outcomes generate benefits for students, staff and the community.

What are the "right" questions that fit within the context of different stakeholder expectations and institutional aspirations? How could the Library, which has a history of gathering data to improve business processes, manage assets and optimise service operations; more efficiently manage its disparate datasets; and improve governance processes? How could a deeper and more nuanced understanding of Library client needs be achieved through effective analytics, and without a considerable investment in resourcing statistical expertise?

To address these challenges and questions, the Library commenced a major multi-phase project in 2012 to review its internal business information and data infrastructure; and to develop a more effective business intelligence strategy, informed by analytics. The project methodology and outcomes are reported in the Methods section of this paper.

LITERATURE REVIEW

Synthesising and applying learnings from research in the areas of 'data analytics' and 'business intelligence' is challenging for practitioners. There are many disciplines exploring how to extract value from data to improve decision making, planning and innovation. "The literature addressing the topics of decision making and use of information is multi-disciplinary and spans topics such as management, social science, information technology, and human neurology and psychology. . . Consequently the literature is not cohesive, and each of the subject areas takes its own perspective" (Kennerley & Mason 2008, p.5).

Evidence of libraries conducting data audits and developing a data audit framework is strong in the area of managing research data. The JISC-funded Digital Audit Framework (DAF) developed by the Digital Curation Centre, HATII at the University of Glasgow provides a mechanism for collecting data through its audit methodology. This has been piloted by research centres and universities throughout the United Kingdom, including the University of Edinburgh and University of Bath (Jones, Ball & Ekmekcioglu 2008, pp. 113-116); University College London (Polydoratou 2009) and others. The DAF has informed the business information and data infrastructure review undertaken at Deakin University Library.

It is only recently that there has been discussion of the benefits of translating the knowledge libraries have created through the development of research services to improve understanding of the nature and context of the data produced by the library. Using data audit methodologies for assessing electronic resources data has been evaluated by the University Libraries, Virginia Tech (Ogier, Hall, Bailey & Stovall 2014, pp.101-113).

Data that contributes to an institution's understanding of students at risk and improving student success and retention is highly valued. Studies of the library's impact on retention either correlate student retention and success with what libraries *have,* such as numbers of staff and expenditures or with what students *use* from libraries as measured by log-ins to databases and borrowings (Hagel, Horn, Owen & Currie 2012, p.221).These studies illustrate the need for a knowledge of the organisation's data assets and the necessary analytic skills to evaluate and apply robust methodologies.

METHODS

The key to approaching any assessment activity is ensuring the right questions are asked and an appropriate fit for purpose methodology is used.

It is important to note that this project didn't aim to create a Library data warehouse, nor did it seek to develop or adapt a learning analytics methodology. The work undertaken by the University of Wollongong Library in developing *The Cube,* and the University of Minnesota Libraries, *Library Data and Student Success Project* are widely recognised as being at the forefront of an emerging area of analytics used to demonstrate the contribution libraries make to student learning.

Deakin University already maintains a data warehouse that consolidates, processes and manages key data sets from a variety of operational systems and sources across the University. The Library works closely with Deakin University Strategic Intelligence and Planning Unit (SIPU) which is responsible for advice and statistical information to support University planning and managerial decision-making processes. SIPU manages the University's data warehouse.

Although no Library data sets feed systematically into the Deakin data warehouse, Library data has been provided to SIPU on an ongoing basis and for projects related to student engagement, success and retention. For example, in 2013 SIPU undertook an important project to develop predictive models to identify students at risk of attrition. As part of this project the Library provided EzProxy log data on student library electronic interaction sessions over a pre-defined period. SIPU data analysis and interpretation indicated a strong inverse correlation between electronic access to Library resources and student attrition. Data is also provided by SIPU to the Library, including EFTSL, University staffing and financial data. This assists the Library to analyse patterns and trends in the profile of student and staff use of Library resources, which in turn informs decision making on service development and resource allocation.

FOUNDATION PROJECT: BUSINESS INFORMATION AND DATA INFRASTRUCTURE REVIEW

Commencing in 2013, the Library embarked on a foundation project to review its business information and data infrastructure. The project was informed by Library experience in data curation and preservation, strengthened through involvement in national research data management projects carried out at the University, including

Seeding the Commons (funded by the Australian National Data Service). Leveraging the results of these projects and lessons learned from data asset audits, the Library project team designed an appropriate data audit project methodology.

The Library data review was also informed by the JISC-funded *DAF* project methodology (Data Audit Framework, now referred to as the Data Assets Framework). *DAF* advises that "to effectively manage data holdings and fully realize their potential, an organisation must first be aware of the location, condition and value of its assets" (Jones, Ross & Ruusalepp 2009, p.8). While the authors were referring specifically to research data assets, this statement also holds true for other datasets.

Figure 1, Data Audit Project Methodology

STAGE 1 – AUDIT PLANNING

In line with standard project methodologies, the project was governed by appropriate management processes. A *PRINCE2*[2] project management approach was applied to organise and control project stages. The Project Manager was a recently graduated Deakin University doctoral student with a strong background in data.

STAGE 2 - IDENTIFYING DATA ASSETS

Like many organisations, Deakin University Library collects and stores a range of data; from a variety of internal and external sources; covering varying time periods; and relating to different services and areas of operation. The datasets support business requirements; contribute to benchmarking; enable compliance with obligations to CAUL (Council of Australian University Libraries) and the University. Some datasets are needed for the long term and facilitate time series analysis of Library services and resources. Others relate to short or medium term Library projects and priorities, and while they may have a finite timeframe for collection require longer term preservation.

[2] PRINCE2 (an acronym for PRojects IN Controlled Environments) is a de facto process-based method for effective project management.

Much of the data gathered by the Library is quantitative, extracted from systems and software that rarely "talk" to each other, including library management and student online learning systems; web analytics and electronic resource access products; and library visit counters. Additionally a proportion of data collected is input via manual processes. Staff across a range of Library areas input real-time service data, and consolidate and report data on a weekly and monthly basis, or as required. Approaches to data collection are not always consistent across campus libraries and practice may vary from person to person. This can create issues in ensuring that we understand what is being counted and measured and across multiple locations.

The Library works with large amounts of e-resource usage data supplied by vendors. The scale of usage data is huge, with volumes increasing each year in line with new resources added to the Library collection. Usage data is an essential collection assessment indicator but the raw data generally requires internal manipulation and analysis to ensure that meaningful insights can be obtained.

Every area of the Library collected data, but not all data was being effectively used. Often data collection had been identified as "something that should be done but is undertaken without knowledge of what questions the data will eventually need to answer" (Chapman, Lown 2010, p.6). The "just in case" approach resulted in data being collected and stored, without analysis or interpretation, for an unknown future need.

The Library's data landscape is complicated. An important early component of the project involved developing a comprehensive inventory of core datasets. During this phase of the project detailed information about data was obtained in interviews with key stakeholders, including staff who contribute directly to data capture and analysis processes.

Data management could only be improved once all required data was identified. A data inventory was created, and provides a central repository of detailed information on core datasets.

The Library data inventory includes:

- description of the asset
- business owner and stakeholders
- data source
- data location
- data audience, including external reporting requirement

This inventory underpinned the next stage of the project.

STAGE 3 - ASSESSING QUALITY AND MANAGEMENT OF DATA ASSETS

Further analysis of datasets, which span services to clients; business and financial processes; collections and resources; Library buildings and facilities, was undertaken and documented in a detailed report. The analysis involved an extensive review and assessment of data curation and governance practices.

The report highlighted a number of issues that presented business risks. In particular, data management was fragmented with some datasets aggregated centrally while others were locally managed by individuals and Library teams. Consistency in

collection practice across teams and Deakin's four campus libraries was a problem. Further, data quality and integrity was compromised by poor governance practice.

This review work was time consuming involving 3-4 months of part time work by the project manager to ascertain needs across campuses. However this was a critical step to ensure that issues were well understood and documented. Recommendations contained in the report were key to effecting change by advising on processes and methods to improve the quality, accuracy and veracity of data, and associated management processes. For example, creating a governance framework with agreed roles and responsibilities and data quality levels for business owners who are accountable for data quality and outcomes; data stewards who manage data on behalf of the business owner; and data administrators who provide technical support to manage the data.

STAGE 4 – REVIEWING RESULIS, RECOMMENDATIONS & NEXT STEPS

Recommendations from the report are under consideration and will be used to strengthen and improve ongoing data management. Once Library management are satisfied that the existing data management processes are adequate, further work will be undertaken in the second half of 2014 to review and refine specific business analytic and reporting needs for both the Library and the University. This is proposed to be undertaken by workshopping the feedback provided by data business owners, stakeholders and Library management in Stage 2 of the project. Additional sources of data may be considered and included as part of the Library's future data sets management.

PROJECT: DATA ANALYTICS USING *JIRA*

Businesses and institutions from around the world are using analytics to quickly analyse, interpret and visualise large quantities of data.

The volume of data to be constructively managed by the Library continues to expand at a fast rate. In 2013 alone 1,604,985 people visited the Library; 121,596 enquiries were received; nearly 4 million electronic articles were accessed and 260,415 items were borrowed.

As the volume of data grows, so too does interest by libraries worldwide in using analytics for data interpretation and visualisation. Building on long-held practices in assessing the usage of resources, libraries are using analytics to determine patterns and trends in collection usage. Harvard Libraries Analytics Toolkit which aims to "gauge and analyse more easily usage data at Harvard Libraries campus wide" (Rapp 2011 p16) is one such example.

Google Analytics is commonly used to analyse website traffic and usage, and more recently libraries are using a variety of software to track and analyse their social media impact.

Deakin University Library is using the power of GA (Google Analytics) to monitor, report and drive changes to the Library's online presence. GA is used across the library's online services, including the Library website, research repository, discovery platform and catalogue to capture, measure and visualise a complete picture of how users engage with the Library site. Interpretation of the data enables the Library to determine where changes need to occur to improve visits, and then to monitor and track the impact of changes that are implemented. In addition to the use of GA for tracking client engagement with the Library's online presence, the Library has also

harnessed the capability of additional software JIRA to assist in tracking business workflows and to assist in data visualisation. These experiences are outlined in the next section of this paper.

JIRA: TRACKING BUSINESS WORKFLOWS AND DATA VISUALISATION

In 2012 the Library investigated use of new technologies to help effectively manage business workflows and to curate, manage and facilitate data visualisation and interpretation. Atlassian's *JIRA* was already being used within the University and the capacity of the product to manage processes and visualise data had been tested. The Library had previously used several software products to collect and manage manually recorded client inquiry data, including *Reftracker* [3] and more recently *LibAnalytics* [4]. *LibAnalytics* is still being used to collect and report client group training activity. However these products lack the analytics capability of *JIRA.*

JIRA, a commercial issues tracking software product, is highly customisable with data capture fields and workflows that can be modified to suit Library processes. "Projects" are established in *JIRA* and "issues" are created for each task or process in the project. Issues have statuses, for example open, in progress and closed. Associated workflows handle the transitions between the statuses.

TRANSITIONING LIBRRAY SERVICES TO *JIRA* MANAGEMENT

Initial use of *JIRA* commenced with the inter-library loans service. The movement of this service to a new management system was also necessitated by major technical issues with the Library's existing inter-library loans software. A web form captures the client loan request, automatically creating a *JIRA* issue. The issue is assigned, tracked and completed via a responsive and streamlined operation covering every step of the process. Issues are always assigned to a staff member, and any changes to an issue are tracked ensuring full accountability and workload reporting across areas, units, teams and individuals.

Having determined that *JIRA* was successful in managing inter-library loans, further Library business processes were progressively transitioned to the system.

DATA AGGREGATION AND VISUALISATION

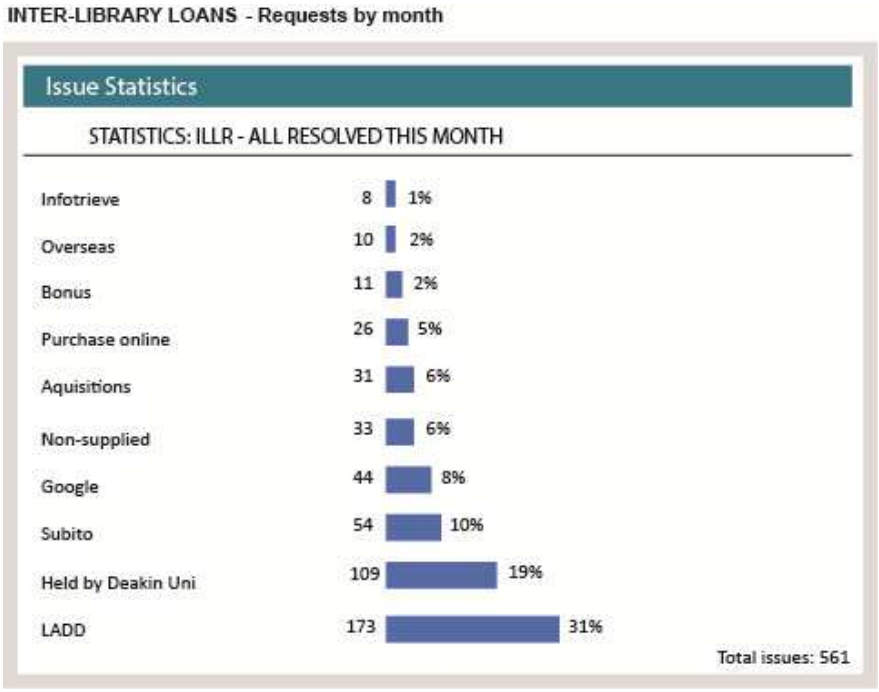
In addition to managing workflows, *JIRA* has proved to be effective in providing an integrated data aggregation and analytics tool. Data from many services and processes is collected in real-time and displayed via a series of web-based dashboards. The visual display helps make sense of the data and enables dependencies and trends to be more readily identified by a range of staff who may not have backgrounds in data interpretation.

An example of how the Library is using the visualisation capabilities within *JIRA* to optimise services, is the analysis of real-time service data to identify peaks. The analysis enables supervisors to adjust resources to meet demands. In the case of the interlibrary loans service, analysis of the visual pattern of suppliers of requested items has enabled the Library to identify that a percentage of requests were for items held in-house. This analysis informs ongoing improvements and modifications to the

[3] Reftracker is a proprietary product produced by Altarama, and is designed to manage reference inquiries.
[4] LibAnalytics , produced by Springshare, provides a single platform to store and analyse library data and usage statistics.

Library website and discovery layer to better enable clients to find the resources they seek.

Figure 2, Interlibrary Loans Requests by Supplier



QUALITATIVE DATA INTERPRETATION

JIRA also blends the quantitative and qualitative as the “numbers” generated from managed processes can be balanced by contextual information. For example the *JIRA* forms are customised to solicit additional qualitative or descriptive information from staff who input the data, via free text fields, or keywords/tags. Such information provides a means by which managers, supervisors and teams can better interpret client needs, identify service trends and staff training needs. Within *JIRA* tags are displayed in a “heat map” which displays the top inquires over a specified period of time. Supervisors and teams unpack that data further by analysing the detailed nature of those inquires. This mix of quantitative and qualitative data is enabling the Library to develop a better picture of clients and their needs.

Figure 3, Monthly Heat Map of Library Service Activity Data

As more business processes and service data are transitioned to *JIRA*, the richness of the data increases. *JIRA* has the capability to support the Library in aggregating data about individual clients, covering many aspects of their interactions and over specified periods of time and via different service points and locations. The interpretation of this data will feed into more personalised and targeted support for clients.

NEXT STEPS WITH *JIRA*

The versatility and effectiveness of *JIRA's* management capabilities is demonstrated by the array of business processes that are now being managed by the system. At the time of writing this paper, *JIRA* is managing client services activity, including inquiries received at Library information points, by telephone, and online, and individual client consultations; all changes to the Library website; the workflow associated with the request of new electronic resources, from request to pricing, and licensing through to ordering; and by many other teams across all areas of the Library to track day-to-day tasks, projects and feedback.

However no system is perfect. *JIRA* does have limitations. In particular, due to the workflow processes integrated within the system, capturing data after an event is tedious as the issue or process being tracked is already complete. This makes it difficult to use JIRA to collect data on completed activities such as digital literacy workshops or learning activities conducted for students and staff. While data associated with these activities is currently being collected and analysed using *LibAnalytics*, it is fed into an overall monthly report reviewed by Library teams and management.

CONCLUSIONS and FUTURE DIRECTIONS

TRANSFORMING DATA INTO A VALUE PROPOSITION

Like other organisations, the Library collects, curates and preserves a vast amount of data. It is easy to continue to collect data because it has always been collected, is readily available and may be of value for some future unknown purpose, However the effort and investment in resourcing and managing this asset is considerable. It is imperative that the Library collects "what counts" within the context of institutional requirements, particularly around the big issues of outcomes for students, for research, and for the bottom line.

Data on its own is insufficient to demonstrate a value proposition for the University community. Bryce Roberts observes that "the value of data is unlocked through context and presentation" (Roberts cited in Power 2014, p. 224). For the University a more powerful story about how the Library is being used can be told by drawing together data derived from service operations, use of strategic resources and assets, and financial performance data to contextualise and present a "persona" of use. "Personas are frequently used in marketing and systems designs to illustrate a specific demographic, attitude and/or behaviour, and their use can be translated into the academic and library setting (Volentine, Whitson & Tenopir 2013, p.1). A persona can change over time and be adapted to speak to different stakeholders. For example, looking back to 2007 data indicates that "John" visited the Library 44 times that year, borrowed 17 books, asked 2 Library questions and accessed 65 e-resources. By 2013 that pattern of use had changed and data now shows that "Sue" visited the Library 49 times, borrowed 8 books, asked 3 Library questions and accessed 116 e-resources. What will the future story be? Data will inform that view

but the data elements may well change and focus more on how the Library is contributing to students' achievement of learning goals.

Personas are frequently used in marketing and system designs to illustrate a specific demographic, attitude and/or behaviour, and their use can be translated into the academic and library setting.

It is essential that the Library continues to develop the partnership with the University's planning body, SIPU, to create a two-way feed of data to inform significant projects and strategic decision-making.

As part of the Library's development of data literacy and application of data intelligence to strategic decision making and quality improvement, all portfolio areas are drawing on data analytics. For example, in contributing to the University's program of course enhancement, Library capability building programs for academic staff are being tracked in relation to Faculty priorities to ensure Library resource allocation is most effective. Secondly, as the University moves to new student enrolment models, the Library's review of service provision to student cohort groups has been informed by data on student demographics, patterns of library resource use and changes to course delivery. And thirdly, a quality improvement program for Library discovery services are utilising Google Analytics to monitor user responses to developments in interface, recommender and new functionality to create a new generation web scale discovery solution.

PROJECT DELIVERABLES

The Library projects outlined in this paper have resulted in positive outcomes. Project deliverables include the creation of a comprehensive Library data inventory which provides detailed information about data assets, data sources, governance and curation processes.

Findings from the assessment of data management, governance processes and associated business risks, highlighted the critical importance of data as a corporate and strategic asset. The value gained from use of data can only be as good as the quality of the data itself. The Library review documented issues around data governance and proposed methods to improve the quality of data, and associated management processes. The development of a governance framework with agreed roles and responsibilities for business owners, data stewards and data administrators will greatly assist this process. Further recommendations to improve data management were reported to Library senior management and work will be undertaken this year to further refine the business intelligence and analytics strategy.

In addition to the data audit and review project, several core Library datasets have been successfully aggregated into a new data curation and analytics tool, *JIRA,* which also provides powerful analytics capabilities. To further enhance *JIRA*'s capabilities, the Library is investigating a number of plugins and add-ons to improve the reporting capabilities of *JIRA*, including eazyBI *JIRA* reports and charts plugin.[5]

[5] eazyBI JIRA reports and charts plugin is used to create custom JIRA reports, charts and dashboard gadgets.

DEVELOPING A DATA CULTURE

The Library has developed an active data culture, where awareness of the value of data and the use of data to inform decision making and support evidence based library practice is widespread. Data interpretation has become a collaborative process involving teams that span all areas of the Library. For example regular weekly, monthly and trimester data reports analysing client activity and interactions, on campus and in the “cloud”, are interpreted by teams and their managers. Data reports, and data visualisation using analytics products like *JIRA* help staff make sense of data, and more readily identify patterns and trends.

Ensuring staff develop data literacy is critical if the Library is to improve business processes, financial performance, resource management, and develop services. “Strong analytical skills and the demonstrated ability to report findings from analysis of data and information” is now an essential selection criteria included in a range of Library staff Position Descriptions. For managers, the Library needs decision makers who know how to develop and grow services using the insights gained from data.

In conclusion, this paper has provided insights into multiple projects running within Deakin University Library and has outlined lessons learned in consolidating data across major Library services. While the projects have raised as many questions as have been answered the Library has made significant progress in developing a comprehensive dataset to support business decisions, and in so doing allowed the Library to optimise operations and services for the benefit of clients. Transforming data into information and understanding to drive decision making, and to create and communicate value for the University community is an ongoing challenge. Focussing energy and resources on contributing data to help investigate the “big” issues and telling qualitative stories using quantitative data will assist this process.

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