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The Academic Library as a University Research Business Intelligence Partner

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Abstract
Ranked in the world's top 50, The University of Queensland (UQ) is a comprehensive research and teaching institution. The University has an established Planning and Business Intelligence Office (PBI) that provides central reporting infrastructure (via SAP Business Objects) as well as analysis support for strategic planning and decision making. On top of the support provided by PBI, some data providers, especially in areas with complex datasets that require expert knowledge (e.g. awards; publications), partner across the University to deliver bespoke analyses of their data. Underpinned by an institutional repository rich in publication metadata and bibliometric indicators, the Library partners across the University to enable and deliver research business intelligence in the areas of:

- Collaboration analysis
- Capability mapping
- Strategic recruitment
- KPI reporting and planning
- ORCID registration and use
- Open access compliance

Research is core business at UQ, and the Library's institutional repository UQ eSpace has evolved in response to global, national and institutional drivers to become more than the institutional open access repository: UQ eSpace is the University's official source of publication data and an integral part of the business intelligence environment. Services have been developed by leveraging the data within UQ eSpace, and, as an in-house built system, the Library has developed it to deliver functionality to ensure it is a strategic asset of the University.

In this case study, we will discuss the business intelligence activities that the Library enables and delivers to ensure the institution can make evidence-based and strategic decisions. Taking into account the Library's unique position in supporting the institution's business intelligence environment through its custodianship of the repository UQ eSpace, the paper will include discussions around resourcing, systems, tools/methodologies, and opportunities for growth.

Keywords: business intelligence; research strategy; research performance; strategy and planning

About The University of Queensland
The University of Queensland (UQ) is one of Australia's leading research and teaching institutions. The University articulates that it strives for excellence through the creation, preservation, transfer and application of knowledge, with a current vision statement: *knowledge leadership for a better world*. UQ is consistently awarded the maximum five-star rating for research grants and research intensity in the Good Universities Guide, with the University's reputation for research excellence underpinned by its 55th global ranking in the Academic Ranking of World Universities. UQ's research addresses national and global cultural, environmental, economic and social challenges. University leaders set the agenda for the organisation, with decisions regarding the research portfolio informed by the current state (areas of excellence and emerging strengths), known challenges and future opportunities for growth, and set against a backdrop where University rankings, together with the Australian Government's innovation, engagement and impact agenda are prominent.

Business Intelligence
Business Intelligence (BI) is "an umbrella term that includes the applications, infrastructure and tools, and best practices that enable access to and analysis of information to improve and optimize decisions and performance" [Gartner, 2019].

The global university ecosystem is competitive and universities must maintain an understanding of their market base, as well as internal and external performance. In Australia, funding for research via grants from the major funding bodies, the Australian Research Council (ARC) and the National Health and Medical Research Council (NHMRC), does not cover the full cost of research. The systemic costs of research across Australian institutions are quite high. This has led to a very strong focus on university rankings and research performance, with the Australian Research Council conducting research evaluation exercises of the university sector through the Excellence in Research for Australia (ERA) initiative in 2010, 2012, 2015, 2018. The strategic importance of research performance is directly related to the role rankings play in international student recruitment, with international student fees enabling a research-intensive institution like UQ to fund the full cost of its comprehensive research program.

Maintaining a competitive advantage and with ever-increasing amounts of raw data available "universities are one of the types of organizations that have the most needs that can be addressed based on data-based decisions" [Combita Niño, Cómbita Niño, & Morales Ortega, 2018]. That is, universities can benefit from strong BI infrastructure and services.

Business Intelligence at The University of Queensland
UQ has a culture that promotes evidence-based decision making and that is supported by a complex and robust business intelligence environment. The Data Warehouse is UQ's central repository of corporate data and the UQ Central Integration Platform allows the data from a range of internal and external sources to synchronise and integrate. This data becomes available for interrogation and presentation in UQ's installation of SAP BusinessObjects. In addition, a recently added application programming interface (API) layer allows other systems to call on business assets. API capabilities enable better integration of systems and thus business processes that draw on increasingly rich data, which can be exploited to facilitate planning and decision making.

The Planning and Business Intelligence Office (PBI) are the business owners of the Data Warehouse and SAP BusinessObjects. Specifically, PBI is responsible for the management and development of the Data Warehouse and standard reports available to staff across all areas of the University.

PBI liaise closely with data owners within the institution to bring data into the Data Warehouse and a team of Business Analysts work with end-users to create standard and bespoke reports that link data together from many systems. PBI staff have good knowledge of all data sources available in the Data Warehouse and can work with casual users of the data to produce reports in response to business needs. However, some data within the University is sufficiently complex

(research income, grants, scholarly publications) to require domain knowledge and additional reporting capability (including additional information and tools) to effectively leverage it for decision making. In these cases, units employ their own data specialists and partner closely with PBI to design standard reports, and also partner across the university with end-users on an ad-hoc basis.

UQ Library is one of the university units employing domain experts to deliver BI services, which will be the focus of this case study.

Library role in Business Intelligence
Libraries have a long history of collecting and managing data about collections, which have evolved with the methods of content delivery (borrowing statistics, gate counts, ebook borrowing, click-throughs). While these types of data are inarguably important to understand the library's client base and assist with planning, it has only recently been the case that academic libraries are harnessing their data to inform broader institutional planning. For example, there are numerous examples in the literature of libraries exploring access and usage statistics and how they link with student performance and student attainment [Zhang, Oussena, Clark, & Hyensook, 2010; Stone & Ramsden, 2013; Thorpe, Lukes, Bever, & He, 2019]. With the rise of open access (OA), libraries embraced the development and implementation of institutional repositories (IRs) as key pieces of university infrastructure for sharing the outputs of research with the global community. With these developments, libraries began collecting and reporting on the number of open access documents within their repositories. UQ Library was a leader in this space, developing repository infrastructure in-house based on the open source Fedora software in the early to mid-2000s to support the OA agenda, in line with national and international trends.

In parallel with these library developments, global drivers in the research space which have directly influenced library service offerings have included the rise of university rankings and research quality assessment exercises. There has been a rapid rise in the application of bibliometrics to measure research performance and a corresponding increasing interest in understanding the research performance of individual academic staff, research groups and organisational units within universities. In turn, this led to the emergence of Current Research Information Systems (CRIS), designed to provide data about researcher publication behaviour and university research outputs. In many universities, the institutional repository and the CRIS system, most notably the publication aspect of the CRIS system, evolved separately. However, at UQ, the institutional repository became the official publication system in 2008.

UQ Library is organisationally within the Office of the Deputy Vice-Chancellor (Academic) portfolio. However, as an academic library in a top-ranked comprehensive research institution, the Library has a core mission to support research academics and, more broadly, design and develop services that contribute to the ongoing success of the research effort. In this context, the Library recognised that the data within the institutional repository was a strategic asset of the University that could be leveraged to enhance understanding of research activity, capability, collaboration and performance. The Library invested in infrastructure, developed staff capability and designed and implemented new services to position itself as a reliable provider of rich institutional data and business intelligence, specifically in the area of University research publication-related information, including bibliometrics.

Enabling Library systems
The institutional repository managed by UQ Library is UQ eSpace. As the official university system for collecting publication metadata, it is a core piece of University infrastructure with value for internal business intelligence and reporting, and for external corporate reporting such as the Australian Research Council's Excellence in Research for Australia exercise. UQ eSpace supports UQ's Open Access policy by facilitating the sharing of research outputs, including post-referee accepted author versions of publications.

UQ eSpace is a bespoke system, originally based on the Fedora open source platform but a recent project moved it into a continuous delivery model on more sustainable and highly available infrastructure. This was achieved in part by migrating UQ eSpace to Amazon Web Services (AWS) ecosystem as the high-availability infrastructure solution.

The project also optimised the use of external sources, with extensive use now made of APIs to harvest metadata records from a range of external data providers including Clarivate's Web of Science and Incites, Elsevier's Scopus, Pubmed, ORCID, Crossref and Altmetrics. Metadata includes a range of article-level citation metrics, augmented by relative citation benchmarks calculated by analysis of Scopus data, as the Library has a Custom Dataset from Elsevier's Scopus.

UQ eSpace is therefore a rich source of article-level metrics, with data providing a range of perspectives on individual article 'performance' which can be aggregated in different ways in downstream University systems (via Central Integration Platform and Data Warehouse) to provide insights related to individuals, research areas, organisational units and the University as a whole.

Information resources required to support research and the research agenda are evolving to be more than just databases, but tools which simplify research and satisfy the diverse research information needs of the research community. Information resources in this context include scholarly resources traditionally provided by the Library and now available online, but also includes for UQ Library:
- Citation databases: including Web of Science, Scopus, Dimensions Plus
- Bibliometric and research evaluation tools: Incites, SciVal, Dimensions API
- Funding databases: Research Professional, SPIN, Grantsearch
- Other tools: Overleaf, VosViewer, Leximancer, The Lens
- Bespoke UQ systems developed by the Library: UQ eSpace

UQ Library service model
The UQ Library services to support researchers are delivered online, by liaison librarians, as well as through the work of the Library's Scholarly Communication & Repository Services (SCARS) teams. As discussed, these services have evolved in response to the global and national drivers that impact University strategy and have implications for individual researchers and their information needs. The drivers which have had the greatest impact on service development and delivery are:
- University rankings and research evaluation,
- Open Access and open scholarship (including FAIR data),
- Research data integrity and reproducibility of research,
- Predatory Publishing, and
- Innovation, engagement and the social, cultural, economic and health impacts of research.

SCARS has three teams delivering a range of services in collaboration with liaison librarians: the Research Outputs and Impact Team, the Scholarly Publishing Team and the UQ eSpace Publications Team. The services are relevant across the research lifecycle and are delivered to stakeholders including the Vice-Chancellor and President's Office and other members of the Senior Executive, Faculty, Institute and School senior executives and managers, research groups and individual researchers, and Higher Degree by Research students. Services are across 4 main areas:

1. Bibliometrics, research evaluation, data citation, collaboration and capability mapping, and research impact beyond the scholarly
2. UQ eSpace, the institutional repository plus the official source of University research output data plus article level bibliometric and Altmetric indicators
3. Scholarly publishing services, including choosing quality outlets, using Overleaf, avoiding predatory journals and conferences, ORCID, data publishing and Open Access
4. Research Data Management, including advice and training plus in-kind support to a University-wide project to develop, implement and operationalize an integrated research data management system for a whole-of-research lifecycle solution.

SCARS are also involved in providing the UQ research community with information about grant funding opportunities and how to use grant opportunity databases. This work is done in

collaboration with the Office of Sponsored Research within the Office of the Deputy Vice-Chancellor (Research).

We have taken an innovative approach to developing our suite of services, including new staffing models and the development of new skills and expertise, including staff training and ongoing professional development (Brown, Alvey, Danilova, Morgan, & Thomas, 2018).

Library Business Intelligence Areas

Research collaboration
UQ Library partner with UQ's Global Engagement team, who support the development and implementation of The University of Queensland's Global Strategy and manage international partnerships, programs and projects, to deliver collaborative publication reports. The publication reports are prepared by the Library Research Outputs & Impact (RO&I) team and are provided directly to UQ Global Engagement and also distributed widely (VC, DVCR, International Office). These reports focus on key institutional and/or industry partners or regional areas, which assist with the identification of opportunities to extend UQ's research and reputation globally. These reports are compiled using tools such as InCites, SciVal, and The Lens. The analyses are based on co-creation of research outputs, such as co-authorship of publications and inventorship of patents.

Research capability mapping
With a University strategy focussed on solving global challenges, the RO&I team has expanded the traditional bibliometrics offering into a service that analyses publications using a range of tools to identify research capability in broad themes, such as energy or water. Publication data is analysed to highlight the breadth, depth and quality of related research, and to identify key UQ researchers active in relevant areas and their internal collaboration networks. These analyses involve interrogating the publication data in different ways, rather than relying on traditional subject area schemas available in the bibliometric tools such as Incites and SciVal. Tools and packages such as VosViewer, Leximancer, and R are used for this work, with the RO&I team upskilling in a self-directed way to develop the competencies required to deliver this service.

Strategic recruitment
Talent retention and recruitment contribute to the ongoing success of the University's research portfolio as well as allowing for the development of new research capabilities. In this context, the RO&I team provides reports that facilitate an understanding of the scholarly impact of individual researchers, including the different contributions they make to existing and/or emerging research strengths and trans-disciplinary capabilities.

Key Performance Indicator planning and reporting
The University has a range of Key Performance Indicators (KPIs) relating to research publications, including productivity, citation impact and collaboration metrics. UQ eSpace is the source of the data, and the expertise of the RO&I team is called upon to assist with setting appropriate KPIs, including advising on the analysis of the article-level data to determine meaningful and robust metrics which align with the recommendations of the Leiden Manifesto [Hicks, Wouters, Waltman, de Rijcke, & Rafols, 2015].

ORCID registration and use
UQ is part of the Australian ORCID consortium. ORCID integration is managed by UQ Library, and as of May 2019, 80% of UQ academic staff (levels B-E) have a linked ORCID, authenticated in University systems via UQ eSpace and available as an eduperson attribute in the University's identify provider (IdP), that is it is an attribute in the Lightweight Directory Access Protocol (LDAP) schema. Library efforts are focused on ensuring ORCIDs are set up properly, curated and linked to UQ, with particular emphasis placed on research staff using ORCIDs in their publishing workflows to enhance the quality of our metadata harvesting into UQ eSpace. UQ academic staff are publishing with their ORCIDs included in their author profiles in journal manuscript systems, and we are tracking this via CROSSREF imports into UQ eSpace. One UQ researcher has published 105 outputs with his ORCID in the journal manuscript system, and the metadata for these outputs flowed seamlessly to UQ eSpace and each record

was linked to his UQ profile without any manual work. This work increases the efficiency of the RO&I team, who are able to provide detailed reports for individuals and research groups to evidence claims made in grant applications relating to research quality, collaboration, thought leadership and social, cultural and economic impact.

Open access monitoring and compliance
As a generator of new knowledge, UQ promotes sharing this knowledge with the global community by making publications freely available online as soon as possible or within 12 months of publication. This is reflected in UQ's Open Access Policy, with the university committed to ensuring that all outputs are disseminated as broadly as possible, where legally possible, with the university committed to ensuring that the needs of individual researchers, their funder agreements, and the university are all met. In this context, the Library works with the UQ academic community to promote the use of the Library's UQ eSpace as a way to share knowledge widely without payment of an article processing charge (APC). This is achieved through uploading post-referee accepted author versions of publications to UQ eSpace, known as the green route to OA, and fully supported by the 2 major Australian grant funding agencies, the ARC and NHMRC. The 2019 CWTS Leiden Ranking results indicate that this approach is successful, with 47.5 % of UQ's outputs OA, the third highest OA output as a percentage within Australia. Internal reporting of open access publications provides data for understanding OA compliance as well as ensuring the University is meeting its 'public good' objective.

Research Data
The Library is currently supporting the University's vision of knowledge leadership for a better world through a proactive approach to the management and sharing of research data underpinned by the FAIR principles. The Library has an evolving research data management service, and research datasets can be described and shared using UQ eSpace, with digital object identifiers (DOIs) able to be minted for data collections and appropriate licensing applied to the datasets. Research datasets underpinning publications can be cited in publications using the DOI, in line with best-practice data citation. UQ eSpace facilitates linking between the dataset record and related publication records. The metadata records for datasets are harvested by Research Data Australia and indexed in Clarivate's Data Citation Index offering insight into the re-use of University research data.

Ad-hoc metrics reporting
In addition to the above, reports are prepared upon request, including for School Reviews, rankings analysis, and supporting the preparation of team metrics and impact information for major grant rounds.

Opportunities
The RO&I team have undertaken some preliminary work in the publication co-authorship network space, which has revealed insights regarding collaboration within UQ that is contributing to a broader conversation on breaking down institutional barriers to drive innovation. Another piece of work currently being investigated is the active matching of funding opportunity information with researcher interests. Further work in these areas is envisaged, with the Library RO&I team members actively developing new skills and expertise in areas including topic modelling, data mining and data visualisation, all of which can be applied to better understand the research output of the University.

Works Cited
Brown, S., Alvey, E., Danilova, E., Morgan, H., & Thomas, A. (2018). The evolution of research support services at an academic library: specialist knowledge linked by core infrastructure. *New Review of Academic Librarianship, 24*(3-4), 339-350. doi:10.1080/13614533.2018.1473259

Combita Niño, H. A., Cómbita Niño, J. P., & Morales Ortega, R. (2018). Business intelligence governance framework in a university: Universidad de la costa case study. *International Journal of Information Management.* doi:10.1016/j.ijinfomgt.2018.11.012

Gartner. (2019, May 24). *IT Glossary*. Retrieved from Business Intelligence:
https://www.gartner.com/it-glossary/business-intelligence-bi/

Hicks, D., Wouters, P., Waltman, L., de Rijcke, S., & Rafols, I. (2015). Bibliometrics: The Leiden
Manifesto for research metrics. *Nature, 520*(7548), 429–431 . doi:10.1038/520429a

Stone, G., & Ramsden, B. (2013). Library Impact Data Project: Looking for the Link between
Library Usage and Student Attainment. *College & Research Libraries, 74*(6), 546-559.
doi:10.5860/crl12-406

Thorpe, A., Lukes, R., Bever, D., & He, Y. (2019). The Impact of the Academic Library on
Student Success: Connecting the Dots. *portal: Libraries and the Academy, 16*(2), 373-
392.

Zhang, Y., Oussena, S., Clark, T., & Hyensook, K. (8-12 June 2010). Using data mining to
improve student retention in HE: a case study. *ICEIS - 12th International Conference on
Enterprise Information Systems.* Portugal.