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### **Capturing business intelligence required for targeted marketing, demonstrating value, and driving process improvement**

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## **Capturing business intelligence required for targeted marketing, demonstrating value, and driving process improvement**

### **Abstract**

The University of Wollongong (UOW) has undertaken an innovative and collaborative research project to demonstrate the value that can be provided by academic libraries. The tool developed, the "Library Cube", is a data warehouse linking student borrowing and use of electronic resources to students' academic grades and demographic information. The project is different to other institutions' efforts to link usage to student outcomes, in that the Library Cube is not a one-off research project, but is now an ongoing part of UOW's systems and performance reporting and represents a fundamental shift in evaluating the student experience through the integration of discrete systems and datasets.

The Library Cube demonstrates a new direction for evidence-based research. Analysis enabled through the Cube has revealed a very strong relationship between library usage and students' academic performance. This information will improve UOW Library's ability to demonstrate value to clients and stakeholders. The Library Cube has also delivered some anticipated and unexpected findings on the relationship between social variables (such as gender, age, and citizenship) and library usage behaviors; and in doing so has also identified potential target audiences for Library promotions and engagement strategies.

### **Keywords**

Library Cube, Library usage, Student grades

### **Disciplines**

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# **Capturing business intelligence required for targeted marketing, demonstrating value, and driving process improvement**

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## **ABSTRACT**

The University of Wollongong (UOW) in New South Wales, Australia, has undertaken an innovative and collaborative research project to demonstrate the value that can be provided by academic libraries through a tool called the '*library cube*'. The library cube consists of two major components: a backend system containing a multidimensional data warehouse linking student borrowing and use of electronic resources to students' academic marks (grades); and a frontend system that allows users to quickly and easily create cross tabulated data views, such as average student marks by frequency of library resource usage and gender. The project is different from the efforts of other institutions to link usage to student outcomes, in that the library cube is not a isolated research project, but is now an ongoing part of UOW's systems and performance reporting. The library cube represents a fundamental shift in evaluating the student experience through the integration of discrete

systems and datasets. It has revealed a very strong relationship between student library usage and academic performance. This information will improve UOW Library's ability to demonstrate value to clients and stakeholders. The library cube has also delivered some anticipated and unexpected findings on the relationship between social variables, such as gender, age, and citizenship, and library usage behaviors; and in doing so has also identified potential target audiences for library promotions and engagement strategies.

## **1. Introduction**

The University of Wollongong Library (UWL), like many libraries around the world, has long used patron satisfaction surveys to drive continuous improvement through measuring the quality of services, identifying changing student perceptions and needs, and obtaining unstructured feedback on what patrons consider important. The surveys were and will continue to be useful. They do, however, have a number of significant limitations, including: they are no longer regarded by administrators as sufficient evidence of impact; they are naturally biased towards library users; they are not run frequently enough to support marketing; and they do not measure the impact of the library on clients' success, only respondents' subjective assessment of value and performance.

UWL required a cost effective and sustainable way of collecting information on its impact on client outcomes, that is, what the client receives for his or her investment of time and energy spent in using library resources and services (Neal, 2011). Alternative methods for demonstrating value, such as contingency valuations and survey-based research were, in UWL's opinion, equally limited. It is in this context that UWL decided to explore alternative methods for demonstrating its value.

In 2009, UWL began working with staff from the University of Wollongong's (UOW's) Performance Indicator Unit<sup>1</sup> (PIU) to develop a *library cube*. PIU has developed a number of cubes to help UOW to make better informed business decisions. From the users' point of view, the cubes provide an elegant way to interrogate existing datasets, allowing users to drag and drop dimensions and measures into cross tables via a web-based platform called Cognos. The library cube is based on a multidimensional data warehouse that joins library usage data with students' demographic data and their Weighted Average Marks (WAM or 'marks'<sup>2</sup>).

The purpose of the project is to demonstrate the value of the library in supporting teaching and learning, and to collect information to help UWL improve the impact of its resources and teaching activities with respect to student academic performance and student engagement (Jantti & Cox, 2010).

## **2. Problem statement**

There are two significant interrelated problems facing academic libraries that require urgent attention. First, libraries are under increasing pressure to demonstrate value in the context of economic constraints and growing competition. Libraries need compelling evidence that directly links their activities to positive outcomes for their clients. Libraries that do not provide such evidence will be at an increasing risk of having their funding reduced or eliminated (Jantti & Cox, 2010).

Academic libraries also face a lack of ongoing access to up-to-date marketing intelligence that can be used to identify which segments of their client base are not using

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<sup>1</sup> The Performance Indicators Unit exists to manage and provide accessible and integrated reporting and analysis solutions through the secure, Web-based Performance Indicators Portal. It collects and leverages critical data through scorecard, reporting, and analysis capabilities providing staff with a one-stop data source that is needed to achieve a clear picture of day-to-day operations: <http://www.uow.edu.au/services/pi/index.html>.

<sup>2</sup> Please note: 'marks' are the same as 'grades'.

library resources and services. Without this information, libraries cannot identify, in an accurate and timely manner, whom to target for promotions, or whether promotions have increased the market share of information consumers. Sound marketing can improve a library's value proposition, and being able to articulate strong evidence of value enhances a library's ability to market itself effectively. Consequently, a lack of evidence linking clients' library usage to positive client outcomes can lead to a cycle of devaluation, as poor evidence of value leads to weak marketing impact, leading in turn to poorer usage, which then reduces the value offered by the library as the cost per client increases. Breaking this cycle is paramount to the long term survival of academic libraries.

For both problems the issue is a lack of ongoing valid and reliable data being collected, from which generalizations can be made about the value provided by libraries.

### **3. Literature Review**

In 1998, Lindauer assessed the state of literature on library performance measures and concluded that:

There are several good publications that offer field-tested measures and data-gathering techniques to provide guidance in all aspects of measuring and evaluating inputs, processes, and outputs. However, almost none of these publications provides measures or methods for assessing the impact of academic libraries on campus wide educational outcomes. Overwhelmingly, the literature is internally focused, looking at the academic library as an overall organization or at one or more of its components or services (Lindauer, 1998, pp. 547-548).

Lindauer went on to state that "The common observation made in numerous publications is that what is most needed are performance indicators that demonstrate the academic library's

impact on desired educational outcomes and methods to measure them (Lindauer, 1998, p. 548).

In the 13 years that have passed since Lindauer's paper was published, there have been a number of developments and innovations in the area of measuring value and impact. If the recent proliferation of conferences on the subject are a valid indicator, however, then the problem of how to demonstrate value is far from resolved.

*Contingent valuation* is arguably the most significant break from existing methods of measuring value, given that it explicitly attempts to measure the economic value of libraries, as opposed to focusing on softer measures of value. A recent significant example was research commissioned by the British Library in 2003, in which over 2000 random members of the public and direct British Library users were asked the following questions:

- How much they would be willing to pay for the library's continued existence?
- What was the minimum payment they would be willing to accept to forgo the library's existence?
- How much did they invest in terms of time and money to make use of the library?
- How much they would have to pay to use alternatives to the library, if such alternatives could be found (British Library, 2003)

Using this method, the British Library found that it generated 4.4 times the value of its funding. Many other libraries have also used contingent valuation. Indeed, Poll has advocated for an International Standards Organisation (ISO) standard for measuring impact based upon the contingent valuation method (Poll, 2010).

Unfortunately, the validity of contingent valuation hinges upon clients having formed an opinion of the value of the free service they were using prior to being surveyed, and that

such opinions would accurately predict their future behavior, should they ever have to choose to fund a public library. Research has found, however, that respondents are likely to overestimate both their willingness to accept and their willingness to pay, which are the two key questions upon which contingent valuations are based (Oakleaf, 2010).

The other problem with contingent valuation is the same as all survey-based research. Crafting and implementing a survey instrument that produces valid and reliable results from which generalizations can be made about the wider population is a costly exercise, which at best only produces a snapshot of the situation at the time of the survey.

Contingency valuation is only one among many methods that have been developed to demonstrate value. Indeed, there are so many methods that the Association of College and Research Libraries (ACRL) recently commissioned a report to provide “1) a clear view of the current state of the literature on value of libraries within an institutional context, 2) suggestions for immediate ‘Next Steps’ in the demonstration of academic library value, and 3) a ‘Research Agenda’ for articulating academic library value” (Oakleaf, 2010, p. 11).

The ACRL report provides a comprehensive overview of the existing literature on the subject of measuring impact and value, and it would be largely redundant to add anything further, other than point to the key findings on measures relevant to students:

- There has been some survey research into the link between student retention and library use, “but the challenge lies in determining how libraries can contribute and then document the contribution” (Oakleaf, 2010, p. 34). Some of student engagement surveys contain library-related questions from which it may be possible to infer the contribution made by libraries. These surveys are limited by their reliance on indirect measures and self-reporting (Oakleaf, 2010). There are many other examples of survey-based research, such as the ARL Mines survey (Oakleaf, 2010), that arguably suffer the same limitations.



- There is a large body of literature on information-literacy assessment, with the most recent literature focused on assessing outcomes using standardized assessment tests., Most research consists of small studies, however, and there is a need for rigorous larger-scale studies (Oakleaf, 2010). Some work has been done on assessing student learning outcomes from student work (e.g., papers, reports), and this approach is promising (Oakleaf, 2010)., Information-literacy assessment is likely to be even more expensive than surveys, however, though it does have the potential to offer richer and more valid data than surveys.
- “Academic librarians have not collected individual student data or accessed institutional student information systems, despite the fact that these data sources could be used to demonstrate library value” (Oakleaf, 2010, p. 43). Since implementing the library cube, UWL has become aware of other similar projects, such as the JISC-funded Library Impact Data Project (JISC, 2011; see also Stone, Ramsden, & Pattern, 2011). However, UOW appears to be the only institution to have created an ongoing system that joins usage to student systems data.
- ACRL listed indirect ways of measuring value, such as institutional ranking measures and accreditation (Oakleaf, 2010). Indirect measures can be useful, though such measures are not sufficient in themselves to demonstrate value to all clients and stakeholders. They also assume that activity translates into client outcomes.
- Attempts have been made to identify the social return on investment—that is, the social benefit provided by libraries. However, it is difficult to “isolate the impact of academic libraries on these contributions” (Oakleaf, 2010, p. 56).

Despite all the research around demonstrating value, ACRL concluded that until libraries connect usage of library resources with student attainment (i.e., marks), “they will be

blocked in many of their efforts to demonstrate value” (Oakleaf, 2010, p. 97). UWL has achieved precisely that with the library cube.

## **4. The library cube**

### *4.1. Overview*

The library cube is a dataset that joins usage of UWL resources with enterprise systems containing student demographic data and academic performance using a unique identifier, the student number. This data is contained within an Oracle Data Warehouse with access managed via IBM Cognos 8.4 software system. The entire system is developed and maintained by PIU.

One of the initial challenges of the project was dealing with the privacy issues. UWL was fortunate in that UOW students are required as part of the enrollment process to provide consent to the university to use their personal information for certain purposes, and the library cube fell within the scope of one of those purposes (Jantti & Cox, 2010). If another library wishes to create their own cube, they will need to ensure that they are able to do so under the relevant privacy and data protection laws.

Due to the nature of the data, it is not practical or possible to join all data within a single cube. To expedite the project, and to ensure data integrity, UWL decided in conjunction with PIU to create three separate cubes:

1. The library value cube, which is now in production, is structured around academic teaching sessions, and is used to assess the impact of the usage of UWL’s resources upon UOW students’ weighted average marks (WAM). This cube also allows UWL to review demographics by level of usage. The library value cube is updated after student marks are loaded into UOW’s student system at the end of each academic session.

2. For marketing, UWL needed a cube that could be updated weekly. This information could not be added to the value cube, as WAM is tied to a session, not weeks.

Consequently, the library marketing cube does not contain WAM information. The marketing cube will contain student demographic data, and will also identify the type of electronic resources being accessed (ebooks, lecturers' ereadings, and database names) . The marketing cube is still under development, and will require further testing and refinement before it is ready for user acceptance testing.

3. The process improvement cube is yet to be built. It will be structured around academic subjects, and is expected to assist UWL academic outreach activities.

While there is a large historical dataset for UOW student demographics and marks, UWL only began collecting resource usage data that could be integrated into the library cube from mid-2009 for loans, and at the beginning of 2010 for online resources. Consequently, the library cubes will only have time-series data starting from 2010.

#### *4.2. Library data sources*

The two library data sources fed into the cube are loans data and data relating to usage of electronic resources.

Loans data is extracted from UWL's library information management system. Unfortunately, the only usable data that can be exported from this system that includes the student unique identifier is the total number of items borrowed to date. To build time-series data, an export of data occurs weekly, and the differences between two weeks is the borrowing that occurred over that week.

UWL used *Ezproxy* logs to extract information on usage of library electronic resources. Ezproxy is the system used by UWL to manage access to licensed materials. Each time a user accesses certain library resources, an entry is generated in the log file. These

resources include subscription databases, e-books, and so-called e-Reading materials (electronic readings uploaded by the library at the request of teaching academics), which can be accessed via the library catalogue, or through links provided on UOW's learning management system. While accessing an e-reading item versus obtaining material independently from a subscription database requires different research skills, at this stage in the project, UWL cannot differentiate between the various types of resources being accessed.

The logs contain useful information, such as the students' unique identifier. But they also contain a great deal of extraneous data. Counting the number of entries in the log proved futile, as they vary wildly depending upon the online resource being accessed. Consequently, UWL decided to use the time stamp in the log as a de-facto time session measure, using the following business rules:

- The day is divided into 144 10-minute sessions.
- If a student has an entry in the log during a 10-minute period, then one sixth is added to the sum of that student's access for that session .
- Any further log entries during that 10-minute period for that student are not counted.

Using this logic, UWL can measure how long individual students spent using its electronic resources with a reasonable degree of accuracy, because of the small time periods (10 minutes) being measured. The marketing cube also uses this method, and includes another measure and dimension for the name of the electronic resource being accessed by the student. UWL was able to identify the online resource being accessed through the forensic task of identifying values ("strings") in the Ezproxy log that are unique to the electronic resource. The 10-minute logic that applies to overall usage of electronic resources is also being applied at the more granular level of electronic resource names.

Joining the loans and electronic resource usage data to student demographic and marks data was not a simple exercise, and required extensive collaboration between PIU and UWL to develop robust business rules. For example, one student can be enrolled in many courses, but there is no data available to allow library usage to be attributed to a specific course. UWL decided in this instance that usage can be attributed across the courses on a pro rata basis, as very few students are enrolled in more than one course. There were other complicated aspects to joining data, for example, not all usage of library resources occurs in session, so business rules had to be created to determine when and where to attribute usage out of session to student marks.

The datasets used to create the cubes are very large, particularly the Ezproxy logs. The hardware and software infrastructure used to build the cubes had been pushed to its limits to extract the names of the resources being used from the Ezproxy logs for the marketing cube. There is more useful information that may be gleaned from the Ezproxy logs, as Nicholas, Huntington, Jamali, & Tenopir, (2006) and Nicholas, Rowlands, Huntington, Jamali & Salazar (2010) demonstrated through their forensic mining of client resource usage behavior data from their institutions' access and authentication logs. As computer power improves, UWL will be able to consider the business case for extracting more information from the logs, but currently that is not feasible.

#### *4.3. The cube itself*

Users of Excel pivot tables or Online Analytical Processing (OLAP) cubes will be familiar with much of the functionality of the IBM Cognos system in which the library cube is housed. Users can simply drag and drop the dimensions of the cube—such as gender, faculty, country of origin—either as a field in a cross-tab table, or as a filter value. Users also need to select what they wish to measure, for example, student head count, or total number of

borrowings. The Web-based system allows users to manipulate data easily, and they can even save views.

**<Figure 1: Library Cube snapshot>**

## **5. Limitations**

Before looking at the relationship between usage of our resources and student performance, it is important to acknowledge that:

- Borrowing a book or using an electronic resource does not automatically translate into learning. Even if the student read a book or article, it does not mean they understood it, or used it to complete an assignment.
- There are many factors besides library usage that contribute to a student's academic success, not least of which are academic teaching skills, and a student's attitudes and aptitude.
- Correlation does not prove cause. For example, good teachers might encourage students to use the library more frequently, and therefore the correlation may be a product of teaching skills, rather than engagement with the collection, per se.
- Other variables that may contribute to a student's academic success, such as attendance, either cannot or have not been captured in the library cube, because of technical and resource limitations.

There are, however, a number of factors that increase UWL's confidence in the validity of the findings:

- Sampling error is not a problem, as the data is a census that is frequently updated—weekly for loans and daily for electronic resources.

- There is a very strong relationship between the average marks for each level of resource usage and student marks.
- Finally, with a few notable exceptions, the relationship still holds for many views of the data.

## 6. Findings

There are so many factors contributing to students' academic performance, that, as expected, there is no direct correlation between use of this collection and academic performance, at least superficially.

Figure 2 is a scattergram containing more than 21,000 points: one for each student in 2010, plotting the total hours students spend accessing UWL's electronic resources in 2010 against their marks. There is definitely a shape to the scattergram, with an obvious floor that rises with increased electronic resource usage. Yet, statistically it is unconvincing.

### <Figure 2: Student marks by online resource usage>

However, there is very strong evidence that the library makes a contribution to students' academic success. The evidence is simply buried a little bit deeper in the data.

It is not possible to identify the impact variables such as students' attitudes have on their academic performance, as that data is unavailable, and would be too expensive to collect. It is possible, however, to avoid the need to do this by examining the central tendency of academic performance for a given frequency of usage, and comparing that to the average for other frequencies of usage.

### **<Figure 2a: Student marks by online resource usage>**

Figure 2a plots the average mark for every integer frequency of students' usage of UWL's electronic resources. For example, the average mark for students who never used UWL electronic resources is 58. The average mark for students that spent up to one hour a year accessing UWL electronic resources per year was 62. Figure 2a indicates that there is a very strong nonlinear correlation between average usage of resources and average student marks ( $R^2 = 0.87$ ).

It appears that the principle of diminishing marginal returns applies, with the curve flattening with higher usage. It also appears that strength of the relationship between electronic resource usage and students' academic performance weakens further along the curve, which is most likely caused by the smaller number of students at these frequencies.

The amount of usage per year appears to be very low. UWL staff have anecdotally observed that most students do not read material online, however, but either print it or save it to their thumb drive to read later. The amount of time spent accessing UWL resources is best interpreted as time spent searching for resources, not time spent reading resources.

One possible explanation for the correlation is that it is simply a function of attendance. Students who drop out early are less likely to use the library, and less likely to perform well academically. The library cube is not linked to attrition or attendance data yet (though this may be possible in the future), so it is not possible to test directly for the influence of attendance. However, it is possible to exclude very poor performers from the data. As Figure 2b illustrates, there is an even stronger correlation between library usage and academic performance ( $R^2 = 0.90$ ) after very poor performing students are excluded.

### **<Figure 2b: Student marks by online resource usage (excluding very low achievers)>**



The most notable difference in this subset of students is that the nonusers have a much higher average mark, and that the line of best fit follows a different curve.

The results for the correlation between borrowing and student marks are similar, but not quite as striking ( $R^2 = 0.73$ ). The correlation is not as tight, and the increase in marks with usage is not as steep.

**<Figure 3: Student marks by borrowing>**

Another way of looking at the relationship between student marks and usage of the UWL collection, is to map the frequency distribution of student marks by various usage levels.

**<Figure 4: Frequency distribution student marks by levels of online resource usage>**

Figure 4 shows the diversity of students' marks and the impact of UWL's collection. For example, some students that use UWL electronic resources fail, and some nonusers perform strongly. All else being equal, however, the more students use UWL's electronic resources, the more likely they are to perform better. To put this in perspective, only half of one percent of the high users fail (0.47%), whereas 19% of nonusers fail. In other words, nonusers are 40 times more likely to fail than high users of library electronic resources. The story is similar for loans, but not as dramatic.

There is a significant difference between usage and impact of UWL's printed collection versus its electronic resources. As Table 1 illustrates, nearly one third of UOW students never borrowed a book in 2010. However, only 8% of students never accessed electronic resources. There is also a large difference between the WAM for the higher users of books compared to electronic resources, with a cumulative difference of 11 and 19 marks respectively between nonusers versus heaviest users. Books appear to be used less, and have less impact. Nevertheless, even though the benefit of using electronic resources is very clear, students who borrow books are more likely to do much better than students who do not borrow.

**<Table 1: Library usage by grades and number of students>**

## **7. Discussion**

### *7.1. Implications*

Clearly, there is a very strong message UWL can promote to its clients and stakeholders. There is also a bigger picture. How can UWL differentiate the value it provides, when collections across Australia and the world are becoming increasingly similar? If it is the collection that is unlocking students learning capabilities, then what value can the library provide over and above database vendors or ubiquitous search engines, for example?

Presently, libraries still have a very large role to play in managing access and collection development. Over time, this is likely to become an increasingly tenuous space to occupy. It is not inconceivable to imagine a future where collection development has been largely homogenized, and access and discovery can be administered much more efficiently by external organizations. In this context, selling the message that increased use of the

collection translates into improved student performance carries a high risk. If other libraries were to undertake a similar project, and find similar results, would that be a good thing? Or would the credit increasingly go to database vendors at the expense of traditional libraries? These are important questions, as libraries need to market themselves on their unique value proposition.

## *7.2. UWL's value proposition*

So what is UWL's value proposition? Ultimately, libraries are about connecting authors to readers. Libraries are the intermediaries, the facilitators in this process, and there are four main points at which UWL can add value: engagement, access, discovery, and collection development.

While collection development and accessibility will continue to be the critical bedrock of success, the individual library is likely to be cast more and more in the role of consumer, rather than producer, of these services. Indeed, it could be argued that the outsourcing of academic librarians in Japan is possible because of the changing position of librarians, relative to external vendors and discovery platform suppliers, and that such changes present real risks to the librarian profession:

The wide use of outsourcing [in Japan] has been beneficial to many library operations. . . . However, the long-term effect on the profession of librarianship raises concerns. Limited budgets, a cumbersome management system, legacy organizational structures, narrow employment opportunity, lack of strong leadership and inadequate LIS education programs all combine to make the future of the profession vulnerable. Since library outsourcing has become widespread, the majority of certified librarians who desire to become academic librarians are compelled to look for job vacancies

among commercial vendors. The current library outsourcing environment is building the foundation of a system in which librarians find it almost impossible to further their careers in Japan (Matsuoka-Motleya, 2011, p. 277).

In the past, academic libraries have placed a metaphorical corral around their resources, and have been able to differentiate their collections from other information sources on the basis of quality. The validity of this distinction will be tested by the growing reliability of publicly-created sources of information residing outside library collections, such as Wikipedia. The growth of non-library-based sources of reliable academic information has led to the well-documented information overload; in this context, some libraries have found an expanding niche in assisting and teaching clients to assess the quality of information sources. Even this space is under threat, however, as it is not infeasible to imagine that the level of skill required to assess the quality of sources will diminish and become more mechanical as new technologies emerge, such as the author-rating systems used for Wikipedia. The question then is, what needs can libraries address in the future, given the large-scale changes to the structure of information, and the way people create and use information?

Neal urged academic libraries to “embrace the ‘human’ objectives, like success, happiness, productivity, progress, relationships, experiences, and impact” (2011, p. 427). Following this trajectory of thinking, *engagement* is an area that, with imaginative thinking, could become a “blue ocean market”:

“Imagine a market universe composed of two sorts of oceans: red oceans and blue oceans. Red oceans represent all the industries in existence today. This is the known market space. Blue oceans denote all the industries not in existence today. This is the unknown market space.

In the red oceans, industry boundaries are defined and accepted, and the competitive rules of the game are known. Here companies try to outperform their rivals to grab a greater share of existing demand. The dominant focus of strategy work over the past twenty-five years has been on competition-based red ocean strategies. As the market space of red oceans gets crowded, prospects for profits and growth are reduced. Products become commodities, and cutthroat competition turns the red ocean bloody. Hence we use the term “red” oceans.

Blue oceans, in contrast, are defined by untapped market space, demand creation, and the opportunity for highly profitable growth.” (Kim & Mauborgne, 2005, p. 106)

Enhancing discoverability via web-based systems is a ‘red ocean’ dominated by Google; whereas ‘engagement’ is a potential ‘blue ocean’, one that university libraries have been exploring the periphery for some time:

The academic librarian's role has become both dynamic and challenging, with librarians frequently involved in outreach and management and “embedded” in the classroom, providing instruction in person or via an online management system. At the same time, librarians are required to understand and use increasingly sophisticated, rapidly changing technology, as academic libraries move toward fully digital or nearly digital libraries that must be managed, and their patrons increasingly request the help of librarians to navigate the explosion of information available on the Internet (Shupe & Pung, 2011, p. 413).

What the authors are proposing is not to occupy another space between the database vendors, search engine providers, and clients, however, but to occupy an entirely new space. If the library is simply an intermediary that helps to connect authors to readers, then inspiring a love of reading and learning is a far more rewarding role than showing clients where to click, regardless of how sophisticated such instruction becomes. Inspiring students to read library acquired resources will require a qualitative leap in the role for marketing at UWL, a role that should focus on two main objectives: increasing traction and improving usage.

### *7.3. Improving engagement through increasing traction and usage*

Gaining traction is about ensuring that students get academic benefit from using UWL's collection. A few groups of users are not getting the same impact from using UWL's resources as other groups. For example, UOW domestic female students get a lot more traction from using resources than their international counterparts. The highest domestic female users of electronic resources scored a distinction (75% on average), which is 15 marks higher than nonusers. For international females, however, only the very highest users received any benefit at all, in terms of academic marks, from using electronic resources.

#### **<Table 2: Female Library usage by student type and marks >**

The library cube has revealed a few other areas where UWL could investigate the possibility of improving engagement by addressing poor usage and low traction.

##### *7.3.1. Books*

In 2010, nearly one-third of UOW students never borrowed a book. This finding is similar to the findings from a similar research project conducted by Huddersfield University

Library (Goodall & Pattern, 2011). In the first session for 2011, 49% of UOW students were non-borrowers. The data points to trends that may suggest loans could decline even faster. In 2009, the older students get, the less likely they were to borrow books. This leaves younger students as a baseline support for demand; however, students age 22 and below are a growing group of non-borrowers, and now outstrip the 23 to 29 age group.

The decline in demand for print material matches national and international trends. It is not a uniform phenomena, however, at either UWL, or internationally. As Joint noted, “Some U.S. print library collections are being used less, but not all. And there are significant library collections outside the U.S.A. with circulation figures showing increases, in direct contrast to North America” (2008, p. 88).

Similarly, the library cube has demonstrated that there are still some groups that get a sizable academic benefit from borrowing, such as University of Wollongong College students, students in particular disciplines (e.g., arts), and cohorts (e.g., international males). Consequently, loanable resources will continue to be relevant to these students.

### *7.3.2. Gender and origin*

Fifty-two percent of UOW male students accessed UWL’s electronic resources for five hours or less in 2010, compared to 34% for females. However, data indicate that males, and domestic males in particular, obtain significantly more traction than females from increasing their usage of resources, both print and electronic. So, *prima facie*, there appears to be a good return on promotion effort to be made in targeting males, both in terms of impact and usage.

Gender differences in usage are not unexpected, and have been found in other research on information usage behavior. For example, Jones, Johnson-Yale, Millermaier & Pérez (2009) reported that:

Our data suggest that women are more likely, for example, to report using mainstream information sources than men. . . . Male college students spend greater amounts of time pursuing a wide variety of leisure activities online with greater frequency than females, including listening to and downloading music, watching and downloading videos. The data are in line with the trend that Fortson et al. (2007) observed in past literature, suggesting that males see the Internet primarily as an outlet for leisure, while women make greater use of its social and educational functions (Jones et al., 2009, pp. 259-260).

Lim and Kwon also recently cited Jones et al. (2009), noting that, “Male students tend to use Wikipedia more frequently than female students and follow links on Wikipedia more than their female counterparts.” However, the authors found “no gender difference in the use of authorized information sources, contrasting with Jones et al.’s (2009) finding.” (Lim & Kwon, 2010, p. 218.). Consequently, putting aside the unavoidable risk of sampling error, or methodological problems, it appears that gender differences in the use of the collection may not be uniform, which is entirely expected given the complexity of gender.

### *7.3.3. Faculties*

When looking at the difference in academic performance of students who do not use UWL resources, compared to the heaviest users, the Science faculty obtains the most benefit from both print and electronic resources. The improvement for using electronic resources is striking, with nonusers obtaining an average mark of 47, and steadily rising up to distinction for the heaviest users (81).



Using the above metric, the faculty that gets the least academic benefit from books is Health and Behavioral Sciences (HBS), and for electronic resources, it is Creative Arts.

However, few students occupy the highest frequency of usage (0.5% of HBS students spent more than 161 hours in 2010 accessing electronic resources), and consequently it is more meaningful to measure traction relative to frequencies of usage that do not sit on the extreme tail of the usage curve. As Table 1 shows, 99% of students in 2010 spent less than 81 hours accessing electronic resources. When traction is measured as the difference between the average mark for non-users and the average mark for those who spend between 41 and 80 hours accessing electronic resources, the story remains the same, except commerce replaces HBS as the faculty receiving the lowest traction for books (commerce = 2 marks, education = 3 marks, HBS = 4 marks, and science = 13 marks). For electronic resources, the Science faculty still receive the highest traction (nonusers average mark = 47, and the average mark for students spending 41 to 80 hours accessing electronic resources = 76. Therefore, Science traction = 29 marks). The lowest level of traction relative to students who spend between 41 and 80 hours accessing electronic resources is Creative Arts and the Sydney Business School (traction = 8 marks for both).

One of the faculties with the highest proportion of nonusers of electronic resources was engineering (second, with 20% students were nonusers). This matches Bridges' research, who found that, "Although engineering students did not statistically differ from their peers in their use of the physical library, they were significantly less likely to use the online library resources when compared with students from liberal arts" (2008, p. 194).

For books, the largest non-users were the Sydney Business School, followed by the Commerce faculty.

#### *7.3.4. First year*

The relative benefit of using the UWL collection is the same for first-year students as it is for other students. This finding poses questions on the relevance of current approaches to information-literacy support, and how these skills could be promoted throughout a student's academic career to improve traction.

Similarly, the increase in usage beyond first year is very marginal, which suggests that ongoing exposure to UWL promotions is not having the desired impact.

#### *7.3.5. Undergraduates and postgraduates*

Undergraduates get much more benefit from using the collection, compared to postgraduates. For example, undergraduates who spent between 81 and 160 hours using electronic resources in 2010 scored 20 marks higher on average than undergraduates who didn't use electronic resources in 2010. Postgraduates in the same category, however, scored 11 more marks.

#### *7.3.6. Age*

With the exception of the 22-year-olds and under, the data shows that the older a person is, the less value they get from using the collection, and the less likely they are to use the collection. Students over age 39 do not seem to benefit from increased borrowing, and the evidence is also weak when it comes to electronic resources. The students that benefit the most are ages 20 to 29 years, who fortunately are also the biggest group of students at UOW.

A picture is emerging from looking at the data through the lenses of year of enrollment, courses and ages. It appears that UWL is doing a good job engaging with new and relatively inexperienced students. However, increased usage of the collection is not

having anywhere near the same impact for our experienced students. This is something UWL will need to investigate further.

#### *7.4. Future for the cube*

The library cube is now part of UOW systems, and will receive ongoing funding. This is one of the key points that differentiate the library cube from existing longitudinal studies, even the ground-breaking large scale quantitative work being undertaken through Huddersfield University Library via the Library Impact Data Project. There, when Phases I and II are finished, data collection will cease. However, the library cube will continue to be perpetually updated with census data. The business case for maintaining the library cube is simple:

- Library resources are expensive. Improving usage reduces the per student cost of the electronic and physical collection. The library cube is essential to achieving and identifying improved usage.
- Like all universities, UOW is seeking to reduce student attrition through early intervention and activities aimed at improving student engagement. Student attrition data will eventually be linked to the library cube. Once this dataset is linked, the library cube can be used along with other datasets to identify groups of students who are high attrition risks. The economic benefit of reducing student attrition is significant, and can be comparatively easily quantified.

The library cube has allowed UWL to identify and describe usage patterns, but it does not explain them. Explaining student behaviors, such as why there are a higher proportion of male nonusers, is beyond the scope of this paper. Similarly, explaining the outcomes such as why female international students do not get the same benefit from using UWL resources as

their domestic counterparts, is also beyond the scope. The limitation of the library cube is that it describes, but it cannot explain. With this in mind, UWL researchers have been meeting with faculty education committees and senior staff throughout the university to discuss the findings, and what actions can be taken to address the findings. The response has exceeded expectations, with academic staff highly engaged with the process.

Once the marketing cube is completed, UWL will be in a position to assess the success of its promotions on a week by week basis. Changing any behavior is challenging, and finding the effective formula will require constant experimentation, assessment, and recalibration. The marketing cube will provide the marketing intelligence that is needed to feed promotion experimentation.

## **8. Conclusion**

The library cube project represents a new milestone in the UWL's quality and assessment journey. Well-established measures of effectiveness, efficiency, and satisfaction are now being augmented by measures of impact and value. Through the development of the library cube, UWL has established solid evidence that it plays a vital role in students' academic success, and that students who do not use the UWL information resources are at an academic disadvantage. The findings also reveal opportunities for improvement. Most importantly, UWL now has at its disposal a tool that can be used to improve learning outcomes for students, by identifying non- and low-user groups, and being able to assess whether targeted initiatives changed students' behavior and outcomes. Libraries do need to be careful, however, that they differentiate the value provided by their collections from the value provided by the library itself. The library can add value by improving usage and traction, and this is something no vendor or search engine provider can achieve.

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## Figures and tables

<Figure 1: Library Cube snapshot>

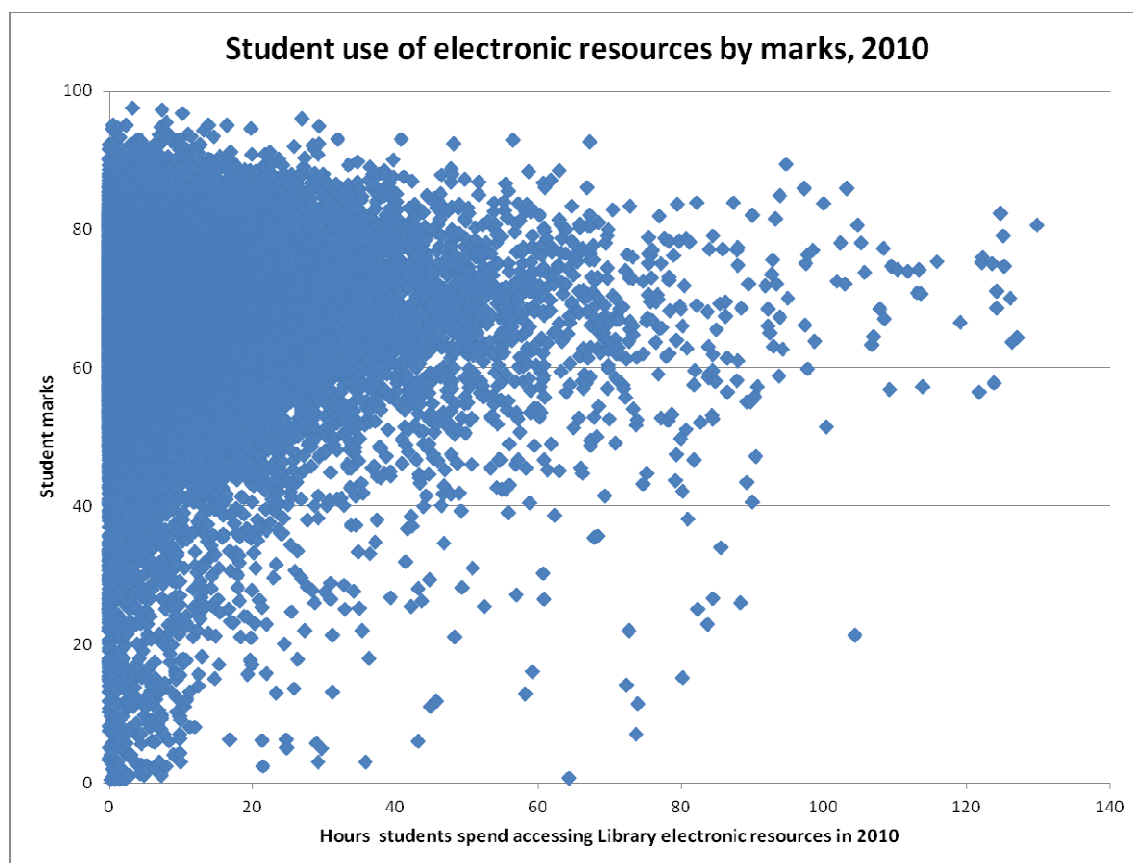
The screenshot shows a software interface with a menu bar (File, Edit, View, Settings, Run, Help) and a toolbar. On the left is a tree view titled 'Insertable Objects' containing various data categories like 'Student Course Enrolment Library Analysis', 'All Sessions', 'Total Books Borrowed in Year', etc. The main area displays a data table with the following structure:

Number of Students	Female	Male	All Genders
No Usage	541	1166	1707
1 - 5	2987	4329	7316
6 - 10	2188	1871	4058
11 - 20	2706	1850	4556
21 - 40	1847	1076	2923
41 - 80	621	302	923
81 - 160	87	35	122
161 - 320			
321 - 640			
Total Hourly Database Hits in Year	10981	10633	21613

Context filters at the top right: Rows: Total Hourly Da..., Columns: All Genders, Context filter: 2010, All Campuses (L..., WAM Recorded.

NOTE: Numbers have been grayed out where the total is less than 10

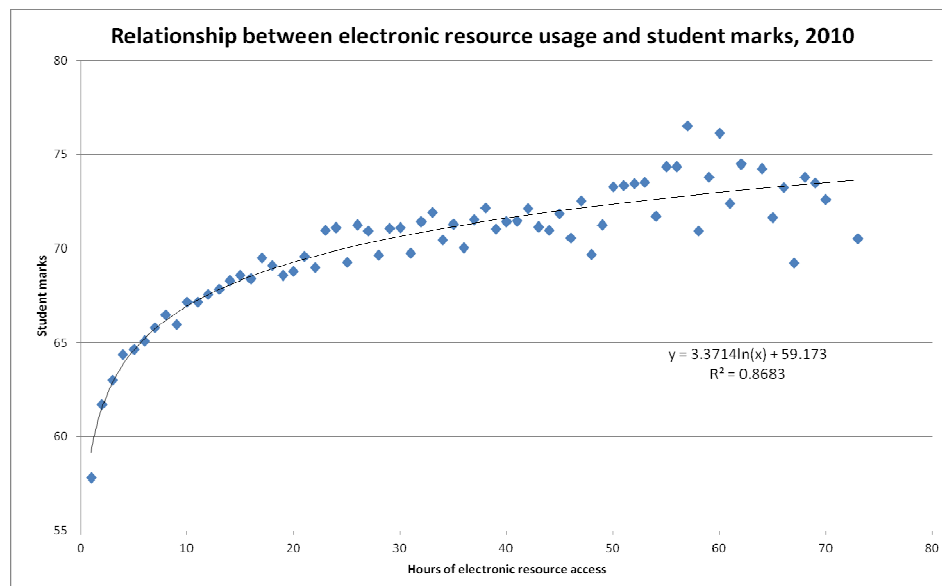
<Figure 2: Student marks by online resource usage>



Note: Data excludes students with null or zero marks, and excludes UOW offshore students. Some students have marks very close to zero (as they may have attended one lecture but did not drop the class by the required deadline—note that 99.16% of students have a mark greater than 14, and 96.96% have a mark greater than 34). Many of the data points overlap because of the large number of students represented here. The data excludes 0.1% outliers—therefore 99.9% of students with a weighted average mark greater than zero were included. The data table used to create this figure is not included, as it would require a table containing more than 21,000 rows of data.



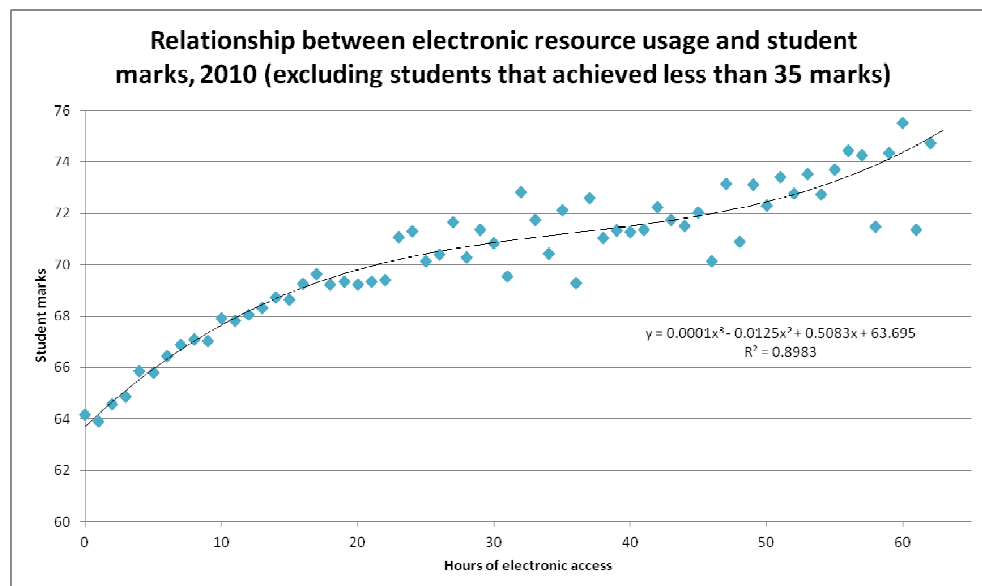
<Figure 2a: Student marks by online resource usage>



**Notes:**

- Any frequency that had less than 10 students was defined as an outlier, and was excluded. The outliers only constitute half a percent of the total (112 out of 21613).
- In order to be able to apply a logarithmic line of best fit, each of the frequencies was incremented by one. However, this has no impact on the correlation, the shape of the line of best fit, or the relationship of the points to each other.
- Data excludes students with null or zero marks, and excludes UOW offshore students, and Australian Command and Staff College students

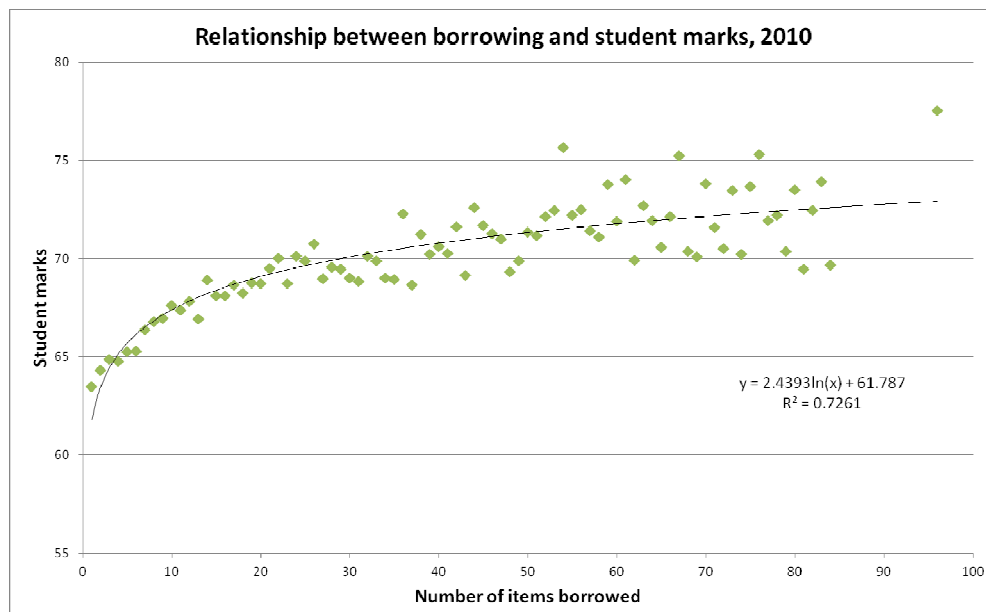
<Figure 2b: Student marks by online resource usage (excluding very low achievers)>



**Notes:**

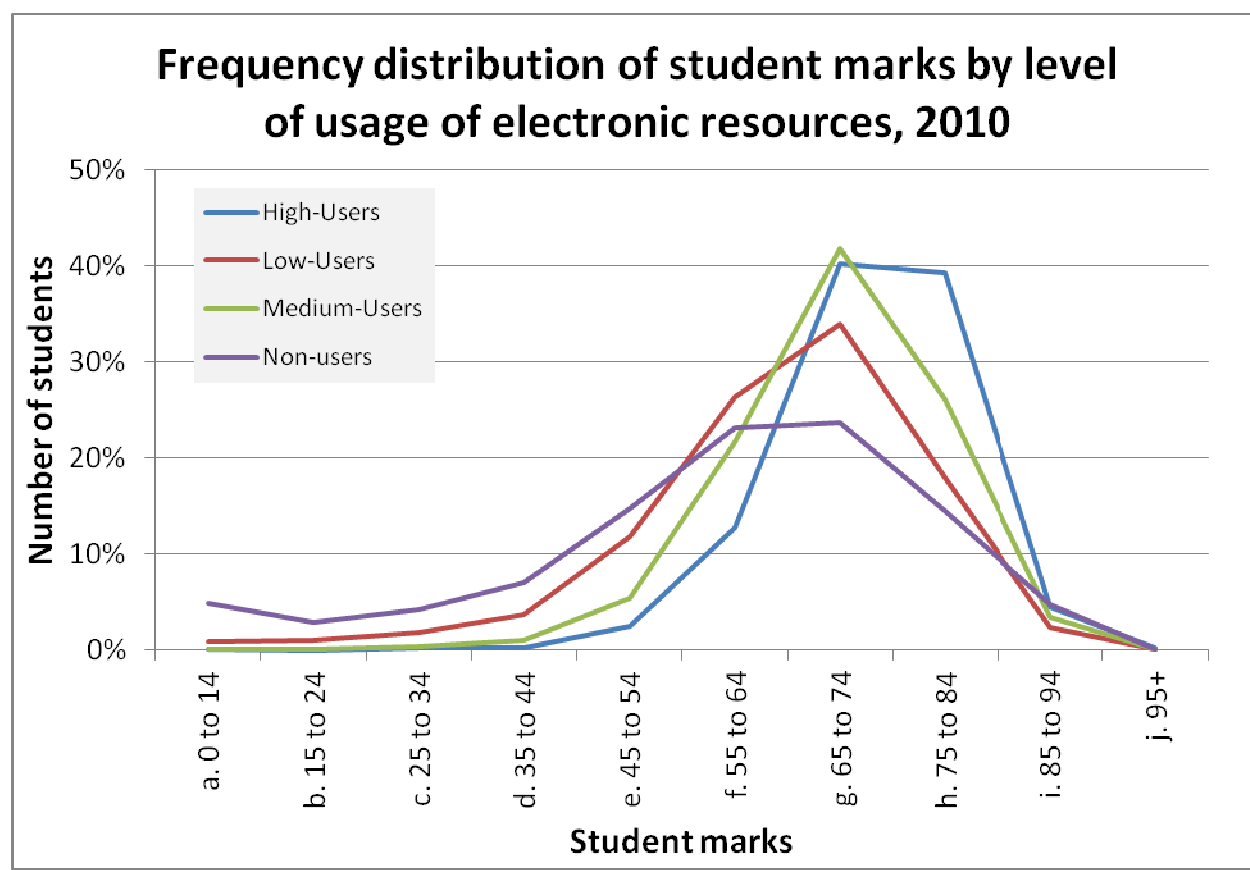
- Frequencies beyond 65 hours were not excluded as outliers with the result that 1.4% of students were excluded as outliers.
- Data excludes students with null or zero marks, and excludes UOW offshore students, and Australian Command and Staff College students

<Figure 3: Student marks by borrowing>



**Note:** Data excludes students with null or zero marks, and excludes UOW offshore students, and Australian Command and Staff College students

<Figure 4: Frequency distribution student marks by levels of online resource usage>



**Notes:**

- Nonusers = zero time spent accessing electronic resources
- Low users = 0+ to 10 hours
- Medium users = 11 to 40 hours
- High users = 41 + hours
- Data excludes students with null or zero marks, and excludes UOW offshore students, and Australian Command and Staff College students

<Table 1: Library usage by grades and number of students>

**Number of students by resource usage and WAM, 2010**

Frequency of usage	Borrowing				Electronic resources			
	No. students	%	WAM	Cumulative difference	No. students	%	WAM	Cumulative difference
No Usage	6,902	32%	63	0	1,707	8%	58	0
1 - 5	5,363	25%	65	2	7,316	34%	63	5
6 - 10	2,713	13%	67	4	4,058	19%	66	8
11 - 20	2,751	13%	68	5	4,556	21%	69	11
21 - 40	2,325	11%	70	7	2,923	14%	71	13
41 - 80	1,217	6%	72	9	923	4%	73	15
81 - 160	317	1%	73	10	122	1%	74	16
161 - 320	25	0%	74	11	7	0%	77	19

Outliers	0				1			
<b>Total</b>	<b>21,613</b>	<b>100%</b>			<b>21,613</b>	<b>100%</b>		

**Note:** Data excludes students with null or zero marks, and excludes UOW offshore students, and Australian Command and Staff College students. The values in the table measure the number of students, not the number of books borrowed. For example, 5,363 students borrowed between 1 to 5 items from UWL's physical collection in 2010.

<Table 2: Female Library usage by student type and marks >

### Female electronic resource usage by student type & marks, 2010

	Domestic females				International females			
	No. students	%	WAM	Cumulative difference	No. students	%	WAM	Cumulative difference
No Usage	309	4%	60		232	9%	64	
1 - 5	2,248	27%	66	6	739	27%	61	-3
6 - 10	1,679	20%	69	9	509	19%	63	-1
11 - 20	2,074	25%	71	11	636	23%	65	1
21 - 40	1,421	17%	73	13	427	16%	66	2
41 - 80	481	6%	75	15	141	5%	68	4
81 - 160	63	1%	75	15	24	1%	72	8
Outliers	3	0%			1			
<b>Total</b>	<b>8,278</b>	<b>100%</b>			<b>2,709</b>	<b>100%</b>		

**Note:** Data excludes students with null or zero marks, and excludes UOW offshore students, and Australian Command and Staff College students