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Evaluation of the Australian Bureau of Statistics' Education Services Website

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EVALUATION OF THE AUSTRALIAN BUREAU OF STATISTICS' EDUCATION SERVICES WEBSITE

An Interactive Qualifying Project submitted to the faculty of Worcester Polytechnic Institute in partial fulfillment of the requirements for the Degree of Bachelor of Science

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April 28, 2008

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WORCESTER POLYTECHNIC INSTITUTE
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ABSTRACT

The Australian Bureau of Statistics redesigned their Education Services website in 2007. This project evaluated the popularity and usability of the redesigned ABS Education Services website. We surveyed math teachers and held a focus group to acquire opinions about the ABS Education Services website, their education resources, and the CensusAtSchool program. We also conducted a quantitative web analysis to determine how the website was being used. We made recommendations to the ABS for improving their website and services.

EXECUTIVE SUMMARY

Teachers who supplement their traditional teaching resources with Web resources are able to positively change their teaching perspectives and strategies in certain areas (Ruthven, 2005). The Web provides educators with many free teaching resource websites. One of these websites is the Australian Bureau of Statistics (ABS) Education Services website. The ABS promotes statistics education by providing free activities, datasets, and other learning tools. To ensure that the ABS uses their resources effectively, they evaluate whether their education resources are both known and well received by teachers. The ABS Education Services last evaluated their website in 2002 and wishes to continually improve their website and services using information they gather during these evaluation phases.

The ABS's 2002 survey found that most teachers either had not visited the website or thought it was not easy to use (ABS Education Services, 2002). During the development and implementation of their CensusAtSchool program in 2006 and their 2007 website redesign, the ABS followed the surveyors' recommendations for improving website usability. After implementing these changes, the ABS needed to reevaluate the Education Services website.

The goal of this project was to evaluate the popularity and the usability of the ABS Education Services website, including its Web resources and CensusAtSchool program. We achieved this goal by

- Acquiring secondary-school math teachers' opinions and
- Conducting a quantitative web analysis.

SECONDARY-SCHOOL MATH TEACHERS' OPINIONS

Our telephone survey and focus group of secondary school math teachers suggested that the website is more usable and popular than the pre-revision website. The teachers who participated in the focus group thought the website targeted younger students because of the nature of the graphics. In addition, some teachers found it difficult to find the CensusAtSchool homepage.

Half of the surveyed teachers had used the ABS website at least once; however only 17 percent had accessed the Education Services website within the ten months prior to the survey. Although they are not necessarily using the Education Services website, teachers are using the general ABS website to acquire statistical data for teaching. Teachers use the ABS website nearly twice as often to find statistical data as they did in 2002. They also use other websites on the Internet to acquire statistical data. In 2002 textbooks were the leading source for statistical data, but the Internet now seems to be the primary source. The use of the Internet, including the ABS website, has risen to 35 percent, up from 20 percent in 2002.

Considering the above data and that sixty-one percent of the teachers knew that all ABS online resources are free, we concluded that many teachers are aware of the free resources but are not using them. They may already have their own ways of gathering data, or have not had time to browse the website.

Teachers scored the ABS website 74 out of 100 on the System Usability Scale, suggesting that the Education Services website is easy to use. Teachers rated the presentation of the website an average of 3.75 out of 5.0 compared to 2.6 out of 5.0 in the 2002 survey. This suggests that the website is well presented and an improvement over the pre-revision website.

Forty-nine percent of teachers were familiar with CensusAtSchool. Some teachers were intimidated by the prospect of starting the CensusAtSchool program because they thought it was complex and time consuming.

Results of the Quantitative Web Analysis

For the web analysis of the website, we used a methodology designed by two leading web analysts: Jason Burby and Shane Atchison. The four step process involved: gathering the data, creating the reports, conducting an analysis, and taking action.

We discovered that the website is used more during the months of March and May. The number of visitors decreases throughout the rest of the year, with localized peaks in usage. This behavior

seems to be directly related to the time that school terms begin when the need for information to prepare class material may be higher.

The CensusAtSchool activities are divided into four types with varying levels of computer use. Users of the ABS website are downloading all four types of CensusAtSchool activities. Having multiple types of activities supports a variety of teaching styles and classroom constraints.

RECOMMENDATIONS

We recommended the following to further improve the popularity and usability of the Education Services website:

- Advertising should stress that ABS's Education Services resources, including CensusAtSchool, are quick and easy to use.
- The ABS Education Services should complete usability testing every other year to ensure that the website evolves as teachers become more tech-savvy.
- The ABS Education Services should release newsletters and new material two weeks prior to the beginning of school terms.
- The ABS Education Services should continue to develop CensusAtSchool activities for all four types of classroom activities.
- The wording on the Education Services website opening pages should be condensed and simplified.
- Primary and secondary level classroom activities on the website should be linked and highlighted.
- A CensusAtSchool link should be added to the Education Services website navigation bar.

- The graphics of the CensusAtSchool website should be tailored to appeal to both primary and secondary students.

During our evaluation, we found that the ABS web analytic suite doesn't provide the flexibility and accuracy in data collection and reporting that the ABS requires for detailed web analyses. The ABS contracted deployment of a new web analytic tool called Urchin but will encounter similar problems if they are not thorough in implementing it. A revised web analytic process may also eliminate many of their issues. We recommend the following to improve the ABS web analytics:

- The ABS Education Services should become actively involved in implementing and using the new web analytics tool.
- The ABS Education Services should develop their own *directly* measurable Key Performance Indicators.
- The ABS Education Services should expand the types of web data they collect and integrate them into their existing behavioral data.

We hope that these recommendations will help Education Services further improve their website and services.

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STATEMENT OF AUTHORSHIP

All sections of this project were written, edited, and finalized with equal contributions by Eric Connelly, Dan Dahlberg and Elyssa Morrow.

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1. INTRODUCTION

Teachers who supplement their traditional teaching resources with Web resources are able to positively change their teaching perspectives and strategies in certain areas (Ruthven, 2005). The United Kingdom's Office of Standardized Education has found that teachers' "research on the Internet has yielded a vast potential source of improved resources, both text and visual, including unprecedented access to archive material" (OfStEd, 2003b). The Web provides educators with many free teaching resource websites. One of these is the Australian Bureau of Statistics (ABS) Education Services website. The ABS promotes statistics education by providing free activities, datasets, and other learning tools for teachers.

To ensure that the ABS uses their resources effectively, they must know whether their education resources are both well known and well received by teachers. The ABS is no stranger to evaluating their Education Services website and wishes to continue improving their services using information they gather during these evaluation phases.

In 2002, the ABS Education Services conducted a teacher survey to evaluate their website; they found that most teachers either had not visited the website or thought it was not easy to use (Appendix A: ABS: *Maths Coordinator Review*, 2002). Based on the results of this survey, the ABS made 16 recommendations to make it easier for teachers to access and use their statistical education resources. In 2006 the ABS added the CensusAtSchool program and published their redesigned website to in 2007.

After implementing these changes, the ABS needed to reevaluate the Education Services website. They wanted to know how many math teachers were using their website, what math teachers thought of the website, whether teachers were using the ABS teaching resources, and how teachers were hearing about the CensusAtSchool program.

The goal of this project was to evaluate the popularity, or teacher familiarity, and the usability, or ease-of-use, of the ABS Education Services website, including its Web resources and CensusAtSchool program. We achieved this goal by acquiring secondary-school math teachers' opinions about the website and methods of teaching statistics.. We also conducted a quantitative

web analysis to find what web pages and CensusAtSchool activities were accessed. From these analyses, we found that those who had used the website thought it was easy to use and more usable than the pre-revision website. The number of teachers who use the ABS website to acquire statistical data has nearly doubled since 2002.

2. BACKGROUND

This chapter examines information that was valuable to the development of our study. It begins with an explanation of the important of statistical education and its presence on the Internet. An overview of the 2002 NESU survey provides a means for comparing our own results with those of a prior ABS evaluation. The Systems Usability Survey, our primary means for evaluating website usability, is reviewed and explained. Finally a general explanation of web analytics and a description of the ABS's web analytics process are provided.

2.1. STATISTICS EDUCATION AND THE WEB

Statistical literacy, or "the ability to understand and critically evaluate statistical results", is on average low in adults (ISLP, 2008). The lack of statistical literacy can be traced back to education, specifically because statistics is viewed as a tool, not a "stand alone" subject (Nicholls, 2001) and educators are not teaching enough math-independent statistics (Holmes, 2003). In order to increase statistical literacy, the ABS helps teachers improve their statistics instruction and encourages them to teach students that statistics is an independent and multi-disciplinary field of study.

The ABS implemented the CensusAtSchool program to provide a free statistics-education tool to teachers. In the program, students collect data about themselves using a questionnaire. This information is then organized into a national database, which students can probe using computer or pen-and-paper educational activities created by the ABS. The goal of CensusAtSchool is to "increase statistical literacy among Australian school students and raise awareness of the role of the Australian Bureau of Statistics within our society" (ABS, 2006). The ABS uses the Internet almost exclusively to distribute CensusAtSchool and many other resources because the Web is widely used by teachers and students. In the 12 months leading up to April 2006, sixty-five percent of Australian children ages 8-14 accessed the Internet at home or at school, and 84 percent of the time they spent on the Internet was committed to educational activities (ABS, 2006). Still, the Web is only beneficial to statistical education if students and teachers are able to find on the website the information they seek.

2.2. RESULTS OF THE 2002 ABS NESU MATH COORDINATOR SURVEY

In 2002 the ABS National Education Services Unit (NESU) conducted a survey to assess teachers' knowledge of the ABS websites and other resources (Appendix 1-3). This survey aimed to:

- "Assess the level of use of data in teaching statistics;
- Determine the source of statistical data used by teachers;
- Collect thoughts about the most appropriate types of data that might be provided to teachers by the ABS;
- Gain a teacher perspective on ways that students might be encouraged to take up statistical study in greater numbers;
- Gauge the level of use of the ABS education lesson plans and assess their presentation and usefulness; and
- Collect names of interested teachers who might be involved in future focus groups (Math Coordinator Review, Appendix 1, 2002)."

The 13-question survey included 115 randomly selected secondary schools across Australia. Researchers held telephone interviews with each school's Math Coordinator. Out of the 115 schools polled, 103 responded. The results were as follows:

- Ninety percent of teachers use statistics in their teaching. Those who did not were mostly from New South Wales.
- Teachers use newspapers, books and the Internet as a means of finding statistical data. The most common type of data used was sports related. The most common way of obtaining data was from books.
- Twenty percent of the statistical data found by teachers is found using the internet. Twelve percent of statistical data was found on specifically the ABS website.

- The most common materials used in teaching statistics included graphing calculators and textbooks.
- Teachers used statistical data to teach their students about collecting and presenting data. Mean, median, and mode were topics taught by 48 percent of teachers.
- Just 22 percent of respondents were aware of the content available on the ABS website, but only 7 percent of those who were aware actually used it.
- Teachers rated the relevance of data on the ABS website a 2.8 out of 5.
- Teachers rated the curriculum content ease-of-use a 3.0 out of 5, and presentation of the website a 2.6 out of 5 (Math Coordinator Review, 2002).

The ABS made sixteen recommendations from the results of this survey. In 2007, the ABS used eight of these recommendations during their website redesign (Review of Education Services, Appendix 2). The redesign focused on creating a better layout with more relevant curriculum resources for teachers (Mooney and Sergi, 2008). This redesign also included separate teacher and student sections. All published ABS data since 1994 is now on their website and available at no cost (Review of Education Services, Appendix 2). The teacher site, as shown in Figure 1, has links to lesson plans in the areas of commerce, economics, geography, and mathematics.

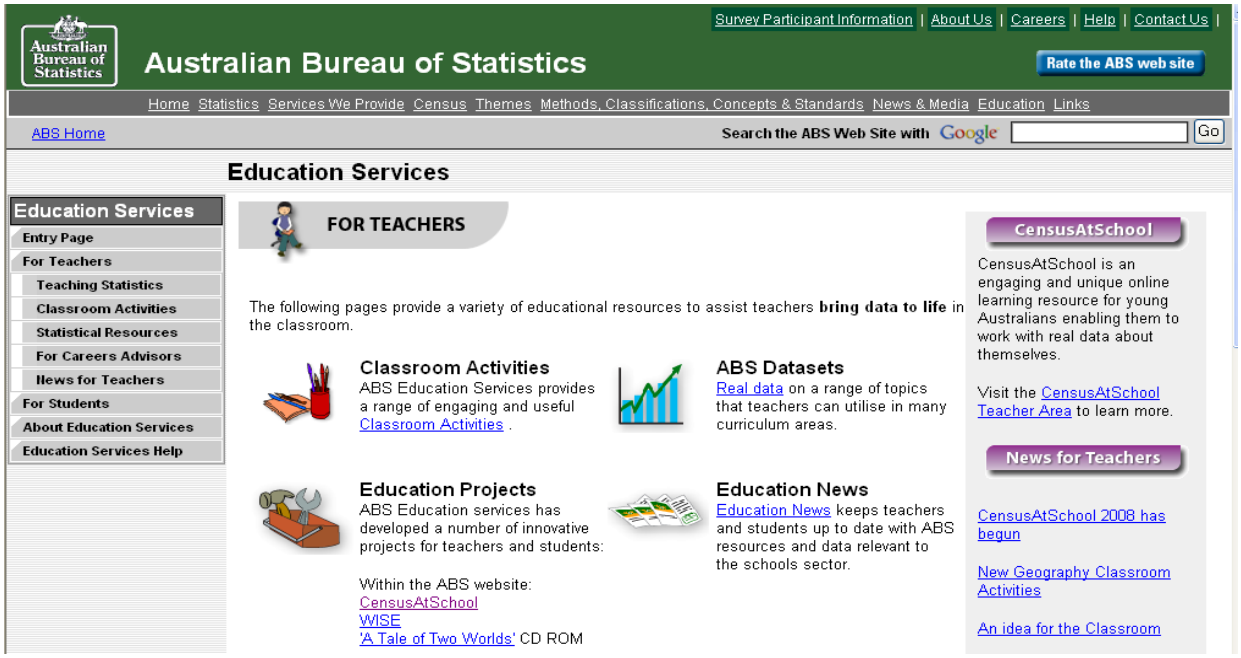

Figure 1 – Education Services Teachers' Entry Page

There are also links to guides on how to teach statistics. In the student section, there are puzzles and games as well as an explanation of the Australian Census and the ABS (Australian Bureau of Statistics – Education Services, 2008). All these updates have changed the overall layout of the ABS Education Services website. The ABS would now like to know if there has been any change in the use of the website with regards to usability and accessibility.

2.3. System Usability Survey (SUS)

Testing the usability of a system can be a challenging process. Many factors need to be considered and often there is not a lot of time or money available to do so. It is challenging to create a general system usability assessment because usability is difficult to quantify. Usability is based on the system in question and its context; unfortunately, no two systems are exactly the same. Despite this, there has always been a demand for a "quick and dirty", low cost measurement tool that is accurate in a broad variety of applications (Brooke, 1996). The System Usability Survey was developed for this reason.

System Usability Survey (SUS) is an effective and reliable way of testing the usability of any system, including websites (Finstad, 2006). SUS was developed at Digital Equipment Corp in 1986. The survey contains ten questions and takes into account a wide range of users' experiences with a system. The responses to the questions consist of a five level Likert scale, ranging from Strongly Disagree to Strongly Agree. Individuals are urged to respond quickly and record their first response (Tullis and Stetson, 2004).

There are many benefits of using SUS versus other usability questionnaires. In 2004, Thomas Tullis and Jacqueline Stetson conducted a comparison of questionnaires for assessing website usability. They compared five questionnaires, which included: SUS, QUIS (Questionnaire for User Interface Satisfaction), CSUQ (Computer System Usability Questionnaire), Words (based upon Microsoft's Product Reaction Cards), and their own questionnaire that they have been utilizing for the Fidelity Center for Applied Technology's Human Interface Design Department. They conducted the analysis by using the surveys to compare two websites: finance.yahoo.com and kiplinger.com (Tullis and Stetson, 2004).

Results showed that SUS had a high level of accuracy with a relatively low sample size. When the sample size was 8, the accuracy of the survey was about 75 percent. However when the sample size reached 12, the accuracy jumped to 90 percent to 100 percent while the other questionnaires maintained an accuracy level between 70 percent and 90 percent. Sample sizes of 12-14 individuals are needed to maintain the reliability of the survey. When the survey has been completed and the samples have been collected, a score (with a range of 0 to 100) can be calculated that will reveal the overall usability of the studied system (Tullis and Stetson, 2004).

2.4. WEB ANALYTICS

A statistical education organization needs to observe the activity on their website to determine if the site is effective in providing users with the information they seek. They may be able to judge the success of its website through many measurements, including how many visitors the website has within a given amount of time or by user retention.

There are three key factors that influence a website's user retention rate. They are:

1. *Content appropriateness*
2. *Design effectiveness and*
3. *Performance efficiency*. (Phippen, 2004)

Web analytics, the process of obtaining and analyzing web traffic data, can provide critical information on the satisfaction of a website's users.

Christopher McFadden of the Web Analytics Association describes Web Analytics as:

> "*... the collection, analysis and reporting of Web site usage by visitors and customers of a web site. This information is used by those responsible for the success of the web site to better understand the effectiveness of online initiatives and other changes to the web site in an objective, scientific way through experimentation, testing, and measurement* (McFadden, 2005)."

Organizations utilize web analytics for many purposes; but the goal is always to improve distribution of information, or increase profit in the case of business. With recent growth of the Internet and the technology surrounding it, analysis can occur with a high level of efficiency. Many tools are available because of the rising trend in web analytics. They range from free tools to professional software, which can cost upwards of thousands of dollars per month (McFadden, 2005).

On any website, it is a goal to determine how well each individual user's needs are satisfied and how to improve their experience. If web designers find commonalities among users, such as if many people access one particular topic exclusively, they can design content to be easier to use (Phippen, 2004). Since the users contribute to an organization's popularity or credibility, determining the user's individual needs is significant to improving or creating good relations with them from the beginning. By focusing on improving the browsing experience on an individual basis, an organization can greatly improve the overall usability of their website.

Web analytics can also reveal why users do not access content an organization deems important. A reorganization of the structure of the website, or layout, could improve the flow of the website and highlight related information to make it more attractive. However, web analytics cannot determine if the problem is that the user does not find the information useful.

2.4.1. LANGUAGE

This section describes the language and concepts underlying web analytics. The term *page* may represent a web page or a file. Many software packages have the ability to count common files such as PDF's or Flash files as pages (Burby, J., 2007). Whenever users spend time on a website, they are in a *"session"* with the web server. This session can last any given amount of time, but usually ends after 30 minutes of inactivity (Peterson, E.T., 2005).

One of the most common measurements used in web analytics is a *hit*, which is counted every time a user enters a page on a website, views an image or downloads a file (Peterson, 2005). When a user visits a page, they could create multiple hits on the page since it loads a variety of content. Sometimes, the user may never need to be on the actual website in order for a hit to be counted. While a hit may be a common term, it often holds no value due to this reason. Another popular measurement used is a *page view*. Unlike a hit, a page view is only counted whenever a user loads a web page.

Web analysis tools usually remove all the excess traffic data caused by spiders. Spiders index the Internet often and may generate a lot of irrelevant traffic on a website. However, the majority of modern web analytic software is capable of isolating and removing this traffic automatically (Burby, J., 2007). See Appendix D for more information on spiders and indexing.

When analyzing data, measurements alone are worthless (Sterne, J., 2002). The combination of measurements and metrics gives the data value. Performance indicators are measurement ratios that relate to an organizational goal or objective. If the organization or business considers an indicator important, it is deemed a Key Performance Indicator, or more simply, KPI (Burby, J., 2007).

2.4.2. Types of Collected Data

Web analytic tools can only provide behavioral data, which tells us what users are actually doing on a website. These data include but are not limited to hits, visits, page views, session length, and returning users. While these data are always insightful, they are not enough to give a complete understanding of the users' interactions. Questions that arise from examining behavioral data can often be answered using attitudinal data. Attitudinal data include results from surveys, interviews, and focus groups and can answer the "why" questions. It is also often helpful to consider secondary data, which in the ABS's case could be the number of CensusAtSchool schools. Useful Key Performance Indicators can be a combination of secondary data and behavioral data. For example, a Key Performance Indicator for Education Services could be the number of new CensusAtSchool schools over a period of a month divided by the number of unique visitors to the "How to get involved" web page per month. Many such combinations of secondary data and behavioral data can provide effective measurements of progress.

2.5. The ABS Approach to Web Analytics

The ABS uses the WebTrends Analysis Suite v7.0c to produce various monthly reports for the ABS website. Education Services receives three reports per month including reports for activity on the main ABS website, the School Education data files (Appendix L), and the keyword search terms used by users. The keyword search term reports help explain what users are trying to find on the ABS website; however, they do not tell who was doing the searching or where users entered the website. The School Education data files are the best source of web data to the Education Services.

Each ABS section has its own website objectives. Their objectives follow the **S.M.A.R.T.** criteria. They must be **S**pecific; **M**easurable; **A**greed to; **R**ealistic; and **T**imely (Peter, 2007). The Education Services unit belongs to the Integrated Collection and Dissemination Services (ICDS) section. The ICDS has defined their website objectives as the following:

1. *"To publish usable, accessable* [sic] *and navigable content*
2. *To increase customer self-service*
3. *To provide and increase remote access to clients*
4. *To increase client services usage*
5. *To reach/capture/service targeted audiences like schools, universities, government, business, community, etc" (Peter, 2007)*

Education Services has specific objectives for improving their website and services, but they have no standardized method to *directly* measure them. Without directly measurable Key Performance Indicators it is difficult to gauge progress.

2.6. SUMMARY

Knowing how the ABS has used survey and web analytic techniques to evaluate their website helped guide our own evaluation. Acquiring knowledge of accurate and professionally accepted website usability evaluation and web analytics techniques provided a solid foundation for our evaluation methodology.

3. METHODOLOGY

The goal of this project was to evaluate the popularity and the usability of the ABS Education Services website, including its Web resources and CensusAtSchool program. We achieved this goal by acquiring secondary-school math teachers' opinions about the website and methods of teaching statistics. We also conducted a quantitative web analysis that examined how often users were downloading teacher activities and accessing the web pages on the Education Services website.

There were three methods used to complete the objectives. We surveyed secondary-school math teachers via telephone based on the ABS 2002 NESU teacher survey, conducted a small focus group with math teachers for usability testing, and analyzed web traffic data from the ABS Education Services website.

Figure 2 shows our goal, objectives, methods, and audience involved in each method.

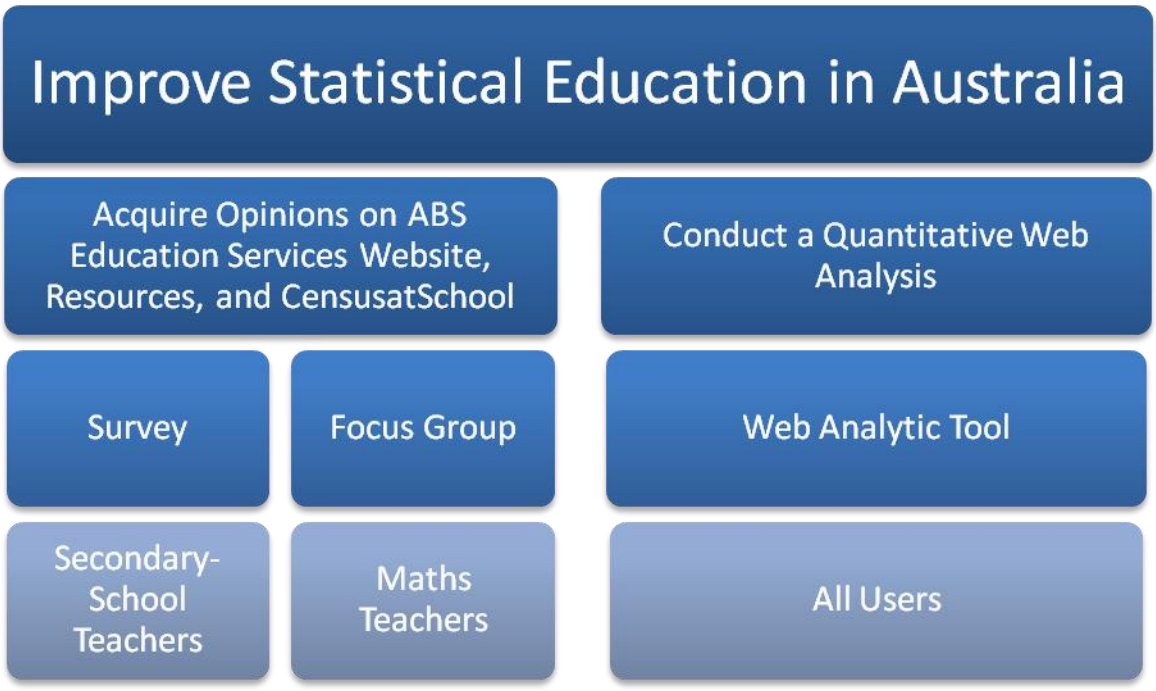

Figure 2 – Methodology

3.1. ACQUIRING SECONDARY-SCHOOL MATH TEACHERS' OPINIONS

Two methods were used to accomplish this objective. The first was a telephone survey of secondary-school mathematics teachers. The second was a focus group with Victorian teachers to test the usability of the website. The following section will describe the process of these methods.

3.1.1. TEACHER SURVEY

The primary purpose of the teacher survey was to evaluate the popularity of the ABS website and to learn how teachers use statistics in math. This survey targeted math coordinators; however, math teachers were surveyed if schools' coordinators were unavailable. Only one math coordinator was not an active teacher at the time of the survey. The survey questioned these teachers about their experience with the ABS website and the CensusAtSchool program. Teachers who had accessed the Education Services website within the ten months prior to the survey also completed the System Usability Survey. This provided us with preliminary information on the usability of the website before planning the focus group. The full survey is located in Appendix E.

The first section of the survey was designed to probe the following questions:

- How many math teachers use statistics in teaching math? *
- Why do math teachers not teach statistics?
- How many teachers use the ABS website? Has this changed since 2002?
- Where else do teachers acquire statistical data? *
- What do teachers think of the ABS Education Services website?

The wording in the survey of the two asterisked questions was copied exactly from the 2002 NESU survey. Doing so allowed direct comparison of our results to the 2002 survey results. The questions relating to the ABS website were expanded based on the results of the 2002 survey.

The second part of the survey concerned CensusAtSchool and was unrelated to the 2002 NESU survey. CensusAtSchool was not implemented until 2006 so the ABS was eager to learn what teachers thought about it.

The second section of the survey was designed to probe the following questions:

- Are teachers familiar with CensusAtSchool?
- How do teachers use CensusAtSchool in the classroom?
- What do teachers like or dislike about CensusAtSchool?

The telephone survey was conducted while on-site in Melbourne. We conducted the survey on math teachers from a stratified random sample of 100 government and non-government secondary schools across Australia. The population of full-time secondary-school students in the state determined the number of schools chosen from each state. Table 1 shows the distribution of the target sample alongside the distribution of the survey responses.

Table 1 – Target and Outcome Sample Distribution

State	% Target Sample	% Survey Responses
Victoria (VIC)	26%	30%
Queensland (QLD)	19%	21%
Northern Territory (NT)	1%	0%
South Australia (SA)	7%	4%
Australian Capital Territory (ACT)	2%	2%
Western Australia (WA)	9%	6%
New South Wales (NSW)	34%	36%
Tasmania (TAS)	3%	2%

The ABS provided us with a complete list of Australian government and non-government schools separated by state. We used the target distribution and a random number generator to decide what schools from this list would be included in our survey.

Since three people shared the task of calling schools, strict protocols were set standardize how we contacted the math coordinators. The protocols for calling these schools were based on the 2002 survey protocols (see Appendix B and F). Ex-teacher ABS employees recommended a short survey because teachers are very busy; we planned the survey to take ten minutes to complete. We surveyed in-person three ex-teacher ABS employees to verify that the questions were understandable, the answers were informative, and the survey took less than ten minutes. This planning and test phase was completed within the first week.

We were required to plan our calling phase because each state had a different school calendar. Victorian and Tasmanian schools were on break from March 20th to April 7th and March 24th to March 31st respectively. During these times teachers were unreachable. For this reason Victorian teachers were called March 17th to March 20th and Tasmanian teachers were called after March 31st. The survey phase ended April 11th. Fifty-three teachers were reached by April 11th.

In five cases, the math coordinator was away during the survey calling period or could not accept outside phone calls. We replaced these schools with others of the same type. There were also two teachers who refused to take the survey. These schools were not removed from the sample because it was their decision not to partake in the survey. Eleven of the teachers completed the survey anonymously. Each school, on average, required three phone calls before a teacher who completed the survey was reached.

3.1.2. FOCUS GROUP

The primary means for evaluating the usability of the website was the focus group. During the focus group, eleven teachers were asked to find specific information on the ABS Educations Services website and browse it on their own. They then completed the System Usability Survey to evaluate the usability of the website. Following the survey, the teachers discussed their experience with the website and provided suggestions for improving it. Participants were encouraged to complete tasks themselves; however, if they were having a lot of trouble, we assisted them in performing the tasks. The focus group took approximately 25 minutes to complete. Appendix K contains the full procedure.

3.2. Conducting a Quantitative Web Analysis

In the book Actionable Web Analytics, Jason Burby and Shane Atchison detail four important steps that can help users achieve successful web analytics. These steps are to:

1. Determine KPIs
2. Create reports
3. Conduct an analysis
4. Optimize and take action (Burby & Atchison, 2007).

This method is most effective as a continuous cyclical process, as shown in Figure 3 (Burby & Atchison, 2007). Since the KPIs established by Education Services were not directly measurable, we began by determining measurable KPIs for our evaluation. Since Education Services' goal is to supply teachers with high quality teaching resources, it was critical that we examine how often users were downloading the teacher activities and accessing the web pages. Our two KPIs were the number of page views and file downloads on the Education Services website. The files we examined were the CensusAtSchool activities and the Education Services datasets.

Figure 3 – Web Analytics Cycle

Since the ABS Education Services updated their website in July 2007, we collected and compared data before and after this date. The data were collected using the reports produced by ABS's web analytics software, WebTrends. These reports included page views, visits, and amount of time spent on each web page.

After generating the reports, we conducted an analysis based on the collected data and our KPIs. Finally, based on the analysis, we proposed improvements for the Education Services website. Although our group had not modified the website, we reported on the current usage of the website and recommended actions the ABS can take to improve it.

LIMITATIONS

We faced problems that forced us to modify our original methods to accomplish our objectives and increase the accuracy of our data. These problems included having multiple URLs for every web page, scattered data throughout multiple reports, and internal users. We attached numerical values to these problems and presented the likely error in our graphs. Additional details on the reports can be found in Appendix L.

3.3. SUMMARY

The primary purpose of the teacher survey was to evaluate the popularity of the ABS website and to learn how teachers use statistics in math. It also provided us with preliminary information on the usability of the website before planning the focus group, which was the main method for evaluating website usability. We developed our KPIs using the web traffic data acquired from WebTrends. These three methods resulted in the behavioral and attitudinal data used to evaluate the popularity and usability of the ABS Education Services website.

4. RESULTS AND ANALYSIS

The goal of this project was to evaluate the popularity and usability of the ABS Education Services website, including its Web resources and CensusAtSchool program. It was met through the following objectives:

- Acquiring secondary-school math teachers' opinions
- Conducting a quantitative web analysis

The following are the results and analysis of the teacher survey, focus group, and web analysis.

4.1. SECONDARY-SCHOOL MATH TEACHERS' OPINIONS

The response rate for the survey was 53 percent. Surveys were completed in approximately 2-5 minutes because most teachers were not asked to complete the System Usability Survey since they had not accessed the website within ten months of the survey. Six teachers were completely unfamiliar with the Australian Bureau of Statistics.

The first questions told us that most math coordinators surveyed were also active math teachers. From the second questions we found that 89 percent of teachers use statistics in teaching math, as shown in Figure 4.

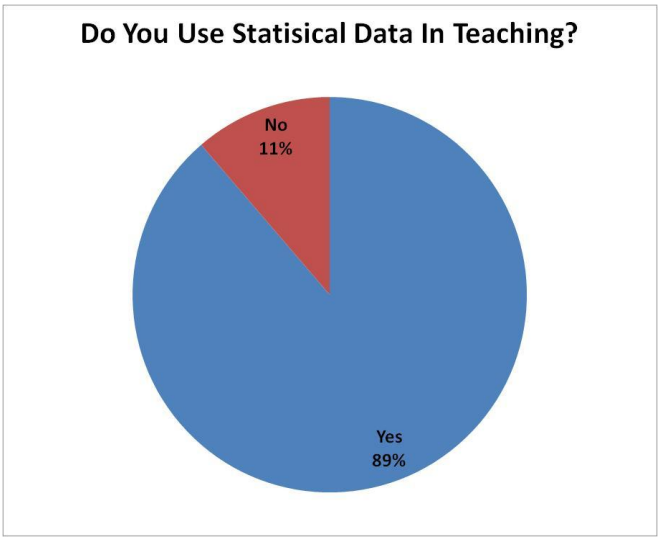

Figure 4 – Use of Statistical Data in Teaching Math

Reasons that some teachers did not use statistics in teaching math were that either their schools were new and had to follow a strict curriculum, or very small and did not have adequate resources. All states require the teaching of statistics (Mathematics Curriculum Summary, ABS); however, the schools are responsible for interpreting and implementing their state's education standards. Schools may teach statistics in math or another subject.

Figures 5 and 6 show how teachers obtained statistical data in 2002 and 2008 respectively. In 2002 textbooks were the leading source for statistical data, but the Internet now seems to be the primary source. The use of the Internet, including the ABS website, has risen to 35 percent, up from 20 percent in 2002. Since teachers are busy, they are more likely to gather information from the most convenient source. Textbooks are readily available to teachers, but teachers' preferences are moving towards using the Internet to find statistical data. Newer, younger teachers may feel more comfortable using the Internet than older teachers. Although we did not take into account age in our survey, we can guess that most of the younger teachers use the Internet as a resource for statistical data. Teachers use the ABS website nearly twice as often to find statistical data as they did in 2002.

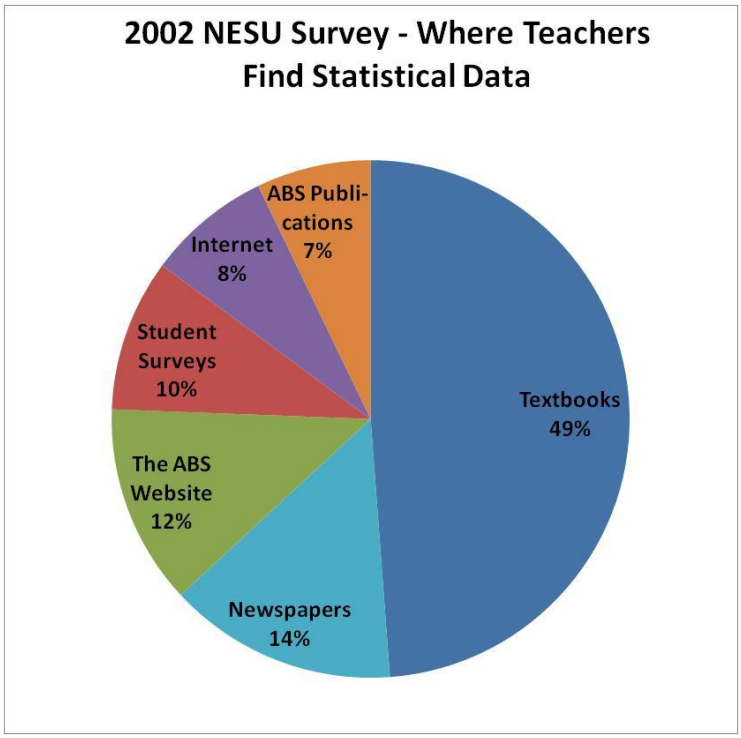

Figure 5 – 2002 Results – Teachers' Sources for Statistical Data

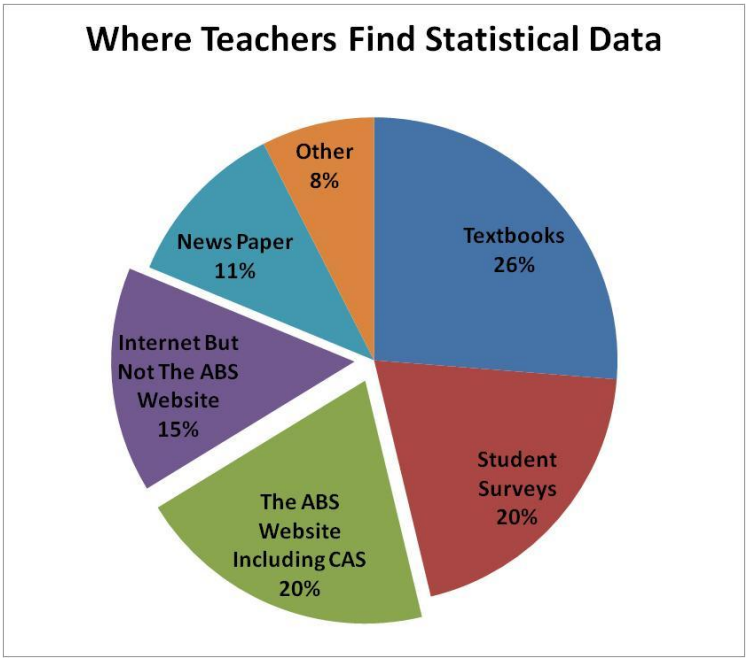

Figure 6 – Teachers' Sources for Statistical Data

As shown in Figures 7 and 8, half of the teachers had used the ABS website at least once; however, only 35 percent of these teachers had accessed the Education Services website within ten months prior to the survey. This means that only 17 percent of all surveyed teachers used the Education Services website within ten months prior to the survey. Teachers may only look at the website once or twice a year to make lesson plans. One teacher mentioned that she could not find the specific data that she was looking for but was not sure the website even contained it.

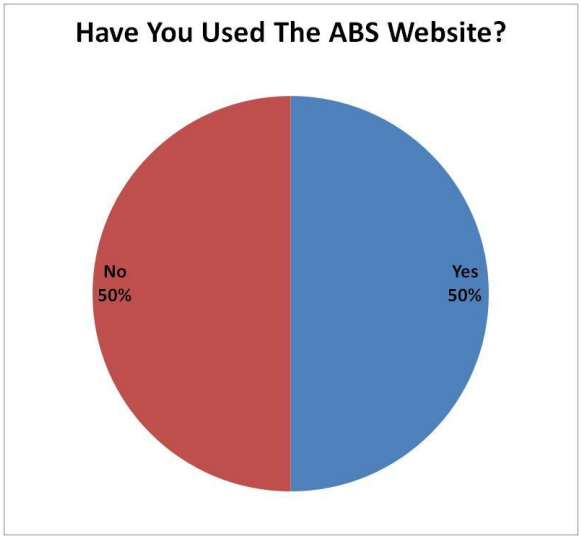

Figure 7 – Use of ABS Website

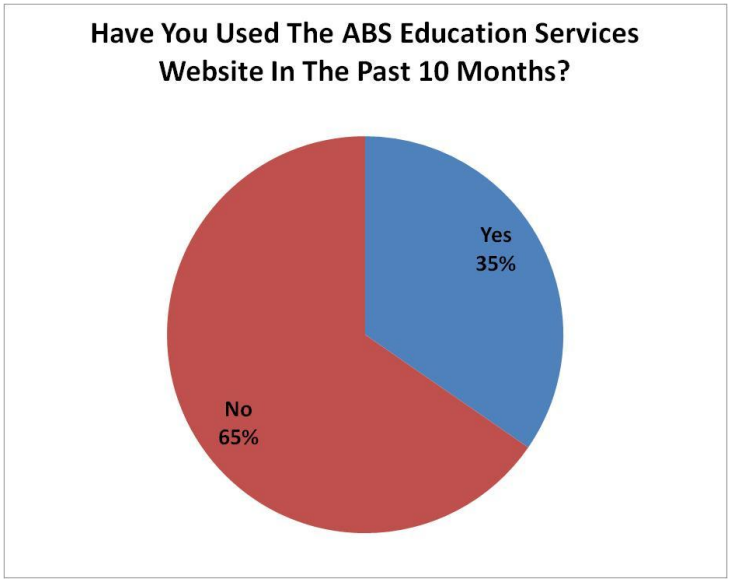

Figure 8 – Use of ABS Education Services Website in the Past Ten Months

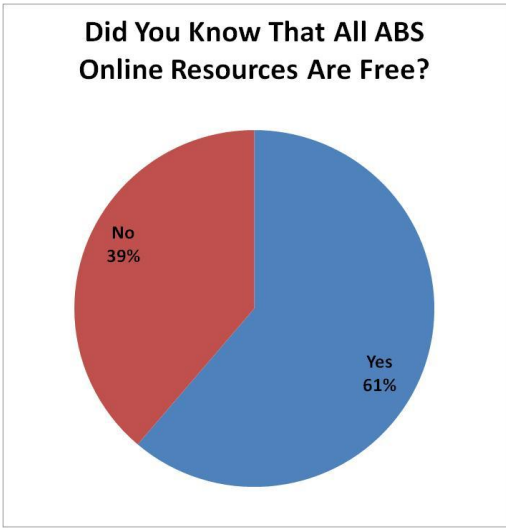

Figure 9 – Knowledge of Free Online Resources

Sixty-one percent of the teachers knew that all ABS online resources are free, as shown in Figure 9. Teachers who did not know this were often interested in learning more about ABS's free resources.

As seen in Table 1, some teachers knew that the resources are free but still did not use them. Two teachers knew that ABS resources were free but had never used them or even accessed the ABS website. In general most of those who had used the ABS website knew that the resources are free and those who have not used the ABS website did not know.

Table 2 – ABS Website Use and Knowledge That Resources Are Free

Used the ABS Website?	Know of free resources?	Number of Teachers
YES	YES	24
YES	NO	2
NO	YES	6
NO	NO	17

The overall score for the ease-of-use of the free classroom resources was 3.7 out of 5.0. Since we did not ask what resources teachers had used, we cannot determine if certain resources were troublesome and in need of improvement.

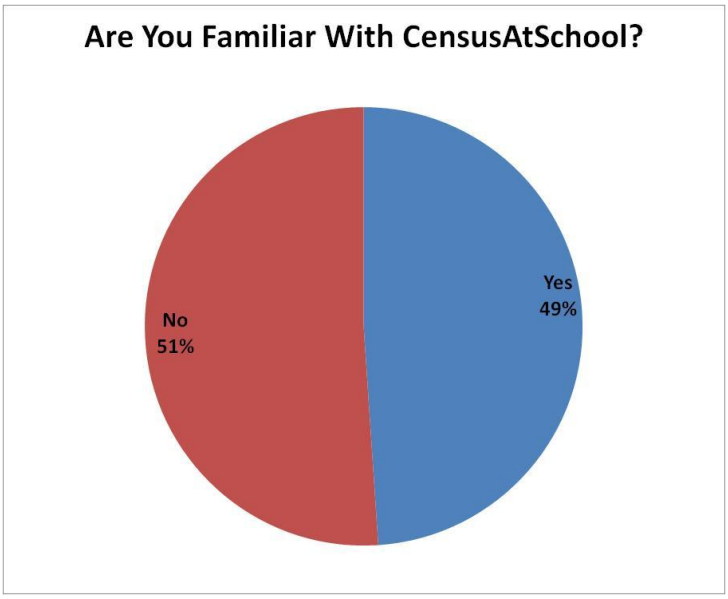

Figure 10 – Familiarity With CensusAtSchool

Forty-nine percent of teachers were familiar with CensusAtSchool, as seen in Figure 10. Some of the teachers who had not started the program were speaking with their colleagues about it and seriously considering starting the program. One teacher commented that he and his colleagues were intimidated because they had the impression it was going to be a lot of work. Another teacher said that he had wanted to try it but his colleagues were unreceptive to the idea. Teachers were often misinformed on the process and purpose of the program. The teachers who had used CensusAtSchool were very pleased with the program and thought it was a quick way to teach statistics. Teachers enjoyed having lots of free data to use. Only one teacher had a complaint about the program. This teacher tried CensusAtSchool and quit after the student survey because he thought the questions were too personal.

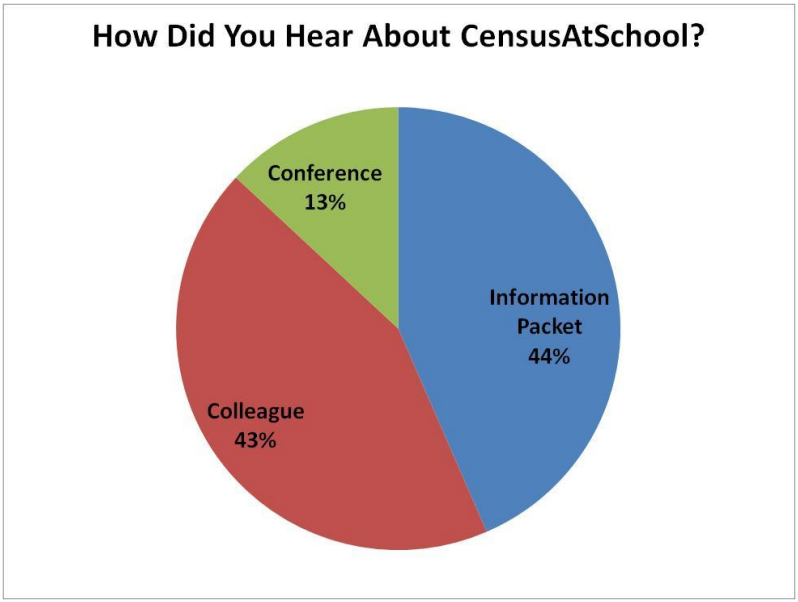

Figure 11 – How Teachers Heard About CensusAtSchool

Teachers heard about CensusAtSchool from ABS information mailings, colleagues, or conferences, as shown in Figure 11. Two teachers could not remember where they had heard about it. Many teachers heard about CensusAtSchool from the information packet sent out immediately after the release of the 2006 Census.

4.1.1. Results and Analysis of System Usability Survey

The System Usability Survey was used to assess the usability of the ABS Education Services website. There were 20 teachers who answered this survey, 9 from the telephone survey and 11 from the focus group. The complete results for the SUS survey are located in Appendix I. Figure 12 shows the average and range of responses. In the survey, 1 corresponds to "Strongly Disagree" and 5 corresponds to "Strongly Agree"; however, for the purpose of presenting the results, the responses for negative statements (i.e. "I found the website unnecessarily complex") are reversed so that 5 corresponds to "Strongly Disagree". This allows 5 to represent a desirable response for all statements.

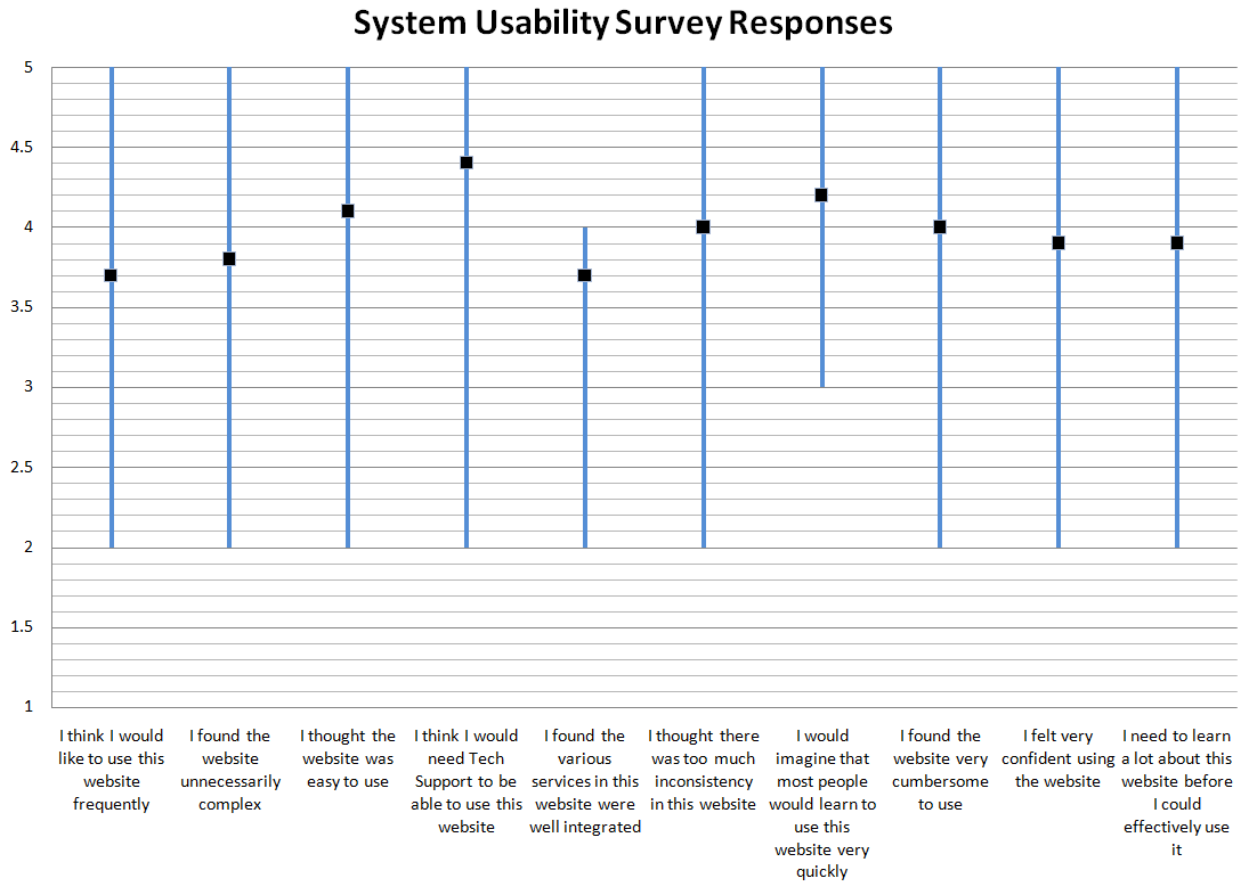

Figure 12 – System Usability Survey Responses

The total score for the ABS Education Services website usability was 74 out of 100. This indicates a website that is fairly well presented, and users are most often able to navigate it and find the information they seek. In the 2002 survey results, the average rating for the presentation of the website was 2.6 out of 5.0. In the 2008 survey, the average ratings for "I found the website unnecessarily complex," and "I found the various services in this website were well integrated" were 2.2 (or 3.8 reversed) out of 5.0 and 3.7 out of 5.0 respectively. These two statements represent only two aspects of the overall presentation; however, they indicate that the presentation of the website has improved. During the focus group, some teachers could not find exactly what they were looking for, indicating that the presentation of the website still has room for improvement.

The teachers made the following comments during the focus group:

- Secondary-school level general classroom activities were difficult to find.
- The CensusAtSchool homepage was difficult to find.
- Navigation pages are wordy, intimidating, and could prevent teachers and students from using the site.
- Minimizing the number of links on each page would make it easier to find resources.
- The graphics of the CensusAtSchool website seemed to targeted primary students and not secondary students.

4.2. Results of the Web Analysis

Our web analysis encompassed three areas of focus:

1. Analysis of the entire Education Services website
2. Analysis of the Education Services datasets
3. Analysis of individual CensusAtSchool activities

4.2.1. Analysis of the Education Services Website

Figure 13 shows data, obtained from WebTrends, of the page views on the Education Services website over the course of three years. We compared multiple years because the traffic on the Education Services website fluctuates due to: breaks and holidays because teachers focus on statistics in different places during the year, events held during the school year that can cause a sharp increase in traffic, etc. When looking at three years, one month can be compared to the previous month of the past year, and be compared to the one before that. Thus, Figure 13 shows both depth in historical data and a horizontal perspective of continuous data.

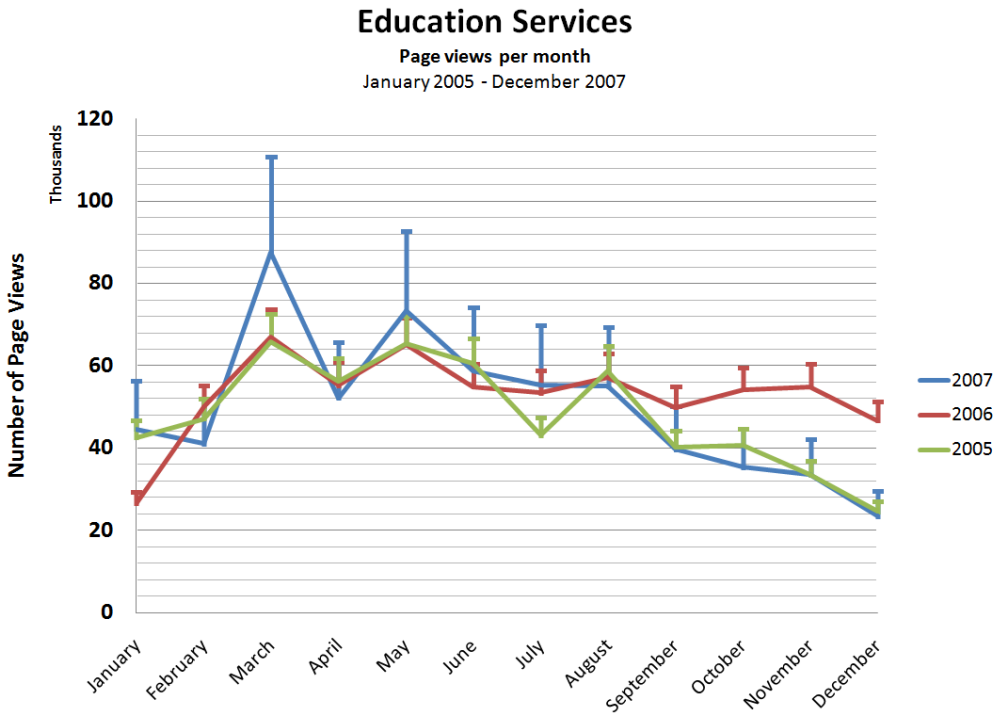

Figure 13 – Education Services Page Views per Month

The highest peaks of usage occur somewhere during the months of March and May. The lowest activity on the website occurs during the end of the year, which is when all the schools go on summer break. In the majority of states, students return to school at the end of January. The increase between the two months is visible in Figure 13, and more predominately in Figure 14.

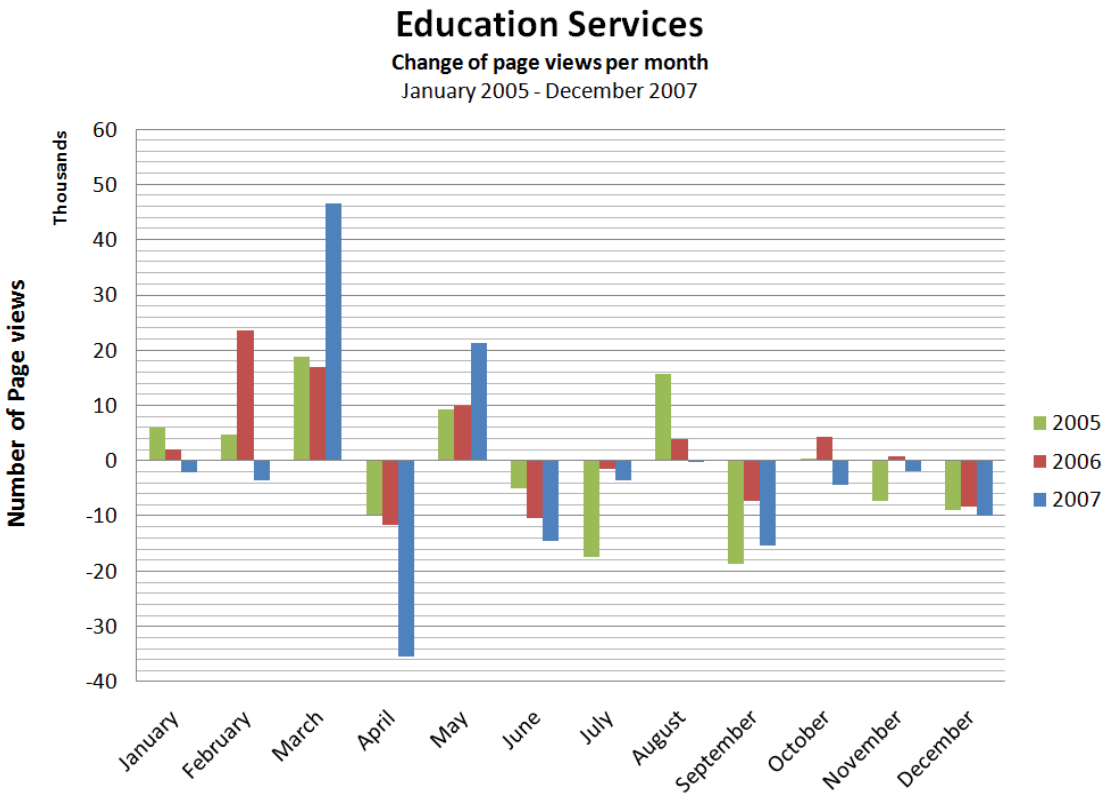

Figure 14 – Education Services Change in Page Views per Month

Figure 14 shows the change of page views between each month and the month preceding it. This is especially useful because the large changes in page views from one month to the next can be seen easily. When we compared these data to each state's academic calendar, shown in Table 2, we noticed a correlation between the two data sets. There is an increase in page views during the beginnings of terms while there is a decrease during breaks.

Table 3 – State Academic Calendar

State	Autumn Break	Winter Break	Spring Break	Summer Break
ACT	12 April – 27 April	5 July – 20 July	27 September – 12 October	20 December – 31 January
VIC	21 March – 6 April	28 June – 13 July	20 September – 5 October	20 December – 28 January
WA	12 April – 27 April	5 July – 20 July	27 September – 12 October	17 December – 3 February
NSW	12 April – 27 April	5 July – 20 July	27 September – 12 October	20 December – 28 January
QLD	5 April – 13 April	28 June – 13 July	20 September – 5 October	13 December – 28 January
TAS	N/A	31 May – 15 June	6 September – 21 September	19 December – 13 February
SA	12 April – 27 April	5 July – 20 July	27 September – 12 October	13 December – 28 January
NT	5 April – 13 April	21 June – 20 July	27 September – 5 October	13 December – 28 January

It may be more precise to say that traffic drops during the period between a couple weeks before the end of a term to a few days before the beginning of the next term. This is because teachers may focus more on examinations than obtaining new teaching material during the end of each term.

This logic can be further carried on to analyze the entire year. Teachers seem to use the ABS Education Services website more often at the beginning of the year. By the fourth term of the school year, the teachers who use the website may either browse less because they know exactly where they want to go on the website or they have already gathered material and do not need to return to the website. These scenarios would cause a drop in page views over the course of the year.

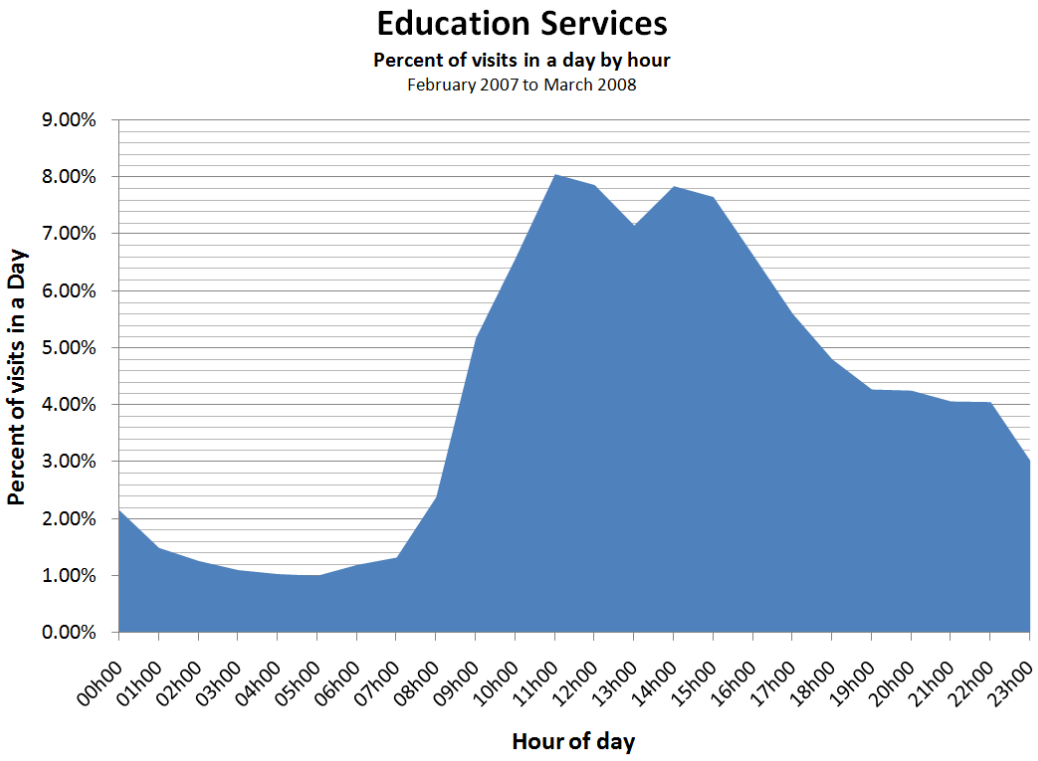

Figure 15 – Distribution of Daily Visitors to the Education Service Website

Figure 15 displays the percent of visits in a day by hour to the Education Services website. The web site receives the highest number of visits at noon and 2 PM. Traffic on the website begins to increase in the morning around 7 AM, continues to increase until it reaches its peak at noon, and then declines starting at 3PM. There is still a considerable amount of traffic occurring during late night hours; however, the website is available globally and users from very different time zones may also be using it.

4.2.2. Analysis of the Education Services Datasets

Our second area of analysis was analysis of the specific Education Service datasets. These data were gathered from a custom WebTrends report generated for us by a web analyst from Canberra's IT department.

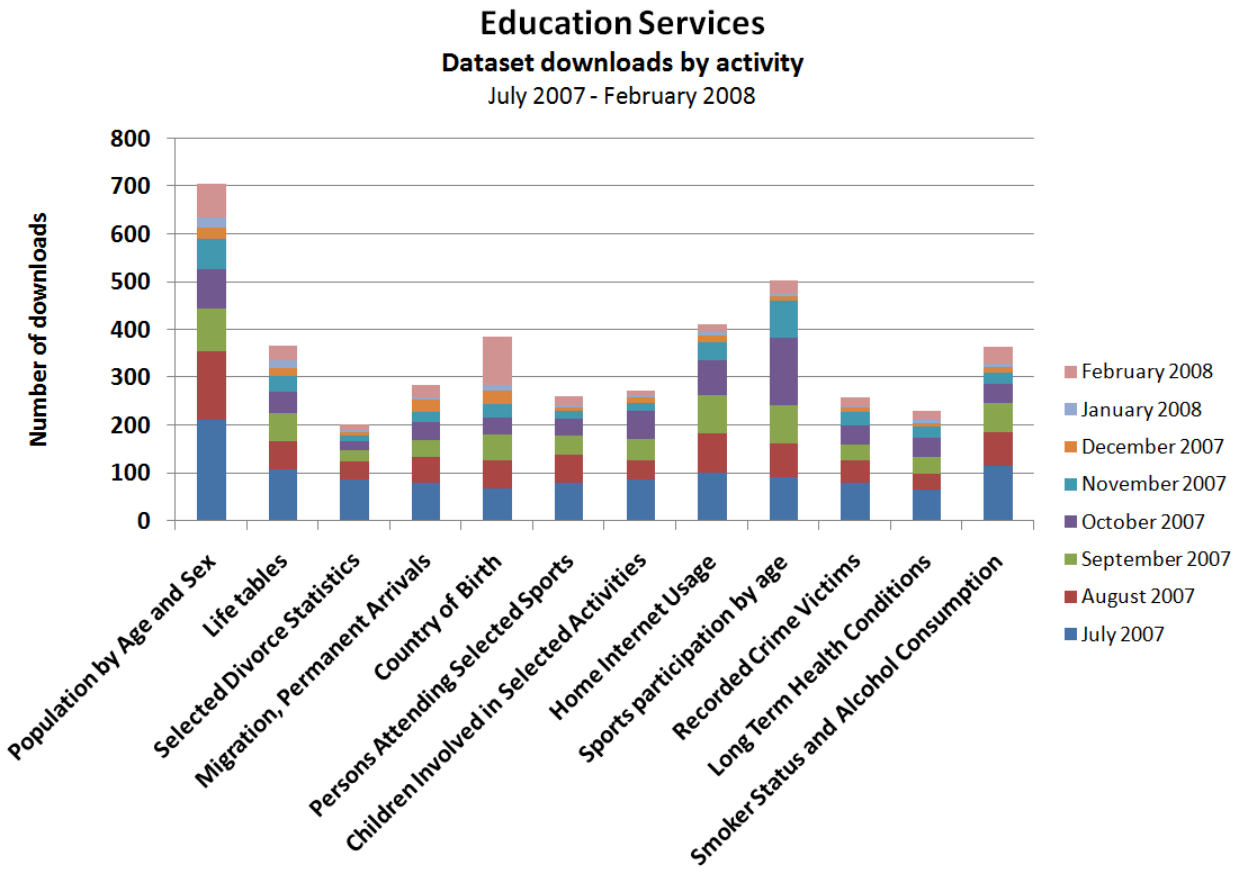

Figure 16 – Dataset Downloads by Activity

Figure 16 shows the number of downloads of datasets that currently reside on the Education Services website. Users are downloading "Population by Age and Sex" most often. The usage for each of these datasets varies over time. Figure 17 details each individual data set by the number of times they were downloaded over time.

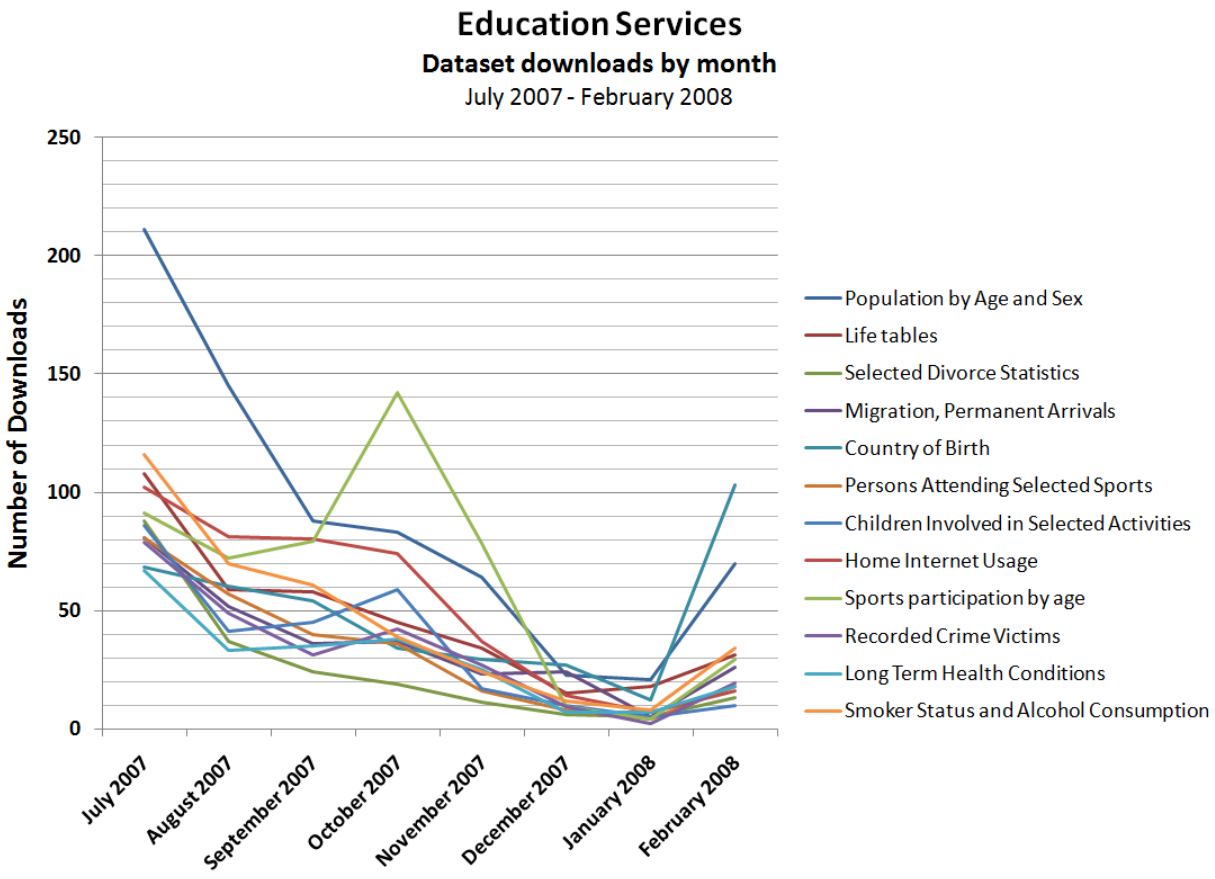

Figure 17 – Dataset Downloads by Month

Each dataset peaks in usage at different times during the year. The highest usage of the "Population by Age and Sex" dataset is in July. However, the highest for the "Sports participation by age" dataset peaks in October. This effect could be caused by popular sports' season schedules or news headlines. The similar scenarios may be important to the usage of other datasets.

4.2.3. Analysis of the CensusAtSchool Activities

Our last area of analysis was to look at the CensusAtSchool activities and determine which activity and which type of activity are the most popular.

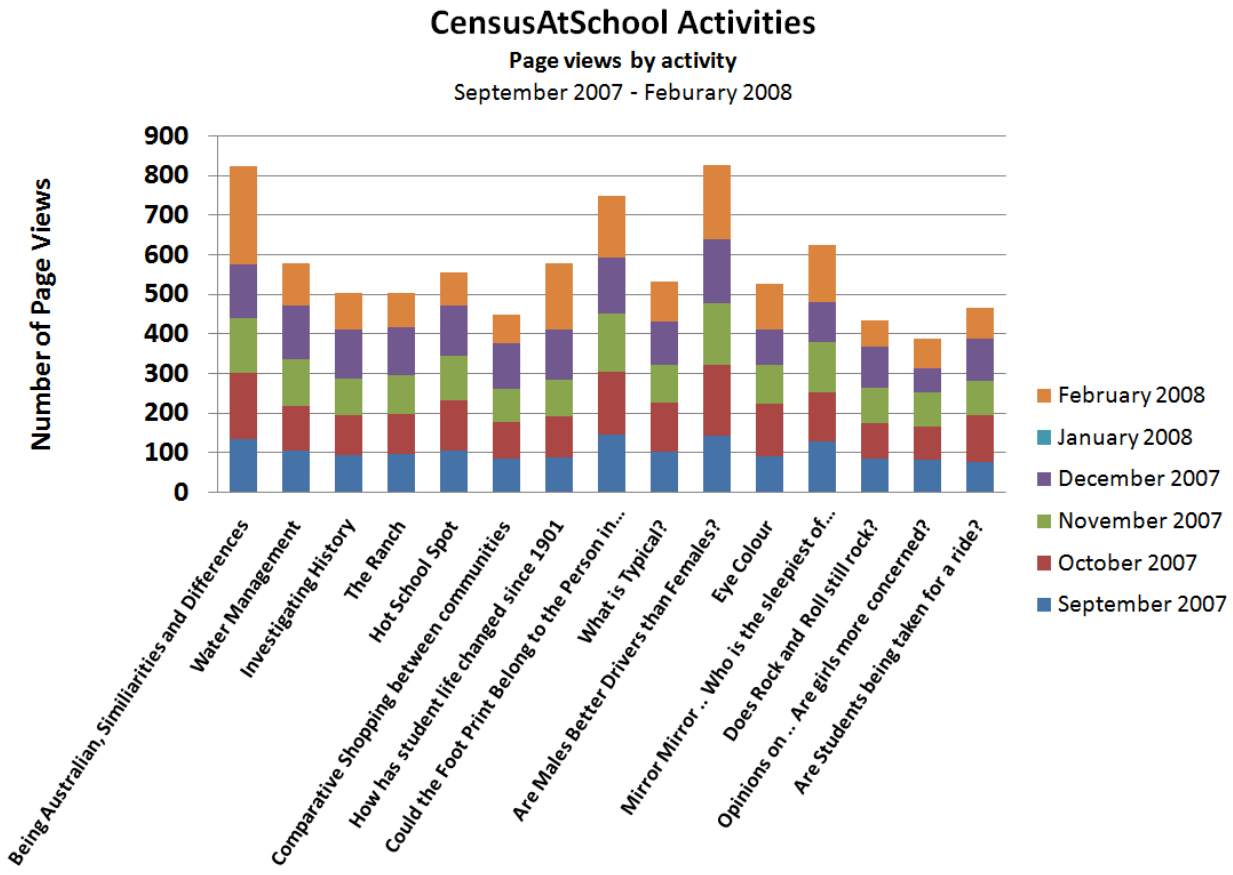

Figure 18 – Activity Web Page Views by Activity

Figure 18 displays the number of page views of the web page each activity resides. The figure shows both the total page views for six months and the distribution of page views for each month. The two most popular months for viewing the activity pages, out of the six analyzed, were the months of October 2007 and February 2008. This also supports the correlation between school term breaks and the use of the ABS Education Services website.

The reason why particular activities are more popular than the others is a matter of debate and cannot be solved alone by behavioral data. The individuals using the activities may find a particular activity more interesting or relevant to their audience. It may be possible to answer this question with attitudinal data.

The second aspect of the CensusAtSchool activities we analyzed was the difference in traffic between the four types of activities. Each activity offered on the CensusAtSchool site was divided up between these four activity paths:

1. Students find their own path
2. Internet access is used
3. Computers used but no Internet
4. No computers are used

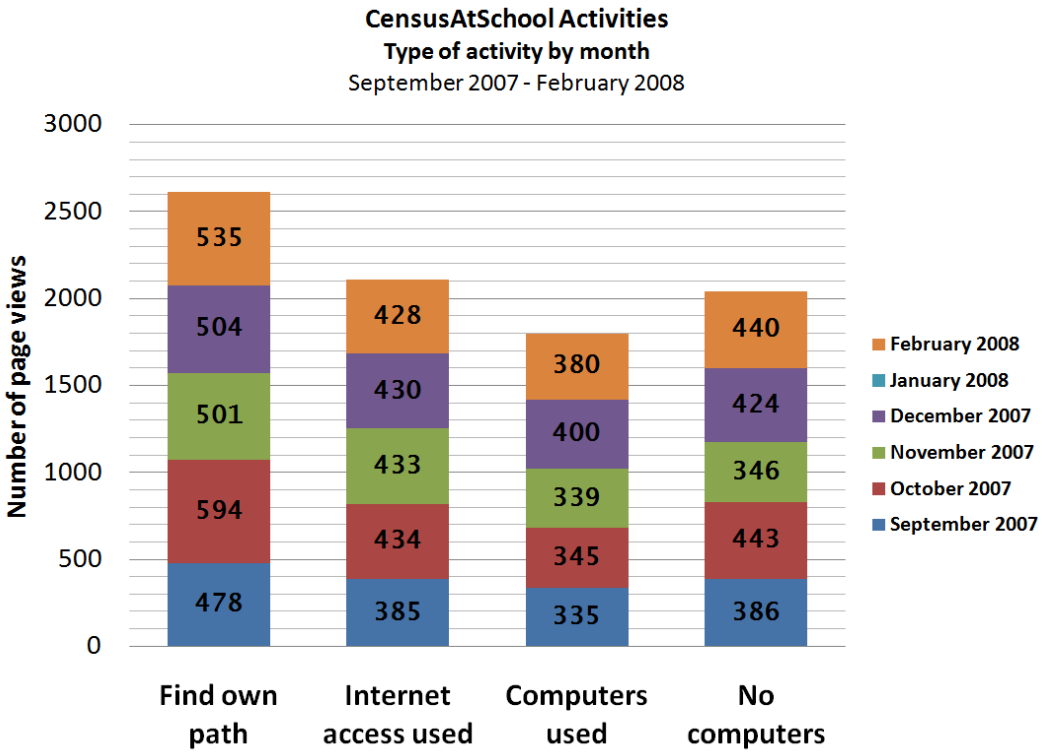

Figure 19 – Types of CensusAtSchool Activities Used

Like Figure 18, Figure 19 shows the page views of the four types of activities over six months. The most popular activity type is 45 percent more popular than the least popular activity type; however, the least popular activity type is still accessed often. All types of activities are utilized significantly. Teachers may be accessing the "students find their own path" activities more often because students can use whatever resources they have to complete the activities whereas the other three activity types restrict what tools students can use.

5. Conclusions and Recommendations

From our teacher survey and focus group, we were able to determine that the usability of the ABS's Education Services website has improved since 2002. Teachers use the ABS website nearly twice as often to find statistical data as they did in 2002. The ABS website has become more popular as a tool for teachers to acquire statistical data; however, much of the data acquired is not from the Education Services website. Teachers may not use the Education Services website because they are pleased with the resources they find on the general ABS website and feel no need to venture to the Education Services website.

Users of the ABS website download all four types of CensusAtSchool activities. Having multiple types of activities supports a variety of teaching styles and classroom constraints.

We believe that there is still room to expand and improve the Education Services website so it may attract new visitors and retain existing ones. We hope that with our recommendations the ABS may further improve the popularity and usability of the Education Services website.

Recommendations for Improvement

Advertising should stress that ABS's Education Services resources, including CensusAtSchool, are quick and easy to use. If these points are stressed, more teachers may use the resources and implement CensusAtSchool.

The ABS Education Services should complete usability testing every other year to ensure that the website evolves as teachers become more tech-savvy. The usability of the website can be determined easily and accurately through testing. Usability testing should also be performed during development of website revisions as well as at the conclusion of the revisions.

The ABS Education Services should release newsletters and new material two weeks prior to the beginning of school terms. Teachers may be more likely to read and act on the material during their planning weeks.

The ABS Education Services should continue to develop CensusAtSchool activities for all four types of classroom activities.

The wording on the Education Services website opening pages should be condensed and simplified. Reducing the wordiness could make it more inviting to users.

Primary and secondary level classroom activities on the website should be linked and highlighted. In the classroom activities pages, there should be clear links to primary and secondary activities.

A CensusAtSchool link should be added to the Education Services website navigation bar. This would make it easier for interested teachers to find information on CensusAtSchool.

The graphics of the CensusAtSchool website should be tailored to appeal to both primary and secondary students. Focus group teachers felt the graphics of CensusAtSchool targeted primary students and not secondary students.

THE ABS EDUCATION SERVICES WEB ANALYTIC PROCESS

During our evaluation, it was found that the ABS web analytic suite doesn't provide the flexibility and accuracy in data collection and reporting that the ABS requires for a detailed web analysis. An internally published ABS report asserted that their tool was not suited to their needs (Downes, 2007). The ABS contracted deployment of a new web analytic tool called Urchin but will encounter similar problems if they are not thorough in implementing it. A revised web analytic process may also eliminate many of their issues.

RECOMMENDATIONS FOR IMPROVEMENT

The ABS Education Services should become actively involved in implementing and using the new web analytics tool. Collaboration with other units may improve each unit's web analysis. Certain data may be useful to several ABS units and it would be inefficient for each unit to analyze it**.**

The ABS Education Services should develop their own *directly* measurable Key Performance Indicators. Education Services relies on KPIs developed by their global branch that are not *directly* measurable. KPI recommendations are available in Appendix N.

The ABS Education Services should expand the types of web data they collect and integrate them with their existing behavioral data. The ABS Education Services should collect and integrate attitudinal data, competitive data, and secondary data.

We hope that these recommendations will help Education Services further improve their website and services.

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APPENDIX A – 2002 MATH COORDINATOR SURVEY

Maths Coordinator Review - November/December 2002

Background

Every two years the National Education Services Unit (NESU) of the ABS has run a survey to gauge the levels of use of ABS products and services. These have traditionally been aimed at school librarians as the primary contact for ABS output in the school environment and asked broad ranging questions on the library, school and use of ABS products and services. Past surveys have looked to ascertain the level of use of electronic products and the last survey, conducted in 2000, had a specific focus on use of the ABS web site.

In recent years, NESU has aimed to communicate more directly with teachers rather than using librarians as intermediaries for ABS information. This shift was engendered by a greater availability of ABS products through the Internet (outside the library) and an extension in NESU's work beyond simply pointing teachers to existing ABS publications of interest, to designing a greater volume of ready to use classroom activities and making them available free on the Internet.

More recently, interest from top level ABS management in statistics education (in response to concern over the number of university graduates with the skills required to continue ABS work into the future) has resulted in NESU taking a more proactive role in engaging students in statistical concepts as well as the statistics themselves. Whilst ABSs' strength in this area is clearly in the area of presenting real life data for students to work with, NESU is looking to find ways to get mathematics teachers using the breadth of data resources available and using these to teach statistical concepts in an engaging way.

These shifts in emphases have meant that this survey has been designed somewhat differently from those conducted in the past, by contacting Maths coordinators by phone in randomly selected schools and asking them questions about their use of data in general and ABS data specifically as well as the education aids, both ABS and otherwise, used in their teaching of statistics.

Purpose

The purpose of this survey is to seek feedback from maths coodinators on how ABS might encourage more interest in the study of statistics by school students. The survey is intended to address the issue by establishing a benchmark by which future success or otherwise of the ABS efforts to increase levels of use and interest in statistical study in Australian schools might be measured. It is hoped that the results of this survey will cast some light on how much real data is being used in the classroom, how much of that data is ABS data and how we might improve our performance in terms of providing real data that will stimulate student interest.

In line with the above aims, the survey looks to:

- assess the level of use of data in teaching statistics;
- determine the source of statistical data used by teachers;
- collect thoughts about the most appropriate types of data that might be provided to teachers by the ABS;
- gain a teacher perspective on ways that students might be encouraged to take up statistical study in greater numbers;
- gauge the level of use of ABS education lesson plans and assess their presentation and usefulness; and
- collect names of interested teachers who might be involved in future focus groups.
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Methodology

It was recognized before conducting this survey that it was unlikely that large numbers of maths teachers would be using ABS materials. Anecdotal evidence suggests that maths teachers are fairly traditional in their teaching methods, tending to stick with set texts, and the NESU has done little in terms of promotion to maths teachers before attending the Mathematics Association of Victoria conference in 2001. It was nevertheless considered important that we approach maths teachers directly and achieve a high response rate so as to set a benchmark for comparison in the future.

To limit respondent burden, the number of questions was limited to 13 and maths teachers from randomly selected schools across Australia were contacted and interviewed by telephone. It was considered that this would also result in a much lower non-response rate (the 2000 survey achieved a 44% response rate with a much larger sample).

The questions and survey form were designed in the NESU with input from both the Statistical Consultancy Unit of ABS Victoria on the sample selection and the Statistical Services Branch in Canberra on the development of the questionnaire . Cognitive pilot testing was also carried out with mathematics teachers in early November 2002. A script was also developed to standardise the way that the teachers were contacted and interviewed.

Results of the survey were recorded onto hard copies of the survey form and subsequently transferred onto a data entry spreadsheet from which the results were collated.

Key information

Population: All secondary schools in Australia.

Sample Size: 115

Point of contact: Maths Coordinator

Response rate: 103 schools responded (equivalent to a 90% response rate).

Results

Conclusions & Recommendations

Results from the survey clearly support the new initiatives undertaken by the NESU as well as suggesting the possibility of new directions that should be investigated. Results below are organised according to possible initiatives for the ABS NESU rather than according to specific questions. Recommendations are in bold type at the end of each section.

1. Scope for use of ABS data

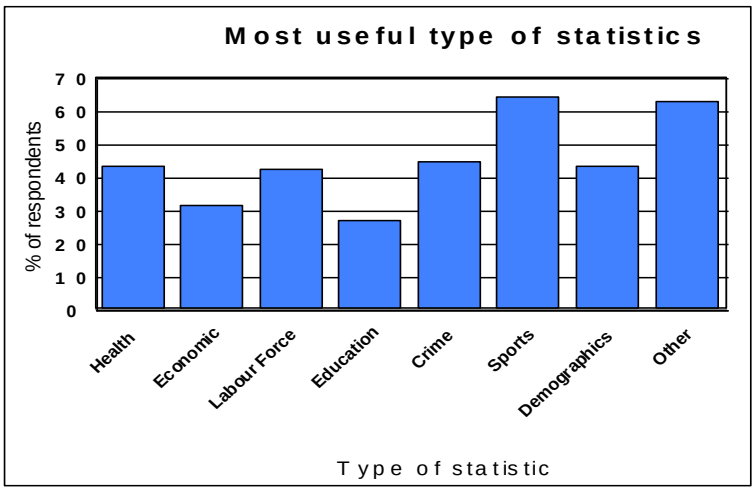
There is clearly a great deal of scope for inclusion of ABS data in statistical teaching with 90 percent of teachers using statistical data in their teaching. Of those that didn't use statistical data in their teaching, 55 percent were from NSW, most likely because of the more tightly controlled school syllabus in that state. Given that NSW represents the largest market in Australia, it should be a priority to work at the curriculum level to encourage greater inclusion of statistics and statistical concepts in the syllabus. Development of the new senior maths syllabus in NSW will begin in 2003.

Recommendation **1: NESU to work with curriculum boards, particularly in NSW to promote the inclusion of statistical learning in mathematics courses.**

2. Types of data

One of the key findings reflected in responses to a number of questions, is the need to make statistics used in the classroom topical and relevant to the students themselves. On question 3, "Where do you find the statistical data used in your teaching?", 24 percent responded unprompted that they sourced statistics from newspapers compared to the 23 percent who answered that they had used ABS statistics, when prompted. The most common answer to question 4, "What type of statistics do you find most useful in teaching mathematics?" was by far sport (64 percent) whilst crime statistics (45 percent) and demographics (43 percent) also rated highly. A number of teachers (27 percent) also indicated in the "other, please specify" category that the data should be issue specific or directly related to the students.

Clearly the ABS is best placed to provide demographic datasets but consideration should also be given to sourcing other relevant and topical statistics as well as coordinating data collection exercises that collect information about students that they will be interested in and that will provide a meaningful context for their studies.



Recommendation **2: Investigate presenting non-ABS datasets that reflect students' interests such as sport.**

3. Topical statistics

There is a clear indication that teachers direct their students to statistics of topical interest to students as indicated by teachers who responded that they sourced data from the newspaper (27 percent).

Recommendation **3: Develop learning activities and associated datasets relevant to recent and current issues in the Australian media.**

4. Inclusion of ABS "real data" in text books

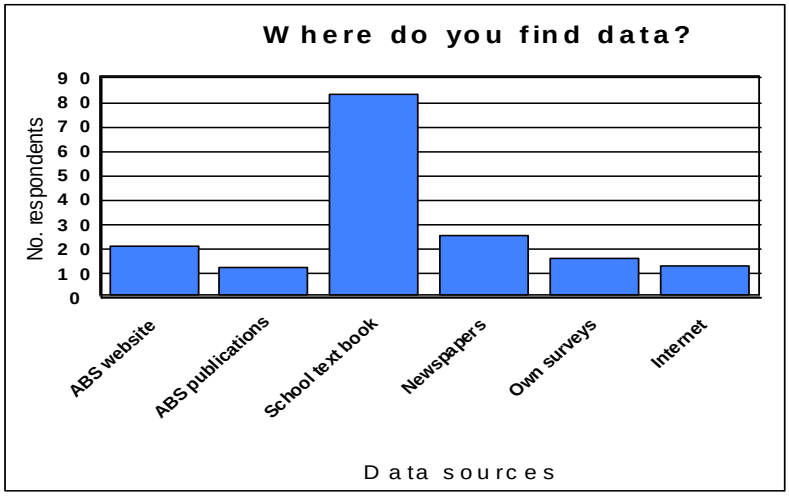
According to responses to question 3, " Where do you find the statistical data used in your teaching?", a large section of teachers (21 percent) only use statistical data from text books. Whilst this is clearly changing, with most of the other 79 percent of teachers citing several sources for statistical data, much of it from the Internet, the text book remains the single biggest tool used in teaching statistics.

Recommendation **4: NESU efforts to have more ABS data included in text books are strongly endorsed, bearing in mind the relevance of the data as indicated above.**

Recommendation **5: It should not be assumed that inclusion of more ABS data in textbooks will encourage more student interest in studying statistics. Given that student numbers are dropping, efforts should be concentrated on providing more engaging resources for teachers to use in the mathematics classroom.**

5. Use of the web for data dissemination and provision of learning activities

Many teachers are also using the web to source statistical information with 28 percent using the ABS web site to find statistical data and some also using other web sites. Anecdotal evidence collected in the survey also suggests that use of the Internet for both data collection and as a learning tool in itself is increasing with many teachers responding that although they hadn't used the web to find data they would be doing so in the future. A similar response was encountered in question 12, where 22 percent indicated that they had used web based activities and several others planned to do so in the future. The results suggest that the ABS will be well positioned to take advantage of this shift.

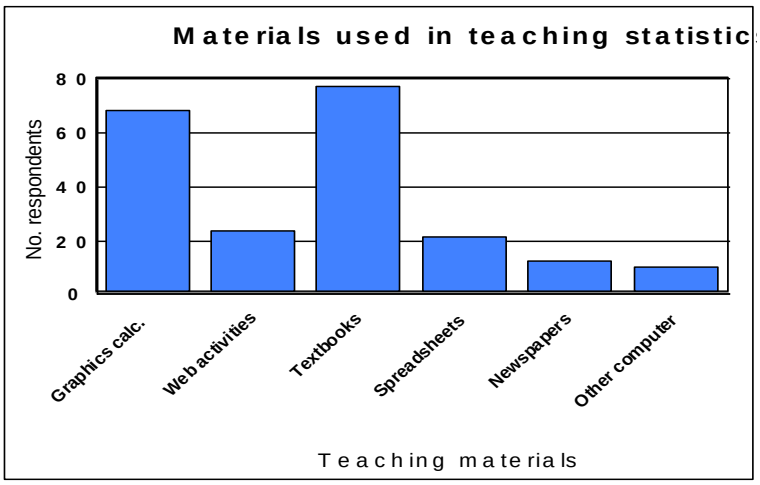


Recommendation **6: NESU to work with other interested parties in creating engaging activities for students on the Internet.**

Recommendation **7: NESU to expand school education pages on the ABS web site to become a centre for statistical learning excellence including links to other relevant sites.**

6. Use of Information Technology

The results from the review suggest that there are a large and growing (although this is anecdotal only) proportion of teachers using new technologies to teach statistics in the classroom. 66 percent of respondents said that they used graphic calculators in their teaching, with many also using web based activities and other computer applications also.



Recommendation **8: Develop strategies for keeping ABS up to date with technologies used in schools and develop curriculum materials that utilise most the widely used applications.**

Recommendation **9: Make ABS datasets available in formats that are easy to use with current technologies.**

7. Data types and formatting

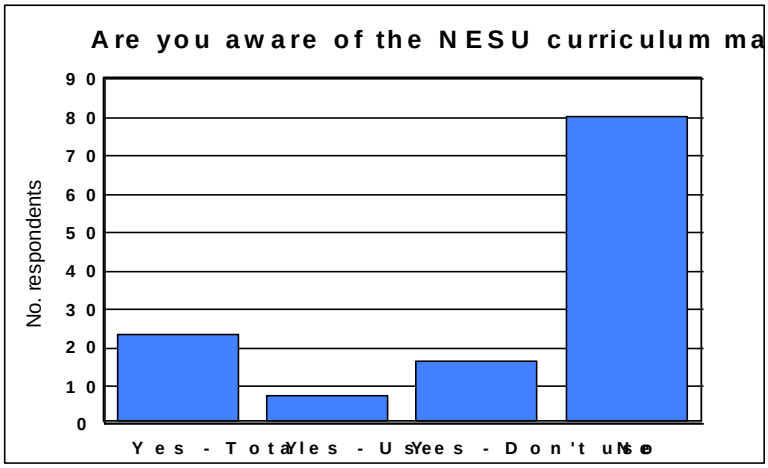
Question 5 asked teachers to describe how they used data in their teaching. Answers were varied but tended to focus on curriculum requirements centred on collection, collation, analysis and presentation of data. Teachers went into more detail on the analysis side with 48 percent specifically mentioning mean, median, and mode and many also referring to measures of spread and the means of presenting these (box and whisker, stem and leaf, graphs etc.). Several also mentioned regression analysis and lines of best fit for bivariate data analysis. A clear indication from this question, was that more could be done to present data suitable for bivariate analysis by the ABS to encourage wider use and interest in ABS data and the subject of statistics more generally.

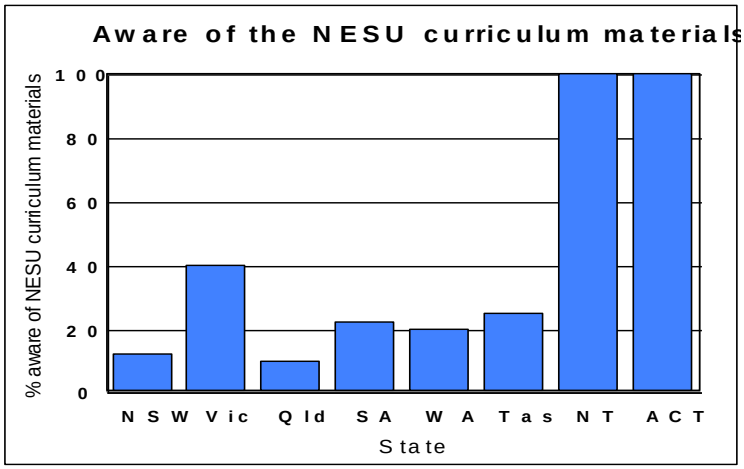
Recommendation **10: NESU to work with ABS subject matter areas to make available datasets that are ready for classroom use in statistical analysis.**

8. Promotional Activities

Awareness of ABS Education materials on the web according to responses to question 7 are at present fairly low at just 22 percent. Only 7 percent of respondents had actually used the material there.

43 percent of those who were aware of the Education pages were from Victoria, most likely due to NESU staff presence at Victorian Maths Association conferences in the past two years. A continuing presence at these conferences, and at national maths conferences will address this to some extent. Direct targeting of maths teachers in mail-out campaigns from the NESU was also highlighted in question 13 as an effective means of increasing interest in statistics from students.





Recommendation **11: Undertake a direct mail promotional campaign that targets maths teachers in all Australian schools highlighting data and associated statistical learning resources that are available from the ABS.**

Recommendation **12: Initiate presence at state based maths teachers conferences by way of attendance, coordination of attendance by local ABS personnel or supply of promotional materials to the conferences.**

Recommendation **13: Develop national e-mailing list for maths teachers for use in highlighting ABS statistics education initiatives.**

Recommendation **14: Approach state and national maths associations to organise reciprocal links on web sites.**

9. Education Pages of the ABS web site

Those that had used the material, on average rated the relevance of the material to their curriculum 2.8, ease-of-use, 3 and presentation of the pages 2.6, all on a scale of one to five, where one is lowest and 5 is highest.

Clearly, there is also great deal that could be done to improve all aspects of the Education pages of the ABS site such as improvements to presentation through greater use of colour, ease-of-use through improvements to the searchability of pages and close attention to keeping the material relevant to school curricula.

Recommendation **15: A set of education web publishing standards be developed, in line with best practise, to enhance useability and presentation of Education pages on the website.**

Recommendation **16: Develop and maintain a greater range of reciprocal web links with related statistics education sites.**

Iain Sutherland

16/01/03

APPENDIX B – PROTOCOLS FOR 2002 MATH COORDINATOR SURVEY

The following is the three step process (probably with multiple iterations) for conducting the survey for our user review. Each of us interviewers have a separate page on the DB - under Education / Client Serv. / Feedback / School user review contact record / "name" as comment documents on School user review contact record.

Step 1. Ring School Number

"Hello, my name is [insert name], I'm from the Australian Bureau of Statistics Education Unit, may I speak to Maths co-ordinator?"

If available	**If not available**
a) Ask for name of Maths co-ordinator b) Go to step two	a) Ask for name of Maths co-ordinator and an appropriate time to call back. b) Thank receptionist c) Record details on DB d) Repeat above steps until you get hold of the maths co-ordinator, then go to Step 2.

Step 2. Establish Contact with Maths coordinator

"Hello [Maths co-ordinator name], my name is [name] and I work for the Australian Bureau of Statistics Education Unit. The Education Unit are conducting a survey across Australian schools to find out how maths teachers use statistics in their classrooms. Our aim is to find out how we can better present and promote statistics and statistical training aids to enable greater use and understanding in the classroom. As part of this survey we would like to conduct a five minute interview with yourself or another maths teacher at your school."

Ask if teacher is available to do an interview now.

NB: We should have a name of a contact by this stage. If the maths co-ordinator doesn't want to co-operate, or delegate to another maths teacher, all efforts should be made to convince them of the benefits - enhanced learning materialsetc. - but we can't force them. Record any refusal on the DB.

Step 3 - Conduct the Interview

a) Record name of school and interviewee (first name only is enough) at the top of the form
b) follow questions from 1 through to the end of the survey form
c) thank them for participating
d) record the details in the DB

APPENDIX C – 2002 MATH COORDINATOR QUESTIONNAIRE

Background & Purpose

This survey has been designed to examine the extent and nature of maths teachers use of statistics and how the Australian Bureau of Statistics can encourage greater use and understanding of statistics in a maths teaching context.

The survey is being carried out as the biannual user review conducted by the National Education Services Unit of the ABS. This review has traditionally surveyed use of statistics and Education Services support material by school librarians. The reasons for the change in target population are twofold

1. The emphasis of the unit's work over the past two years has shifted more toward fostering understanding and access to statistics among teachers, rather then using librarians as an intermediary, hence the focus on teachers; and

2. A lack of graduates with statistical skills due to a general shift away from mathematics, and statistics in particular, in the school years.

It is not the intention of this survey to examine the means by which the ABS might attempt to reverse the trend away from the study of statistics by school students. But the survey is intended to address the issue by establishing a benchmark by which future success or otherwise of the ABS efforts to increase levels of use and interest in statistical study in Australian schools.

It has been agreed within the ABS that the most appropriate role for the ABS in fostering an understanding of and interest in statistics and statistical concepts, will be in providing real data. It is hoped that the results of this survey will cast some light on how much real data is being used in the classroom, how much of that data is ABS data and how we might improve our performance in terms of providing real data that will stimulate student interest.

This survey has been designed to be conducted over the phone with maths teachers from schools selected using a stratified random sample.

Interview text and questions

This survey has been designed to examine the extent and nature of maths teachers' use of statistics and how the Australian Bureau of Statistics (ABS) can encourage greater use and understanding of statistics in a maths teaching context. Your input will help us to design better education resources for teachers and help us measure the success of our current and future statistical education program.

This survey should take less than 10 minutes.

1. Please indicate the year levels and streams (where applicable) in which you teach **mathematics**.

Year	**7**	**8**	**9**	**10**	**11**	**11**	**12**	**12**
Level	❑	❑	❑	❑	❑	❑	❑	❑
					.....	.....	.....	.....

2. Do you use any statistical data in teaching maths?

Yes ❑ **Please go to question 3**

No ❑ **Please go to question 6**

3. Where do you find the statistical data used in your teaching?

ABS web site ❑

ABS publications ❑

School text books ❑

Other, please specify .....

4. What type of statistics do find most useful in teaching mathematics? eg. health, population, economic etc

Health & Welfare	❑	Education	❑
Economic	❑	Crime	❑
Sports	❑	Demographics	❑
Employment	❑		
Other, please specify	.....		

5. Please briefly describe how you use statistics in teaching mathematics?

.....

.....

.....**Please go to question 7**

6. Why do you not use statistics in your teaching?

Not relevant to school curriculum	❑
Too difficult to access	❑
Other, please specify	.....

7. Are you aware of Education Services curriculum materials (such as lesson plans and activities) on the ABS web site?

Yes	❑ **Please go to question 8**
No	❑ **Please go to question 12**

8. Do you use the Education Services curriculum materials on the ABS web site?

Yes	❑ **Please go to question 9**
No	❑ **Please go to question 12**

9. On a scale of 1 to 5, where 1 is not relevant at all and 5 is very relevant, please rate how relevant to your maths curriculum you find ABS curriculum material.

Not at all relevant 1 2 3 4 5 very relevant

Please comment on relevance of teaching materials:

.....

.....

.....

10. On a scale of 1 to 5, where 1 is very difficult and 5 is very easy, please rate how easy is it to use ABS curriculum material.

Very difficult 1 2 3 4 5 Very easy

Please suggest how we could make ABS teaching materials easier to use:

.....

.....

.....

11. On a scale of 1 to 5, where 1 is very poor and 5 is very good, please rate the presentation of the Education Services web pages.

Very poor 1 2 3 4 5 Very good

Please suggest how we could improve the presentation of the ABS Education pages:

.....

.....

.....

.....

12. What other materials do you use in teaching statistics in mathematics? tick all applicable boxes.

Graphic Calculators ❑

Web based activities ❑

School text books ❑

Other, please specify .....

13. How do you think the ABS could encourage greater interest in statistics from students?

.....

.....

.....

14. Would you be prepared to have us come back to you to follow up on your comments for more detail?

Yes ❑

No ❑

Thanks for participating in this survey

APPENDIX D – RELATED RESEARCH

AUSTRALIAN BUREAU OF STATISTICS BACKGROUND

The Australian Bureau of Statistics was established as a result of the Census and Statistics Act in 1905 (Informing a Nation, 2005). This independent, private agency is run by a head statistician who is appointed for seven years at a time. ABS is responsible for conducting the Australian Census. It also acts as a consultant for businesses, universities, and governments (ABS website). There is a variety of material on their website including data about the economy, people, business, environment and energy as well as regional statistics (ABS website).

Education Services was created in 1994 and is section of ABS. Its' goal is to "promote greater understanding, knowledge and access to ABS statistics by teachers, librarians and students, increase statistical literacy in the school sector and the broader community and promote statistics as a career choice for students" (ABS ES website). Education Services is the branch who is conducting the newly implemented CensusAtSchool program (Mooney, Sergi). ABS Education services offers classroom activities and curriculum materials for teachers and games and projects for students. A site for teachers instructing them how to teach statistics is also available.

INTERNET USE WITH REGARDS TO CHILDREN

The Internet is massive and very complex. Because of this, students often have trouble finding and processing information available on the Web. With all of the information available to them on the Web, it is no wonder that children have difficulty finding what they are looking for. In a 2005 study, Kuiper, Volman, and Terwel found that children have difficulty picking search keywords, reading large amounts of text, and evaluating the reliability of sources, which are all skills required for web research. They tend to rely on familiar websites and venture beyond them very little. It is our hope that students will acquire these skills and become comfortable using Web resources. In hopes of accelerating students' learning process, focused educational websites have been developed.

Statisticians want to place statistics in the group "lab science" and activities to be hands on (Cobb, 1993). I. Gal and J.B Garfield (1997) have come up with a set of goals that statistics education should follow. These steps will help the learned to understand and enjoy the process of statistics. The first of these goals is to understand the purpose. Like any other class, if the student does not know why they are doing an activity, they will be less likely to complete it. This goal falls within the teachers' responsibility. ABS can supply the services for teaching statistics but the teacher must motivate the students. The second goal is to plan out the method of gathering data. In some lesson plans on the ABS website, the data set is given. Students can also collect their own data by means of survey or questionnaire. The next steps ensure that the student understand the relationship between statistics and math. This goal is very important. As stated above, mathematics and statistics are seen as one in the same by some people. This goal should be stated clearly at this point in the lesson. When the results of the study are shown, the students should question the results. This gets the student to think "outside the box" and realize that questions in statistics have many answers (Gal, 1997). In older children, the statistics resources they are given might not be helpful in stimulating interest. Statistics should be a more "hands on" class than a textbook class. The book used should follow that philosophy. Eric Sowey of the University of South Wales states that textbooks are good for some aspects of Statistics but often "fall short" at saying exactly what needs to be said. "Students need more than simply an assurance that statistics is important in the real world to be motivated to learn and retain statistical ideas" (Sowey, 1995). Like any other subject, the combination of theory and practice is most often the best way to cement the subject matter (Sowey, 1995). These steps will help students understand and enjoy the process of statistics. [2]

Statistics, if not presented right, can be dull. Students will obviously be more apt to complete an assignment if they feel it has value. Data sets such as sports, and eye and hair color would be popular in children ages 6-10. Teachers should plan hands on activities, such as making a survey, to get the students up and into the role of a statistician (Yilmaz, 1996). A physical display of

statistics might benefit the students (Moore, pages 1-6). Musftafa Yilmaz of Northeastern University states that students should make the questionnaire, gather the data and present the findings to the class (Yilmaz, 1996). Younger children are more likely to find the fun in this and therefore making the activity worth its while (Yilmaz, 1996).

Instead of teaching information to their students, teachers should provide the tools students need to acquire information over the web (Phillips, 2003). The teachers role therefore from the one who is the "foundation of knowledge" to one who helps students find the "pathways to knowledge" (Kuiper). Teaching with this new philosophy will strengthen students' analytical abilities, making them more capable learners.

CensusAtSchool in Australia and in Other Countries

The Census of Australia is run by the Australian Bureau of Statistics. The Census happens every five years and is important in gaining data about the residents of Australia (ABS Census Website). Censuses are carried out all through the world and in order to educate young people about the Census, some countries have set up a program called "CensusAtSchool." The CensusAtSchool program is used by Australia, New Zealand, South Africa, Canada and the United Kingdom. The United States has a similar program called Census In Schools (US Census Bureau website). The follows paragraphs will compare and contrast some different Census AtSchool/ Census In School sites with regards to the ABS CensusAtSchool site (Census at School).

The US Census in Schools programs' goal is to "promotes data literacy and increases awareness of Census Bureau products and activities by providing educators with teaching tools, resource materials, workshops, and other professional development opportunities" (US Census Bureau Website). According to their website, "the Census in Schools program provides K-12 teaching tools for educators. These include lesson plans that correlate with national standards in math, geography, civics and government, history, economics, and language arts" (US Census Bureau Website). On their website they have some lesson plan links, similar to the ABS website, however, not as extensive. The lesson plans available on the Education Services website are focused on years 7-10. On the US Census website, there is data such as "number or 7, 8 and 9

year olds" that might be very interesting to a child of that age. This information can be found in a child friendly and colorful website called "State Facts for Students." Upon completion of the "Census at School" program for 2008, the ABS might want to look into fun, colorful and unique ways of displaying information pertinent to children on their website. ABS does have activities aimed at younger students however; younger students will have fun with data like the aforementioned and perhaps retain knowledge of the statistical process.

The UK CensusAtSchool site is very extensive. It includes lesson plans and curriculum items as well as news and events. The UK CensusAtSchool website is its own intensity as opposed to the Australian Site, which is linked to ABS. At the bottom of the UK page, there are links to a variety of participating organizations such as the Centre for Statistical Education, National Statistics, Department of Education and Skills, Curriculum Online and Nottingham Trent University. ABS is the only organization in Australia in charge of Census at School so naturally, the website for the program would be on their page. The UK site does not have separate teacher and student areas. The ABS site divides into teacher and student sections as soon as you arrive at the main CensusAtSchool site. This is a positive trait because teachers and student do not have to look around to find where their respective activities are. The teacher area is generally more professional looking while the child site has substantially more clip art. The UK has linked together mathematics and statistics in their lesson plans. As mentioned before, the current trend is to move away from the combination of mathematics and statistics and move towards statistics as its own entity. The UK site also has lesson plans on a variety of topics not covered by ABS such as science and history (CensusAtSchool, 2006). Another key aspect of the UK page is their advertising on "how to get involved". There is a link to this section right on their home page. This link is very important in the success of the program as it allows interested teachers and community members to find what they are looking for right away. ABS does not have the link directly on their homepage.

Overall, the CensusAtSchool websites are very informative and useful. They should direct the user to the appropriate site and be well thought out. These websites should attract users' attention and get them interested in statistics and learning.

WEB ANALYTICS BACKGROUND

Before the dot-com bubble burst in 2001, there was an immense surge of businesses making an appearance on the Internet. Within this bunch, were the many companies that would be now known as "e-businesses", whose only market was the individuals who used the Internet.(Nobles, Rovert 2001) Since these businesses had no other market to turn to, it was very important that the business understood its current conditions within the marketplace and was able to judge the efficiency and profitability of its actions (3 Sterne, Jim 2002).

WEB METRICS

When web based businesses first took off, the Web data available was very basic, consisting of little more than website counters and server logs. Early website logs listed lines of IP addresses and HTTP requests that were difficult to analyze. Software was soon able to take in the logs and produce more intuitive data, which are known as *metrics*. These results often highlighted data such as the number of hits, page views, visitors, visitors' IP addresses, and the amount of time a visitor spent on any given page (Sterne, 2002).

Unfortunately, metrics alone do not provide enough insight for making important decisions like reconstructing a website. For example, 'spider' programs browse the Internet to create indexes for search engines and can generate misleading page views. Some hits may also occur for similar reasons. If a webmaster looks at only metrics without comparing them to business goals, it may appear that the site is much more popular than it actually is.

ANALYTIC STRATEGIES

Tracking a user's *click streams* is beneficial, especially if you want to judge how easy it is for users to navigate a website. Click streams reveal a user's navigation process, which can provide insight into why the content they view is important to them. The goal of reviewing click streams is to understand the thought process of the user as they search for specific content. With this knowledge, the amount of searching and the number of 'clicks' required to find popular

information can be greatly reduced, which will increase website usability and user satisfaction (Burby, J & Atchison, S., 2007).

The majority of Web Analytic tools keep track of keywords visitors use to find a website on search engines. If there are commonly used keywords, it may be beneficial to offer more information on that topic or organize the website such that it makes the topic more obtainable and accessible.

The number of *404 errors* triggered by users trying to visit certain non-existent pages is information helpful to the improvement of websites. If there are a high number of 404 errors within the data, it means that there might be dead web site links. If users are getting many *500 errors*, a program or script on the website is not processing correctly on the server. Following this error may point to an error within the script itself. Compatibility between all users (computer operating system, browser etc.) is essential to ensure that everyone has the ability to visit the site and gain the same information from it (Vidgen, R., 2002).

Making the comparison between new versus old website traffic data can help track the progress of a developing website. If an organization has recently changed their website, comparing current data to past data may give insight on how the new website design compares to an older version. An increase in the number of visitors or a decrease in length of click streams indicates that the website revision was successful. Since the Australian Bureau of Statistics Education Services changed the layout of their website in 2007, this comparison strategy could be useful in this study.

APPENDIX E – 2008 ABS AND WPI TEACHER SURVEY

Section 1: ABS Website Use

1. What levels and subjects do you teach?

   Primary: 3 4 5 6

   Secondary: 7 8 9 10 11 12

   Subjects:

2. Do you use any statistical data in teaching maths? If not, why not?

   □ Yes

   □ No – "Would you like information on ABS *free* resources for teaching statistics?" (End Survey)

   Explanation:

3. Did you know that all ABS online resources are free?

   □ Yes

   □ No

4. Where do you find the statistical data you use to teach statistics? Select all that apply.

   □ ABS Websites (go to question 6)

   □ ABS Publications

   □ Textbooks

   □ Internet

   □ Other, explain:

5. Have you used the ABS website?
   - □ Yes
   - □ No – "Would you be interested in receiving information on ABS website and its free resources for teaching statistics?" (End Survey)

6. Have you used the ABS Education Services website within the past 10 months?
   - □ Yes – "Please answer the following questions based on your experience within the past 10 months."
   - □ No – "Did you know that ABS improved their website to make it easier to use?" (End Survey)

Please indicate how well you agree or disagree with the following statements. Choices are Strongly Disagree, Disagree, Neutral, Agree, and Strongly Agree.

		Strongly Disagree				**Strongly Agree**
7.	I think I would like to use this website frequently.	1	2	3	4	5
8.	I found the website unnecessarily complex.	1	2	3	4	5
9.	I thought the website was easy to use.	1	2	3	4	5
10.	I think I would need Tech Support to be able to use this website.	1	2	3	4	5
11.	I found the various services in this website were well integrated.	1	2	3	4	5
12.	I thought there was too much inconsistency in this website.	1	2	3	4	5
13.	I would imagine that most people would learn to use this website very quickly.	1	2	3	4	5
14.	I found the website very cumbersome to use.	1	2	3	4	5
15.	I felt very confident using the website.	1	2	3	4	5
16.	I need to learn a lot about this website before I could effectively use it.	1	2	3	4	5

17. Have you used the *free* classroom resources on the ABS website (including activities, datasets, learning tools, etc.)? If not, why not?

□ Yes

□ No (End Survey)

Explanation:

18. Please indicate how easy it is to use ABS resources. Choices are Very Difficult, Difficult, Neutral, Easy, and Very Easy.

Very Difficult				**Very Easy**
1	2	3	4	5

Section 2: CensusAtSchool

19. Are you familiar with the CensusAtSchool online learning resource?

- □ Yes
- □ No – "Would you be interested in receiving information on Census at School?" Describe CensusAtSchool and refer to www.abs.gov.au/censusatschool (end survey)

20. How did you hear about CensusAtSchool?

21. Which of the following describes your level of involvement in the CensusAtSchool project? Select all that apply.

- □ Sent in a registration form
- □ Set up a Teacher account
- □ Had students complete the questionnaire
- □ Used the data when it became available
- □ None of the above

22. What aspect of the CensusAtSchool project have you found to be the most valuable?

APPENDIX F – 2008 ABS AND WPI TEACHER SURVEY PROTOCOL

Step 1: Telephone the school

"Hello, this is (Insert name here) and I am calling from the Australian Bureau of Statistics Education Services Unit. Is the Maths Coordinator available to speak with?"

If available:	**If not available:**
1. Ask the name and phone number of the Maths Coordinator and go to step 2	1. Ask for an appropriate time to call back 2. Thank the person you were speaking with 3. Record information 4. Call back at specified time

Step 2: Speak with Maths Coordinator

"Hello, my name is (insert name here) and I am calling from the Australian Bureau of Statistics Education Services unit. We are conducting a survey across Australian schools to gain opinions and preferences on our new website and CensusAtSchool programs. With your information, we can improve our services to serve educators better. Would you be willing to take this survey or is there a teacher available that would?"

If there is a teacher available	**If there is not a teacher available**	
Conduct interview	Ask if there is another time when you could call back	
	If there is another time to call back	**If there is not another time to call back**
	1. Set up a new time to call back 2. Record names of people talked to, time to call back and any other details of the call 3. Call back teacher at specified time	1. Ask for the name of another math teacher who would be able to take the survey 2. Thank the person you were speaking to 3. Conduct survey with math teacher

Step 3: Conduct the Survey

1. Take down name of school and teacher name on top of the data sheet.

2. Follow the survey, recording all responses.
3. If the teacher answer makes it past question 5, we will ask them if they would mind if we contacted them for a follow-up interview. These questions will allow us to ask comprehensive questions about their opinion of the website.
4. Thank them for taking part in the survey.

IF TEACHER REFUSES TO PARTICIPATE:

"*Might I emphasize that with your information, we could better serve educators like yourself.*"

If the teacher still refuses, politely thank them for their time and end the call.

APPENDIX G – GLOSSARY AND ACRONYMS

Within this section, you will find definitions of terms used through out the IQP proposal. Any term that is *italicized* in the paper is a term you can find defined in this section.

ABS – Australian Bureau of Statistics

ABS ES – Australian Bureau of Statistics Education Services

Accessibility – See *Ease-of-use*.

CAS – CensusAtSchool

Content Management System – A system for designing and management web pages on a web server.

Click stream – The series of pages in which a user has visited.

(HTTP) Cookie – A HTTP cookie, or more commonly "cookie", is packets of text that a web server sends a user's browser, which it returns unchanged. This is useful for things such as authenticating and user-side variables for anything that the web server wants to track about that user.

Ease-of-use – User can utilize the website without having to overcome a steep learning curve.

Entry page – The first page a user visits on a website. They can arrive at the entry page through a variety of ways, whether it is a link from another site or the user typing in the address in his web browser.

Exit page – The last page the user was visiting before ending his session.

IP address – A 32-bit number (e.g. 130.215.24.12) which is assigned to any computer connected to a network through the TCP/IP protocol. The IP address is always unique IP address for each computer. However, once a computer leaves the network, the IP address may be reused for another computer (which is defined as a **dynamic IP address**). A **static IP address** is an IP address that remains tied to a specific computer and does not change, regardless the number of times the computer has disconnected and reconnected to the network.

Homepage – The web-page where the website's *site map* typically begins. It stands as the beginning point for users entering into a website and is often a landing page for many websites.

Hit – A hit is calculated whenever another computer communicates with the *web server*. This could be attributed to a user visiting the website, viewing an image, downloading a file, and among other things. The user does not actually have to visit the website in order for a hit to be generated.

HTTP – HyperText Transfer Protocol – It is the underlying protocol that handles Internet web-pages and the "world wide web".

HTML – HyperText Markup Language – A markup language that is used for HTTP. HTML allows web-pages to have extensive formatting and adds the ability for pictures, videos, and other files to be delivered to the user.

Keyword – Words that are specifically used to describe a website. These words are often used in search engines when indexing the website.

Key Performance Indicator (KPI) – Similar to a *Performance Indicator*, but they are the most important indicator that will directly measure an objective's progress.

Landing page – Similar to an *entry page* except that a Landing page is the page the owners of the website want the user to enter the site on. While this could very well be the *homepage* of the site, it does not have to be.

NESU- National Education Services Unit

Page – Often defined as the individual pages users view when browsing a website. However, this definition is left up to the webmaster as he may set it to any file he wants the Web Analytic software to recognize as a page.

Page tagging – Page tagging involves placing a snippet of code that runs whenever the page loads. This code would then notify another server indicating that the page has been visited along with any additional information kept. Cookies on the other hand track users have by utilizing server side code that reads variables that are stored in test files located on the user's local computer.

Page View – A measurement that increases when a user visits a page on a website. Each page has its own measurement of page views. The number of views is calculated on a time basis set by the webmaster.

Performance Indicators – They are ratios and combinations of measurements and/or metrics that are used for directly or indirectly measuring the organization's progress towards a given goal or objective.

Popularity – How well liked the website is in respect to the Math teachers.

Referrers – Other websites that bring traffic (users) to another website. It is created by the referring website having a link on their site that lead to another website.

Session – When a user visits a web page, he is considered to be in a session with the *web server*. A session can last any given amount of time defined by webmaster. Sessions are typically calculated and tracked with *cookies*.

Sitemap – It is a visual representation of a website's structure. Each item in a sitemap is each page or if the site is very large, each major category within the website.

Visitor – Defined as any computer establishing a connection with the *web server* and beginning a session. While most often webmasters want to focus on the human visitors, *robots* are calculated as visitors as well. The user or robot may be calculated as a visitor again when their session expires and they visit the website again.

Unique Visitor – Similar to a *visitor* except the user or robot are only calculated once over a period of time as defined by the webmaster.

Usability – The simplicity of which someone can utilize a website.

Webmaster – The webmaster is the individual that is responsible or maintaining and/or designing the website. They may or may not be the individual that make decisions regarding the site structure and handle the software running the website.

Web server – It is the server (often a single computer) that hosts a website and it is often the server in which a user's web browser makes request to and from.

WPI – Worcester Polytechnic Institute

APPENDIX H – TIMELINE OF PROJECT WORK

TASK	WEEK							
	Prep	1	2	3	4	5	6	7
Research ABS resources and review previous survey protocols and results	x							
Develop survey protocols and actual survey	x	x						
Work with ABS Education Services to assess Web Analytic tools and determine KPIs.		x	x					
Conduct survey and focus group		x	x	x	x	x		
Create database of survey answers			x	x	x	x		
Conduct quantitative data analysis				x	x	x		
Compile all results					x	x	x	x
Make recommendations						x	x	x

APPENDIX I – SYSTEM USABILITY SURVEY RESULTS

This chart shows the results of the System Usability Survey from both the teacher survey (columns 1-9) and focus group (columns 10-20).

Question	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Average
I think I would like to use this website frequently	3	4	4	4	4	4	4	4	5	4	3	4	3	4	4	4	3	2	2	4	3.7
I found the website unnecessarily complex	2	3	2	2	1	2	2	2	2	1	2	3	4	1	1	1	2	4	3	4	2.2
I thought the website was easy to use	4	4	4	4	5	5	4	4	4	5	4	2	2	5	5	5	3	3	4	5	4.1
I think I would need Tech Support to be able to use this website	1	2	2	2	1	2	1	1	2	3	2	4	1	1	1	1	1	1	1	1	1.6
I found the various services in this website were well integrated	4	3	4	4	4	4	3	3	4	4	4	3	3	4	4	4	4	2	4	4	3.7
I thought there was too much inconsistency in this website	2	2	2	2	1	2	2	2	3	2	3	4	2	1	1	1	2	3	1	1	2.0
I would imagine that most people would learn to use this website very quickly	4	3	3	4	4	4	4	4	4	5	4	4	3	5	5	5	4	4	5	5	4.2
I found the website very cumbersome to use	2	2	2	2	1	1	2	2	2	3	3	4	3	1	1	1	2	3	2	1	2.0
I felt very confident using the website	4	4	4	5	4	4	4	5	4	4	3	2	3	5	4	4	3	2	4	5	3.9
I need to learn a lot about this website before I could effectively use it	4	2	2	2	1	2	1	1	3	2	3	3	3	1	1	4	2	3	1	1	2.1
SUS Score																					
Positive	14	13	14	16	16	16	14	15	16	17	13	10	9	18	17	17	12	8	14	18	
Negative	14	14	15	15	20	16	17	17	13	14	12	7	12	20	20	17	16	11	17	17	
Total	70	68	73	78	90	80	78	80	73	78	63	43	53	95	93	85	70	48	78	88	
Count	20																				
Average	78																				
Standard Deviation	14																				

APPENDIX J – SURVEY RESULTS

Question	Number	2		3						4		5		6		17		18	19		20		
		Yes	No	Textbooks	Student Surveys	ABS Website	Internet	News Paper	Other	Yes	No	Yes	No	Yes	No	Yes	No		Yes	No	Information Packet	Colleague	Conference
ACT	GOV	1			1	1	1			1		1			1	1		2	1		1		
NSW	GOV	1			1						1	1					1			1			
NSW	GOV	1		1	1						1		1				1			1			
NSW	GOV	1			1		1			1		1			1					1			
NSW	GOV	1		1					Football		1		1							1			
NSW	GOV	1		1							1		1							1			
NSW	GOV	1			1					1		1			1		1				1		
NSW	GOV	1			1						1								1		1		
NSW	GOV	1					1			1		1		1			1		1		1		
NSW	GOV	1			1			1			1		1							1			
NSW	GOV		1							1		1			1					1			
NSW	GOV	1		1				1		1		1			1				1		1		
NSW	GOV	1		1	1	1				1		1		1						1			
NSW	GOV	1			1	1		1		1		1		1			1	4		1		1	
NSW	NON	1				1	1	1		1		1			1	1		2	1		1		
NSW	NON	1		1	1						1		1				1			1			
NSW	NON	1				1	1		Car Magazines, UK-Bureau of	1		1		1		1		5	1				1
NSW	NON	1			1	1			Meteorology	1		1			1				1				1
NSW	NON	1		1			1	1	Brochures	1		1			1				1			1	
NSW	NON	1			1						1	1							1				1
QLD	GOV	1				1			Local Resources	1		1			1		1		1			1	
QLD	GOV	1				1				1		1			1	1		5	1		1		
QLD	GOV	1		1							1		1				1			1			
QLD	GOV	1		1		1				1		1			1	1		4					
QLD	GOV	1			1					1			1		1				1		1		
QLD	GOV	1		1							1		1							1			
QLD	NON	1						1			1		1				1		1		1		
QLD	NON	1			1						1	1					1		1		1		
QLD	NON	1			1	1					1	1							1			1	
QLD	NON	1		1							1		1							1			
QLD	NON	1		1		1				1		1		1						1			
SA	GOV		1							1		1		1			1		1		1		
SA	GOV	1				1				1		1		1					1		1	1	
TAS	GOV	1		1		1				1		1		1		1		4	1			1	
VIC	GOV	1						1			1		1							1			
VIC	GOV	1		1							1	1								1			
VIC	GOV	1							Victorian Curriculum Sets		1		1										
VIC	GOV	1					1				1		1						1			1	
VIC	GOV	1					1			1		1			1					1			
VIC	GOV	1				1	1	1		1		1			1				1				
VIC	GOV		1								1												
VIC	GOV		1								1												
VIC	GOV	1		1				1			1		1							1			
VIC	GOV	1		1	1						1		1							1			
VIC	GOV	1		1					Generated by Teacher		1	1								1			
VIC	NON	1		1						1		1			1					1			
VIC	NON	1									1		1										
VIC	NON	1				1	1			1		1		1						1			
VIC	NON	1					1			1		1			1					1			
VIC	NON		1	1																			
WA	GOV	1		1		1	1			1			1		1				1				
WA	NON		1								1		1										
WA	NON	1		1							1		1				1		1		1		
TOTAL	TOTAL	47	6	21	16	16	12	9	6	26	26	30	19	9	17	6	12	26	23	24	10	10	3

APPENDIX K – FOCUS GROUP USABILITY TESTING

INFORMED CONSENT AGREEMENT FOR PARTICIPATION IN USABILITY STUDY

Investigators:
Eric Connelly, Dan Dahlberg, Elyssa Morrow
Contact Information:
Worcester Polytechnic Institute, 100 Institute Road, Worcester, MA 01609, USA
Title of study:
Evaluation of the Australian Bureau of Statistics' Education Services Website
Sponsor:
Australian Bureau of Statistics Education Services Unit

Introduction:
You are being asked to participate in a usability test. Before you agree, however, you must be fully informed about the purpose of the study, the procedures to be followed, and any benefits, risks, or discomfort that you may experience as a result of your participation. This form presents information about the study so that you may make a fully informed decision regarding your participation.

Purpose of Study:
The purpose of this study is to test the usability of the Australian Bureau of Statistics Education Services website. We will test how easy the site is to navigate, how the layout is presented and how easy it is to access information.

Procedures to be followed:
The test will take no more than 20 minutes. The participant will be given instructions to find certain pages and resources on the website. When this is done, the participant will have the chance to browse the website on their own terms for no more than 4 minutes. When this is complete, the participant will be asked to complete a 10 question survey regarding their experience with the website. After that, a brief discussion of the website will take place. During this discussion participants will be asked to share opinions, problems faced and suggestions regarding the website.

Risks to Study Participants:
There are no risks involved with this usability test.

Benefits to research participants and others:
There are no benefits involved with this usability test.

Record Keeping and Confidentiality:
For your confidentiality, names will not be presented with our final report. Any comments you make during this test will be recorded but will be presented in an anonymous matter. The Australian Bureau of Statistics and the investigators will have access to the records of this

survey. Upon completion of the report, all materials related to this study will be stored in the secure ABS database.

Records of your participation in this study will be held confidential so far as permitted by law. However, the study investigators, the sponsor or its designee and, under certain circumstances, the Worcester Polytechnic Institute Intuitional Review Board (WPI IRB) will be able to inspect and have access to confidential data that identifies you by name. Any publication or presentation of the data will not identify you.

Compensation of Treatment in the Event of Injury:
You do not forfeit any of your legal rights by signing this statement

For more information about this research of about the rights of research participants', or in the case of research related injury, contact:
Names and addresses listed at top of page 1

IRB Chair: Professor Kent Rissmiller
TEL: +01 508 831 5019
E-MAIL kjr@wpi.edu

University Compliance Officer: Michael J. Curley
TEL +01 508 831 5519
E-MAIL mjcurley@wpi.edu

Your Participation in this Study is Voluntary:
Your refusal to participate in this study will not result in any penalty to you or any loss of benefits to which you may otherwise be entitled. You may decide to stop participating in the research at any time without penalty or loss of other benefits. The project investigators retain the right to cancel or postpone the experimental procedures as they see fit.

By Signing Below:
You acknowledge that you have been informed about and consent to be a participant in the study described above. Make sure that your questions are answered to your satisfaction before signing. You are entitled to retain a copy of this consent agreement.

_____ _____
Study Participant Signature Date

_____
Study Participant Name (Please Print)

_____ _____
Signature of Person who explained this study Date

WPI AND ABS FOCUS GROUP TO ASSESS THE USABILITY OF THE ABS WEBSITE

"Good Afternoon everyone, we would like to welcome you to this usability testing session. We are three students from Worcester Polytechnic Institute in the United States and are conducting this usability testing as part of a project with the Australian Bureau of Statistics Education Services to evaluate their website. Their website was redesigned in July of 2007 and this testing will help to determine if the new design is easy to use. The old design was tested and it was found that it was not very easy to use. The tests that we will be doing today will help us determine if the new ABS website is easy to navigate and can be used effectively. The session should last from 15-25 minutes. If you have any questions or comments, feel free to ask. Thank you in advance for your time and help."

Procedure:

1. Go to http://www.abs.gov.au/
2. Navigate to Education page
    a. "You would like to look for references on Education and in particular, references for teachers."
3. Download an activity
    a. "You have heard the activities the ABS provides are useful in the classroom and would like to download one."
4. CensusAtSchool pages
    a. "You now wish to find more about the CensusAtSchool program"
    b. "You would now like to find out how to get more involved in the program"
5. Browse around website for a few minutes
6. Fill out post testing questionnaire and give any comments.
7. Discussion can occur after all participants are finished with the post testing questionnaire

QUESTIONS – POST USABILITY TESTING

"Please be aware that these questions are very general and deal with your experience with the ABS Education Services website as a whole. Any specific problems, comments or suggestions will be addressed in the focus questions and discussion."

	Strongly Disagree				**Strongly Agree**
I think I would like to use this website frequently.	1	2	3	4	5
I found the website unnecessarily complex.	1	2	3	4	5
I thought the website was easy to use.	1	2	3	4	5
I think I would need Tech Support to be able to use this website.	1	2	3	4	5
I found the various services in this website were well integrated.	1	2	3	4	5
I thought there was too much inconsistency in this website.	1	2	3	4	5
I would imagine that most people would learn to use this website very quickly.	1	2	3	4	5
I found the website very cumbersome to use.	1	2	3	4	5
I felt very confident using the website.	1	2	3	4	5
I need to learn a lot about this website before I could effectively use it.	1	2	3	4	5

Please feel free to give any comments or suggestions about the website:

Some focus questions:

- Did you think the overall design of the pages was easy to use?
- Did you find the links to other pages within the website useful?
- What do you think of the information and resources available on the pages?
- Was there any education information that you expected to find but was not available?
- Would you use these pages? If so, what sections of the web site do you think would be useful?
- Were page titles meaningful?
- Was there one area of the website you had particular trouble with?

Possible questions if time allows:

- Are you aware of other websites that provide similar services to the ABS' website? If, yes,
    - Which ones?
    - How would you compare these websites?
    - What do other sites provide that ABS' does not?
- Do you usually use the Internet to find information?
    - For your everyday life?
    - For your work?

"Thank you everyone for completing this usability test. Your comments and suggestions will help us greatly in determining how usable the new ABS website is. If you have any additional questions or comments, feel free to ask us now. Again, thank you very much for your time and comments."

APPENDIX L – ADDITIONAL WEB ANALYTIC METHODOLOGY

Contained in this section is additional information about the quantitative web analysis regarding the steps we have taken in order to achieve our results.

THE ABS WEBSITE STRUCTURE

Each individual page of the ABS website was a single page that ended with the file format ".es". Other popular file formats are ".html", ".php", ".asp" but many more exist. Each ".es" page belongs to a Lotus Domino database. There were many databases across the website, each broken up into their own category, such as "Statistics", "Themes", "Products and Services", "School Education", and others. Since we were only concerned with the Education Services and CensusAtSchool websites, we focused on the "School Education" database in our data collection. This database, "cashome.nsf" included all pages under Education Services and all CensusAtSchool web pages, but excluded CensusAtSchool resources, which are in the Statistics database ("ausstats.nsf").

When individuals were designing a web page and included a link generated through the CMS, the URL for the link would be formatted into a hexadecimal dynamic link when the web page went live on the Internet. These links differ significantly in structure than their normal counterparts.

For example, if a site designer working on the *entry page* of Education Services decided to put a link on the page leading to the "For Students" section of the website. If they used the CMS to generate the web link, it would format it in hexadecimal format:

http://www.abs.gov.au/websitedbs/cashome.nsf/51c9a3d36edfd0dfca256acb00118404/20ab1c5b0d872790ca2572fe001e2ad9?OpenDocument

If the site designer decided to manually input the non-hexadecimal, direct web URL, it would look like what is shown below:

http://www.abs.gov.au/websitedbs/cashome.nsf/Home/For%20Students.es

Both of these URLs lead to the same web page. However, there can be multiple hexadecimal formatted web URLs for any given real web page due to the way the CMS generates URLs. When a user who is browsing the ABS website requests a page, the web server would retrieve the page from the appropriate database and then send it to the user. To the web server, the links appear to be two different pages so it never properly distinguishes between either of them. The server contacts the CMS to find the appropriate page, and then sends it to the user.

WEB ANALYTIC TOOL

In addition to the monthly global reports, the tool generates data files for each Domino™ database that lists the 1,000 most popular pages within each database. These files contain the page, the rank of the "top 1000" it places, the amount of page views over the given month, the percent of page views over total page views for the database, the number of visits and the average amount of time spent on the web page by all users. A mock two-line example using fake web pages representing the number 8 and number 9 most popular page is shown below:

8, -
http://www.abs.gov.au/websitedbs/cashome.nsf/7s283457194jd8fs2b3591uu57821249/9f8h38aj3857dssjh28383338jd93452?OpenDocument, 1905, 2.98%, 782, 00:00:58

9, -
http://www.abs.gov.au/websitedbs/cashome.nsf/7s283457194jd8fs2b3591uu57821249/7f723ds282cvnqa1245812358djskj233?OpenDocument, 1852, 2.72%, 812, 00:01:41

From these lines, we could determine that the first page was the 8th most popular page for the month. It obtained 1,905 page views throughout the course of the month with 782 individual visits. It also accumulated 2.98 percent of the page views for the entire School Education database. The average user spent approximately 58 seconds on the page before moving somewhere else.

Since these data files are produced every month, the statistics of each individual page can be used to calculate the totals across any given months or years. However, this large of an analysis is impractical for other reasons discussed later.

Gathering the Data

Since there were multiple URLs for a single web page, the first step in our process was locating each URL for the web pages. If one URL was not found or was missing when results were compiled, it meant a loss of data accuracy. The CMS did not keep an index of every URL that indicates what page it belonged to. A lack of an index or list of URLs required each individual URL to be located manually. To overcome this issue, we accomplished this in either one of two ways. The first was to browse the website and enter the page from various links and other web pages. The new URL was displayed after the page was entered. The second method was to look at the data files and manually cycle through each reported URL to find what page it actually belonged to. Both these methods were cumbersome and tedious, but they were the only methods to determine what the URL resolved to.

Once the URL was located, the proper statistics are shown next to it. Our job was to act as a manual log analyzer by picking out key portions of the information from the data files and manually organize it.

Calculating the Measurements

We used the program UltraEdit, which allowed us to locate a specific term across multiple data files. Since we were trying to calculate metrics for individual pages, the search term used in the searching varied depending on what at we were trying to compile. We would have to search across the data files multiple times in order to gather the measurements for a single page given that there was multiple URLs for a single page. When the program finished locating the URLs, it would display the lines that contained the URL in another window, allowing us to manually input the numbers. We kept track of each of the results in an Excel spreadsheet depending on the search term used and what URL we were looking at.

Organizing the Data

Once we found all the results for a set of URLs, it resulted in the compiled results for a single page. We used Microsoft Excel to put the data into separate spreadsheets and used its graphing utility to create the graphs and charts. Due to restriction in the data, we were forced to display the

data by the month. If we were able to display the data by weeks, it would be much easier to assess the troughs and peaks of specifics pages. However, the overall trend of the website remains clearly visible on a month by month basis.

UNDERSTANDING ABS WEB LOGS

These logs are produced by the web server on a live basis. Whenever a user communicates with the web server (such as viewing a web page or downloading a file), the web server inserts the appropriate information into the log. The logs are divided up by page and day. So for every page there is a separate log for every page.

The structure of each line in the log remains the same so that it can be understood by a third party easier. For example (using mock data), two lines in the web log looks similar to the following:

```
130.215.6.14 www.abs.gov.au - [02/Apr/2007:00:04:34 +1000] "GET
/websitedbs/cashome.nsf/Home/Entry%20Page.es HTTP/1.1" 200 8420 "" "Mozilla/4.0
(compatible; MSIE 6.0; Windows NT 5.1; SV1; .NET CLR 1.1.4322; InfoPath.1)" 94
"" "g:/websitedbs/cashome.nsf"

130.215.6.14 www.abs.gov.au - [02/Apr/2007:00:04:34 +1000] "GET
/AUSSTATS/wmdata.nsf/stylesheetscurrent/zabs_website.css/$File/zabs_website.css
HTTP/1.1" 304 0 "http://www.abs.gov.au/
websitedbs/cashome.nsf/Home/Entry%20Page" "Mozilla/4.0 (compatible; MSIE 6.0;
Windows NT 5.1; SV1; .NET CLR 1.1.4322; InfoPath.1)" 0 ""
"g:/AUSSTATS/wmdata.nsf"
```

This constant structure enables an individual, or a log analyser, to sort through the data and calculate results. The following table explains the structure of individual lines in the web log, using the first line in the above example as a basis. In this example, this line is inserted into the web log by the web server when a user clicks on the “Education” link on the main ABS homepage (which leads to the Entry page of the Education Services section).

130.215.6.14	User’s IP address. In this case, it is 130.215.6.14.
www.abs.gov.au	The ABS web server in which the user is requesting information from.
-	Separator
[02/Apr/2007:00:04:34 +1000]	The date and time in which the ABS web server received the request from the user.
"GET /websitedbs/cashome.nsf/Home /Entry%20Page.es	The statement that the user sent to the server. The user is sending a request command to retrieve the “Education Services” entry page.

HTTP/1.1"	Version of HTTP the user is requesting the page in.
200	The response code of the user's request. Since the request was successful, it is '200'. It would show '404' here if the page is not found.
8420	The size of the page/file requested in bytes. This page was only 8,420 bytes.
""	This would be the place where the referral page will be displayed. We can tell that the user directly went to this page either through a bookmark or typed in the link manually because this field is blank. The next example explains more.
"Mozilla/4.0 (compatible; MSIE 6.0; Windows NT 5.1; SV1; .NET CLR 1.1.4322; InfoPath.1)"	This is the information about the browser that the user was using to view the web page. This is also the location where generous spider bots indicate that they are bots. This user is using Microsoft Internet Explorer 6.0 (which can be seen from the 'MSIE 6.0' in the line).
94	--unknown--
""	--unknown--
"g:/websitedbs/cashome.nsf"	This is the local server location for the database in which the file/page was retrieved from. The page was located in the "cashome.nsf" database in the directory "websitedbs" on the G drive of the ABS web server.

The next line in the example shows the user requesting a CSS file. This type of request comes naturally and automatically from the web browser. For example, for every image on the web page, the browser needs to send a separate GET request for it in order for the user's browser to display it. The CSS file GET request is a similar situation. The requests that are directly caused by the user are requests that are triggered by the user clicking on links. A user may make as many as a thousand or more underlying requests before all the content on a page actually loads.

This table shows the structure of the second line in the example.

130.215.6.14	User's IP address. It remains the same since last time since it is the same individual.
www.abs.gov.au	The web server remains the same since the underlying request is from the same page.
[02/Apr/2007:00:04:34 +1000]	The date and time in which the web server received the request from the user.
"GET /AUSSTATS/wmdata.nsf/stylesheetscurrent/zabs_website.css/$File/zabs_website.css	The GET request for the CSS file. The CMS structures the location of files so that actual files have "$File" in their URL.
HTTP/1.1"	Version of HTTP the user is requesting the file in.
304	This response code is defined as "Not Modified". This means that the file the user is requesting has not changed since the last time he requested it during his session.
0	Since the file was not sent, no bytes were transferred

"http://www.abs.gov.au/websitedbs/cashome.nsf/Home/Entry%20Page"	The page on which the request generated from. Since the CSS file is part of the Entry Page, the request originated from this page.
"Mozilla/4.0 (compatible; MSIE 6.0; Windows NT 5.1; SV1; .NET CLR 1.1.4322; InfoPath.1)"	The user's browser remains the same.
0	--unknown--
""	--unknown--
"g:/AUSSTATS/wmdata.nsf"	The CSS file resides in a different database (for this example). The web server indicated that this file was retrieved out of the "wmdata.nsf" database in the AUSSTATS folder on the server's G drive.

Since the web logs were very structured, old web analytic tools (and the one by which ABS operates with) took these logs and sorted through them to compile figures, reports and tables. Modern web analytic tools often avoid looking at the logs and utilize tracking code in each page to keep track of what happened to each page.

BARRIERS

We were faced with many problems that significantly affected the project goals and objectives. ABS' CMS and their web analytic tool were a poor match. The tool did not retrieve accurate data and was overall unreliable.

The tool was capable of producing reports filtered by Domino™ database (for example; producing a report on the School Education database), but these reports delivered inaccurate results, as discussed later in this section. The inaccuracy in data and recommendations by individuals in other departments of ABS, caused us to take alternative measures and avoid using the tool altogether.

MULTIPLE URLS FOR ONE PAGE

A key downfall to the way the web analytic tool was implemented is its inability to distinguish what links belong to what web page. The result is that every link that the CMS generates through

the process of building the website, the web analytic tool thinks is a brand new page and not just a new link to an existing page. This creates two issues:

1. The resulting calculated metrics are split between each individual link, or URL, and
2. In order to compile results for a certain page, you would first have to find every possible URL for that page.

When the web analytic tool produces reports, it does not differentiate between the URLs and proceeds to calculate metrics for each individual URL as if it was a separate web page. This is caused by the fact that the web analytic tool is set up as a log analyzer; it simply looks at the web server logs, and generates the reports based from the logs. Since the web server does not know what links belong to what pages, the web analytic tool will suffer the same issue as well.

There are many businesses today that use Content Management Systems that utilize dynamically generated links and their web analytic tools are successful at producing reliable web metrics. Their success is due to the web analytic tool being integrated into the building process of the website. The tool would be integrated into each individual page through the addition of "tracking code". This way, no matter what the link was for the web page, the tool would understand what page it is.

Due to the issues mentioned above, we were required to find the URL's for each web page manually. The metrics for each were then located in the data files or logs and then compiled. These results appropriately represented the metrics for each individual web page.

Since there were multiple URLs for any given page, the number of URLs within the entire database was vastly larger than the number of actual pages. There were 264 unique web pages in the School Education database; however, there are over 1000 different URLs.

Data Accuracy

Due to the reasons mentioned above, plus additional factors, the reports produced by the WebTrends tool lack reliability and data accuracy. Since each page is split between many URLs, it is possible to lose data. Also, within the reports internal visitors (employees and anyone within

the ABS network) are not removed. Lastly, spiders and other robots are (possibly) counted in the web reports.

If one URL is not found or is missing when results are compiled, it means a loss of data accuracy. The CMS does not keep an index of every URL that indicates that page it belongs to. The trouble arises because it is hard, if not impossible, to determine whether or not every URL has been found. A lack of an index or list of URLs requires each individual URL to be located manually. This can be done in one of two ways. The first is to browse the website and to enter the page from various links and other web pages. The new URL would be displayed after you entered the page. The second method is to look at the report generated by WebTrends and manually cycle through each reported URL to find what page it actually belongs to. Both these methods are cumbersome and tedious, but they are the only methods to determine what the URL resolves to.

Internal users were not filtered out of our metrics. The page views and visits of ABS employees are counted within the reports of the Education Services website. It is important to eliminate this traffic in order to obtain true statistics on the organization's intended audience.

The last concern in data accuracy is the inclusion of spiders and other web robots in the metrics produced by the reports. Since the robots are not humans, or the intended audience for the organization, they need to be removed from the metrics in order to portray the proper information.

FAILURE TO INCLUDE ALL PAGES IN REPORTS

When WebTrends produced its monthly top 1000 most visited page reports for each database, it did not include statistics regarding the direct non-hexadecimal links. Conversely, when WebTrends produced customized HTML reports of a database, it did not incorporate statistics on the CMS (hexadecimal) links. What results is the statistics for the hexadecimal links and the non-hexadecimal links being separated.

This separation rendered both reports incomplete. The data files show the individual page statistics as discussed earlier. The HTML reports of the database have general statistics covering

the entire database and not individual pages (and excluding statistics on CMS generated links). Unfortunately, neither tool could be adjusted to incorporate both set of links. The combination of these two methods did not result in the appropriate data. This was why we were required to analyze the raw web traffic data logs produced by the web server.

APPENDIX M – ADDITIONAL TEACHER SURVEY METHODOLOGY

The telephone survey was conducted while on site in Melbourne. We conducted the survey on a stratified random sample of 100 government and non-government secondary school math teachers across Australia. The sample represented schools from all states. The population of full time secondary school students in the state determined the number of schools chosen from each state. Table 1 is the sample number of schools from each state and territory including government and non-government schools.

Sample Size of Survey

State	Total Secondary Schools Represented	Government	Non-Government	% of Total Secondary Schools in Australia	% of Total Full Time Secondary School Students	Actual Number of Teachers Contacted
Victoria (VIC)	26	15	11	21.2	26.3	16
Queensland (QLD)	19	12	7	18.6	18.6	11
Northern Territory (NT)	1	1	0	3.0	0.9	0
South Australia (SA)	7	4	3	8.8	6.5	2
Australian Capital Territory (ACT)	2	1	1	1.7	2.0	1
Western Australia (WA)	9	5	4	12.4	9.3	3
New South Wales (NSW)	33	21	12	31	33.9	19
Tasmania (TAS)	3	2	1	3.8	2.5	1
Total	100	61	39	100	100	53

Mathematics Coordinators were chosen because the 2002 survey contacted Mathematics Coordinators. In order to better compare the two surveys, we left the Mathematics Coordinators as the independent variable.

Teachers were more often available in the morning before school, during lunch and right after school. Western Australia and South Australia are 2 and 0.5 hours behind Melbourne respectively. This allowed phone calls to be spread out during the day.

When conducting the telephone survey, there were very few times where we called and the maths coordinator was available to take the survey right away. Multiple calls had to be made in order to reach the correct person. In some cases, the teacher could not be reached by April 11th. The average number of calls per teacher was 3.

In some cases, the math coordinator could not accept phone calls from outside lines or were away for the specified calling period. In this case, another school replaced the targeted school. This replacement school was randomly selected. We used the main list of schools from the state and used a random number generator to obtain a new school. In total, 5 schools had to be replaced due to similar situations.

Three teachers were curious as to how we chose the school. The teachers were told that the school was chosen as part of a random sample.

Eleven of the teachers we surveyed did not give their name. In those cases, the survey was then completed anonymously. We recorded the information from an anonymous teacher in the same manner. Names were only important if the teacher wanted more information sent to them. Another problem was not being able to reach the intended Math Coordinator or math teacher.

For the second portion of the survey, the teachers were asked where they had heard of CensusAtSchool. The categories for this response were an information pack, an advertisement, an article in newsletter/journal, a colleague/word of mouth, a conference, a professional development session or other. If the teacher had used CensusAtSchool we asked them what parts of the program they believed to be the most useful and also their level of involvement in the

program. Due to the time constraint on the survey, the number of CensusAtSchool questions was limited.

APPENDIX N – RECOMMENDED KEY PERFORMANCE INDICATORS

We recommend the following Key Performance Indicators to ABS Education Services:

1. Activity delivery effectiveness (File downloads of an activity / Page views for the page where the activity is found)
2. Brand awareness (Number of page views to the "For Teachers" page (or Education Services page) without referrals / Total page views to that page)
3. Distribution of users pursuing information for Students to information for Teachers (Page visits of "For Students" / Page visits of "For Teachers")
4. Average time spent on the classroom activities web pages (Average time of the average time spent on all classroom activity pages)
5. Landing page exit ratio (Number of exits from the Education Services, or "For Teachers" page / Page visits to that page)
6. Attraction rate (Number of new visitors / Number of returning visitors)
7. Visits per visitor (Average total of number of visits / number of visitors)
8. Questionnaire completion rate (Number of CensusAtSchool questionnaires completed / the number of page views of the questionnaire page)

Each KPI speaks about a certain aspect of the website that otherwise would not have been examined (Unless otherwise noted, each KPI is calculated every period the Web analytic tool issues its reports).

For example, to see the effectiveness of the activity pages, we will want to look at the number of users who actually downloaded the activity versus the number of people who views the website. This will give us the "effectiveness ratio" by showing how effective each one of the activity pages is at delivering interesting and helpful information about the activity. The higher it is, the more convinced the teacher (or any other individual) is to use it and download it.

Another KPI is the “Branding effectiveness” ratio. Since the ABS Education Services wants to attract teachers (and ultimately students as well) to their website, Education Services does a lot of promoting to schools. Within these promotions is a link that leads directly to the Education Services website, the “For Teachers” web page, or the CensusAtSchool home page. When users manually type this link into their web browser (or use a bookmark) they are directly visiting the site without coming from another website. According to the web server, they will be visiting the website without a referral. Due to this, we can calculate how effective the branding has been in the promotions sent out by dividing the number of page views to indicated page without referrals by the total number of page views to that page.

The Landing page exit ratio shows us the number of people who cannot find what they are looking for by showing the number of times that people exit from that page divided by total page views for that page. Individuals could be coming to the Education Services website or “For Teachers” page and discover that the website does not provide them for what they were looking for. After looking at this ratio, an inquiry might be brought up questioning what exactly might these users be looking for that the website did not provide.

However, one of the most important things to keep in mind when transitioning to a new tool or new web analytic process is to avoid data overload. If Education Services does not focus on their KPIs, they will lose track on what is most important to the department and the website.