User-Centred Evaluation and Design: A Subject Gateway Perspective

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Abstract:
Customer expectations of gateway services as well as their information needs are dynamic. The Australasian Virtual Engineering Library (AVEL) has consequently taken an iterative approach to interface design, usability testing and customer needs analysis. User-centred design has ensured that AVEL remains relevant to the way its target audience seeks information to solve "real world" problems. This paper details the methodologies that have been employed by AVEL to discover the needs of customers. It particularly focuses on heuristic evaluation and scenario based testing as useful analysis tools. It looks at the importance of identifying and responding to the unique resource requirements and information seeking behaviours of discipline-specific target audiences and uses engineers and IT professionals as one example. The results of usability investigations and our responses to customer demands are discussed and some conclusions for future development are drawn.

Introduction

As an information source the Web is at once exciting and daunting. Although it is a truism to say that the size of the Web is proving increasingly problematic for information seeker, it is still sobering to remember the estimated dimensions of this colossal information source.

By 2002, the number of Web pages will exceed the number of people available to read them (DigitalDesign Works 2001). In September 2001, Google invited Web surfers to search over 1.6 billion Web pages, while NetNames gave a figure of over 36 billion for total domains registered worldwide in April of the same year.

An earlier study at the University of California, Berkeley differentiated between the “surface” Web and the “deep” Web. The “surface” Web consists of approximately 2.5 billion documents. However, taking into account *all* web-accessible information including specialised web-connected databases and dynamic Web sites (collectively known as the “deep” Web), there are 550 billion web-connected documents, of which 95% are publicly accessible. These sites are not widely known among average surfers, even though the information available is 400 to 550 times larger than the information on the “surface”. In addition, 7.3 million pages are added every day to the total Web. (Lyman & Varian 2000).

One of the primary objectives of “subject gateways” is to assist information seekers to make sense of this "chaotic repository for the collective output of the world's digital printing presses"(Lynch 1997). The Australasian Virtual Engineering Library (AVEL) is one of a number of established Australian gateways (National Library of Australia 2001 Subject). A subject gateway has been defined as -

A Web-based mechanism for accessing a collection of high quality, evaluated resources identified to support research in a particular subject discipline (Campbell 2000).

The core-business of subject gateways is to add value to third-party created Web resources. Additional services may be offered to the user and there may also be some degree of customisation or personalisation, but the essential aim is to assist the user’s resource discovery through the application of specialised skills and knowledge. The subject gateway assures the user of quality by discovering, evaluating and describing selected resources from an otherwise chaotic universe of information, including both the “surface” and “deep” Web. Subject gateways apply strict, usually formalised selection criteria to resources included in their repositories, taking into account issues such as the authority, accessibility, currency and subject relevance of the resource. Metadata is usually applied to assist the resource discovery and description process.

The technical infrastructure remains invisible to end-users. They access the resources through a portal interface, usually connected to a metadata repository. In AVEL’s case this is a MySQL database. Open standard protocols (such as Whois++, LDAP, Z39.50, Harvest Broker) allow the infrastructure to blend into the background. (National Library of Australia 2001 Definitions)

Usability: An Imperative for Subject Gateways

While the back-end mechanisms employed by subject gateways are well established and accepted, little work has been done to date on gateway user-interfaces. In their original proposal the IMesh Toolkit partners (Institute for Learning and Research Technology,

University of Bristol; the Internet Scout Project, University of Wisconsin-Madison; UKOLN, University of Bath) listed usability as one of main areas in which current generation of subject gateways is lacking (UKOLN 1999). The IMesh Toolkit Project is funded out of the NSF/JISC International Digital Libraries Initiative.

In order for the end-user to gain maximum value from these resources, the gateway's "shop-front" or presentation layer must be as usable and as accessible as possible. Stringent selection criteria and impeccably crafted metadata will do little to assist resource discovery for the user who cannot work out how to use the search-engine, or make sense of the results retrieved through browsing. For the customer approaching the gateway with an information need, the user-interface – that is, the Web site and the search engine - is the only means of access to the repository of resources. A Web site designed without reference to the needs of real people can mean that the effort involved in selecting, evaluating and creating records is wasted.

If the core business of gateways is to assist resource discovery, it is absolutely imperative that usability principles are applied to interface design. For average customers relevant results are all that matter. They have absolutely no interest in DC metadata standards, controlled vocabulary searching or hyper-index browsing. While some users can see the value of third party "high quality, evaluated resources", others cannot. Any subject gateway is simply another information resource in an ever-growing array. The nearest competitor is only a click away - and it is not likely to be a subject gateway. If clients can't find the information they require quickly and easily using a gateway interface, they will turn to less authoritative sources, using search engines like Google or Hotbot. Frustration means that users will leave the site, and they may not return.

As resource intensive projects, it is important for subject gateways to obtain the maximum return on their investment. Stake-holders range from government departments to academic and business organisations. Contributions to the project may be financial or in-kind. Like a number of Australian gateways, AVEL came into existence with the successful application for a Research Infrastructure Equipment and Facilities Scheme Grant from the Australian Research Council / Department of Education, Training and Youth Affairs in 1998. AVEL is a collaborative venture and significant financial and in-kind contributions were received from the partner institutions, which include:

- University of Queensland (lead institution)
- University of New South Wales
- Monash University
- University of Melbourne
- Queensland University of Technology
- Institution of Engineers, Australia (IEAust)
- Centre for Mining Technology and Equipment (CMTE)
- Cooperative Research Centre for Enterprise Distributed Systems Technology (DSTC)

The fundamental strength of gateways lies in human expertise and judgement in the selection of resources and the manual creation of metadata records. However, this also makes them

expensive to maintain. Although automated harvesting tools do exist these are usually not employed on a stand-alone basis as the perceived quality of the information contained in the gateway is diminished. It can take an experienced resource selector between twenty and forty minutes to locate, evaluate, describe and enter metadata for a single record. In addition, there is the cost of maintaining the integrity of the records through regular link-checking and periodic review. Furthermore, the process of publicising the resources to the user community entails significant expense. It is therefore crucial to ensure that the user interface is as user-friendly as possible, and that it is used as frequently as possible.

Customer-Focussed Gateway Design

The idea of involving the customer or end-user in the design of a product or service is not a new one. The term "user-centred design", has its roots in software and design engineering, but similar common-sense approaches have been employed for decades. Other terms such as "human factors engineering", "human-computer interaction" and "usability engineering" are often used interchangeably. Central to these ideas is the philosophy that the user of a product should be given primary role in the design process. The tasks that are enabled by the product, the product's goals and objectives, as well as the context in which it is created are all informed by the user's viewpoint. (Rubin 1994)

Put simply, user-centred design is an approach that can be applied to any sort of human-computer interactive system design that focuses on making the system as usable as possible. To this end, it requires the maximum involvement of the end-user, particularly at the beginning of the design cycle and at other crucial stages of the design process. The procedure is also iterative - a product is designed, tested and modified over a period of time, using customer input as a basis for re-modelling. A 1981 definition still provides a coherent summary of the concept of user-centred design. It states that user-centred design is -

*…the practice of designing products so that the user can perform required use, operation, service, and supportive tasks with a minimum of stress and a maximum of efficiency (*Woodson 1981).

More recently the concept of user-centred interface design has been applied to Web page design. With their personal Web sites, usability advocates like Jakob Nielsen and Bruce Tognazzini have assumed Internet celebrity status as Web gurus and usability evangelists. Again, what they have to say is not new. They offer a range of common sense ideas and simple testing methods that aim to make ease of use and Web site functionality the main objective of site design.

Usability testing can be defined as -

A measure of the ease with which a system can be learned or used, its safety, effectiveness and efficiency, and the attitude of its users toward it (Preece et. al. 1994)

This strongly engineering-based approach does not necessarily preclude good graphic or visual design. It simply means that any aesthetic design should serve a specific purpose, be functional, assist users to complete tasks and not hinder the overall performance of the site. Indeed, good graphic design should enhance the usability of a site.

Because of the emphasis they place on aiding resource discovery, librarians and other information professionals are highly conscious of the importance of simplicity and are more likely to employ it in their Web page design than some other sectors of the Web community.

As a result, librarians have amassed considerable experience in the usability testing of Web sites. (Popp 2001; Dickstein & Mills 2000)

AVEL has encouraged the participation of its user group from its inception. This input has not been restricted to Web interface design, but has encompassed a number of Web page management issues such as the resource selection guidelines and the scope of the collection. The target community has been encouraged to provide opinion and advice, thereby defining the way AVEL has evolved. Decisions concerning the choice of thesaurus, metadata schema, interface design, keyword searching, resource selection policy and target audience were made with input from both engineers and librarians.

The participation of the target audience from the earliest stages has brought other benefits in terms of the entire cycle of customer ownership of AVEL. (Rubin 1994) The involvement of engineers in the management structure of AVEL and the part played by the Institution of Engineers, Australia (IEAust) as a partner in the venture, has contributed significantly to the credibility of AVEL in the engineering, academic and professional communities. Of equal importance have been the marketing opportunities created by this collaboration. These opportunities have been exploited through presentations and reports to the Australian Council of Engineering Deans, key professional engineering groups and engineering faculties, schools and departments across Australian universities. News about AVEL has appeared in engineering publications and it is linked from the IEAust Web site and various engineering school Web sites.

Shoe-String User-Centred Design and Usability Testing

Although subject gateways may be resource intensive, in Australia they are not characterised by big budgets. There is no equivalent of the funding from the Joint Information Systems Committee (JISC) in the UK for eLib projects like the Edinburgh Engineering Virtual Library (EEVL). Australian subject gateways are usually established with fairly modest, non-recurrent start-up funds. They may have a business plan in place but by commercial standards their income stream is small. Like many library-based initiatives they operate because of generous in-kind support, resource sharing and tenacious financial management.

Despite finite funds, AVEL was not tempted to ignore user participation in the design of the gateway and involved customers from the project planning stage. The target audience for AVEL is diverse and includes university researchers, undergraduate and postgraduate students, researchers in the R & D departments of Australian companies and Australian government departments as well as engineering and IT professionals working in industry. Other significant elements of the AVEL community are the information professionals and librarians who assist these groups.

Nielsen has observed that Web page developers are often paralysed by the idea that only the “best”, most stringent and consequently most expensive and time-consuming usability testing methods should be employed. Paraphrasing Voltaire he notes that the “best” is often the enemy of the “good” (Nielsen 1999). As one library-based Web designer has commented, “ The first big step to usability testing is to recognise that a little information is exponentially better than none” (Hudson 2001).

AVEL has taken a pragmatic approach and chosen to employ a number of simple, cost-effective usability testing methods and information gathering exercises over a three-year period. Nonetheless, the data obtained has proved to be both revealing and helpful. The methodologies employed have offered a way of actually implementing the main principles of

user-centred design. That is - they provide a valuable glimpse of *who* are customers are**,** *how* they are using the gateway, *why* they are coming AVEL and *where* design and services could be improved.

Because customer expectations and resource discovery needs are not static, the successful, innovative gateway must identify them and tailor its services to accordingly. It also needs to continuously monitor customer demands and react appropriately by adapting or adding new services and information resources as required.

Employing an iterative approach to gateway design, AVEL has built on and refined previous design stages. In order to identify, anticipate and fulfil the needs of its audience AVEL has undertaken a range of qualitative and quantitative research including focus groups, online user-surveys, log file analysis, heuristic evaluation and online scenario-based testing. Some of these methods are detailed further below.

Focus Groups

A series of focus groups with user groups held in 1999 were important in ensuring that the design of the system was user-driven and informed by real customer demands and expectations. The participants were engineers and IT researchers, academic staff and postgraduate students representing all University of Queensland Engineering Departments and including the School of Information Technology. A second focus group was held with staff and students from the Queensland University of Technology.

The focus groups were effective in gaining a better understanding of the information seeking behaviours of the target audience, the types of tasks they wanted to perform, the scope of the information they wanted AVEL to cover and the types of services that interested them. Of particular importance were the ways that users navigated the existing Web site.

Figure 1: Screenshot of Old AVEL Home page (September 1999)

Also useful was feedback on the browse function and how it could be improved. Because HyperIndex browsing was being considered for AVEL, it was vital to obtain feedback on the usefulness of this refinement. A basic “competitor comparison” was conducted with participants asked to compare the AVEL browse function with the browse function of our “sister” Web site, the Edinburgh Engineering Virtual Library (EEVL). Data from the online survey conducted after the focus groups indicated that around one in five users liked to browse the database. While this is not a large proportion, the importance of providing multiple paths to resource discovery was recognised.

The need to implement a browse option that had a close "fit" to the information seeking behaviours of AVEL customers was seen as crucial.

In response to suggestions made by focus group members a number of significant changes to the browse structure and presentation were made. Top level terms were included on the Home Page, in much the same way that the Yahoo! directory structure operates. A tree structure was used once a term was selected so that customers could easily identify where they were in the browse hierarchy.

Respondents indicated that they were often confused about how to display records once they had drilled down to the required level. A prominent red "Display" button was added to make this more obvious.

An alternate approach to browsing for information was also required. To this end, the thesaurus terms were supplemented with an alphabetical index at the top of the browse screen. Resulting terms were then listed in alphabetical order. To reduce customer frustration any terms that did not have records attached were "hidden". Records have subsequently been added for all thesaurus terms.

Key subject areas and resource types were identified to give more breadth and depth to the database. While the Heuristic Analysis tests conducted recently indicate that there is still some refinement to be done, this first attempt at making the site more usable demonstrates the iterative nature of interface design.

As a result of the focus group feedback, AVEL also made a number of significant changes to its interface. The Web page was redesigned and divided into the typical three-column structure associated with portals. All search, browse and service options were made immediately obvious to the user. The central column now contained the browse and search options (basic and advanced), while the right and left hand columns detailed AVEL services. The Web page colours were changed and the options clearly segmented by different banners and colours.

Figure 2: Screenshot of AVEL Home page

Online Survey

A complementary method of testing AVEL's usability was the online survey. A survey was mounted on the AVEL Website, and was also distributed to subscribers to the AVEL newsletter. The survey focussed on gathering information on basic demographics, current service usage and customer satisfaction with current services. It also identified the types of services respondents would like to see added in the future.

Thirty-two surveys were completed late in 2000. The bulk of the responses came from Australian customers, however responses were also received from users based in Malaysia, India, South Africa and the United States. Interestingly, AVEL Web usage statistics also indicate that significant traffic is coming from these countries, especially South Africa. Most of the respondents were Librarians and Information Professionals, however a significant proportion were engineers, academics or students. Almost half the responses came from people employed in the academic or research sector with 19% coming from the government sector and 16% coming from the private sector.

When asked what services they were currently using, full text access and current awareness services featured strongly. 21% of respondents said they used full text papers, 20% used the newsletter, and 14% used the "Latest Resources" feature of AVEL. Other services such as the "Online Bookshop" and the "Conference Announcements" section received scores of between an 8% and 10%.

In terms of future services, the majority of respondents concurred in their desire for full text information and current awareness services. Most said that "Links to Electronic Journals" (21%) or an "Alerting Service" (20%) were features that they would like to see. 13%

favoured an "Expertise Directory" while 12% each wanted "Online Seminars by Experts" or an "Ask an Expert Service".

Despite the fairly small return rate some tentative observations can be made from the data collected. The survey certainly serves as a starting point from which other investigations can be made and the data can be used in conjunction with information gathered from the other research methods that AVEL has employed.

Heuristic Evaluation

The goal of heuristic evaluation is to uncover usability problems that may be inherent in an existing design (Nielsen 1992). It involves using a small group of evaluators to examine a web interface and judge its usability against a set of principles, or heuristics. One of the most popular sets of heuristics was developed by Jakob Nielsen (Nielsen 2000 Ten). Nielsen's "10 Usability Heuristics" focus on the ease with which users can navigate through a Web site and their ability to perform and complete tasks using the site. Nielsen stresses the importance of simplicity in interface design. He emphasises the need for uncluttered Web page design, the use of unambiguous natural language, consistent labels and headings, and point-of-need help.

Heuristic evaluation was chosen as a testing method for AVEL because of its reputation for returning results that are both illuminating and comprehensive while remaining relatively inexpensive. It is simple to administer, and requires a small testing group. One study comparing usability testing methods reports that -

... heuristic evaluation ... produced the best results. It found the most problems, including more of the most serious ones, than did any other technique, and at the lowest cost (Jeffries et. al. 1992).

For the AVEL study, a small group of evaluators were chosen from a representative group of academics, postgraduates, undergraduates, researchers and professionals. None had previously used AVEL extensively, and some had not used the site at all. They were each briefed prior to the tests so that they fully understood the heuristics that they would be using to evaluate the site. The evaluations took place over a two-week period in August 2001.

Each individual evaluation took between 60 – 90 minutes. An observer, who was thoroughly familiar with both the AVEL Web site and the heuristics being used recorded notes during the sessions, noting where problems with navigation occurred, or where the evaluators were confused. Positive comments were also recorded. The browser toolbars were suppressed during the testing so that the evaluators were forced to use the navigation features inherent in the site.

Prior to the evaluation, the evaluators were given time to familiarise themselves thoroughly with the site. They were then asked to perform a set of simple tasks. These included: conducting a simple search, conducting an advanced search, browsing, locating full-text papers, locating conference papers, subscribing to the newsletter and finding help. The evaluators were taken through the site systematically and asked to comment on the headings and labels, as well as on the search fields used. They were permitted to ask questions if they needed help navigating or using the site and these questions were recorded. They were also encouraged to make any general comments about the AVEL Web site, and AVEL services.

AVEL had already made significant modifications to its Web page design as the result of focus groups held in 1999. Not surprisingly, during this round of testing, the overall AVEL site, the gateway concept and the range of services offered impressed the evaluators. Most appreciated the value of using AVEL as an information intermediary and had confidence in the results that were returned to them because they knew the sites had been evaluated by

AVEL staff. The simple layout of the homepage, the minimal use of graphics and the speedy return of search results were also welcomed. The design of the Web site was thought to be striking and memorable, with clear brand identification.

Heuristic Evaluation and Issues for Future Development

While the main responses to the AVEL Web page were positive, the goal of usability testing is to find and document existing problems in interface design. A summary of the heuristic violations and the action required to rectify them is attached as Appendix 1.

Most of the usability issues uncovered by the evaluators were minor and required easily implemented, cosmetic changes. The problem reported most frequently was that the headings and link words used on the AVEL home page were not immediately comprehensible to the evaluators. Some, like “Jobs & Employment” and “Documentation” were ambiguous, while others such as “ENGINE Database” (which links to a free bibliographic database called ENGINE” and “SciTech Library Newsletter” (a newsletter produced by the US-based National Science Foundation) were not understood by the majority of the evaluators.

Other problems related to navigation within the site. Possible ways of resolving of these issues would be a Home link on all lower level pages, the creation of a site map, and the inclusion of “alt” text for the AVEL logo image demonstrating its link back to the Home Page.

One group of problems will require significantly more effort to rectify and these relate to the inclusion of actual metadata labels as search fields and in the full metadata record. When conducting an advanced search the user is given the option of searching a range of fields such as TITLE, CREATOR, SUBJECT, DESCRIPTION, and PUBLISHER. There are nineteen fields that can be searched - all taken directly from the AVEL metadata schema. In addition, there are five opportunities to combine search terms using “Contains” or “Does Not Contain”.

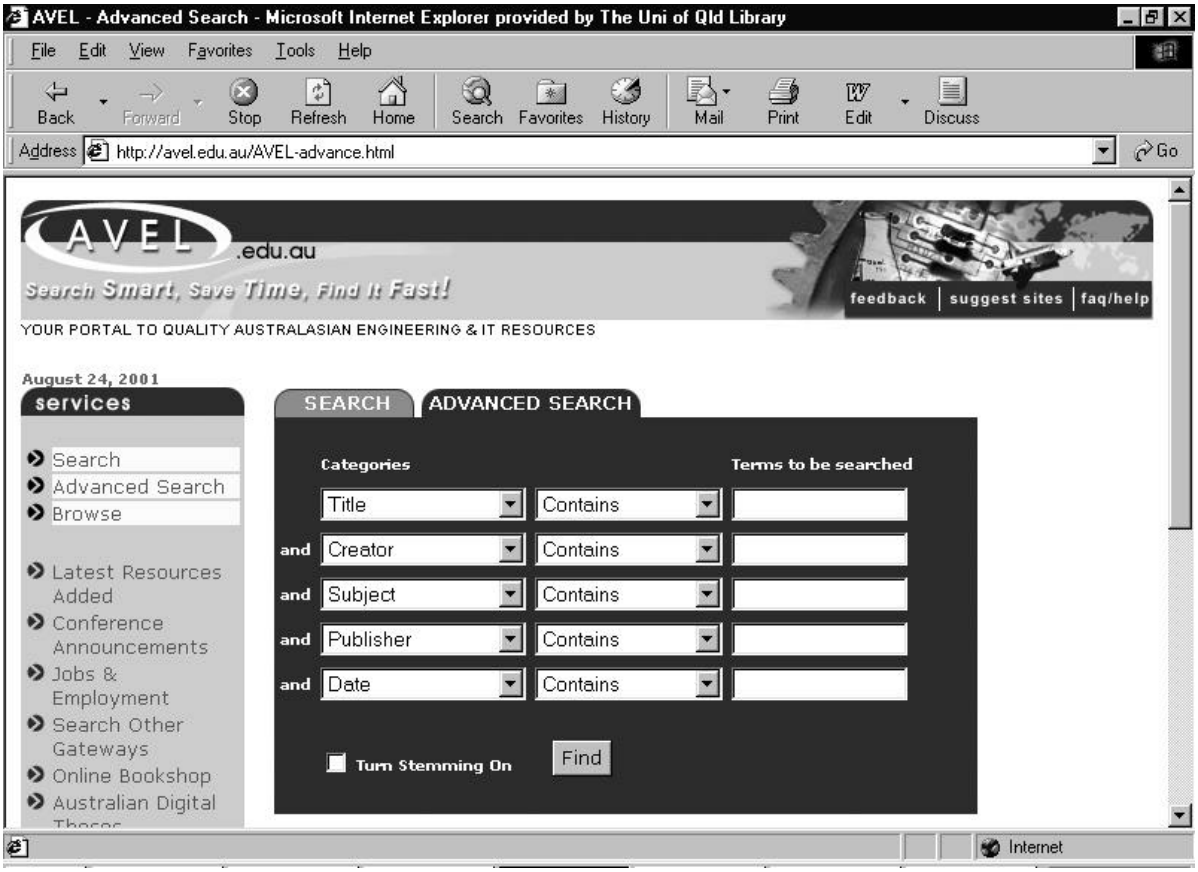

Figure 3: Screenshot of AVEL Advanced Search Screen

Many evaluators found the range of search fields and options confusing, and were intimidated by the layout of the search box. It was clear novice searchers would require additional help with examples of search strings and explanations of fields suggested.

Nielsen's strictures on the necessity for of unambiguous natural language were borne out by the evaluators' difficulties with the phrase “Turn stemming on” which is used instead of the term “truncation”. Not only did they fail to understand the terminology, they also failed to understand the explanation provided - "a form of automatic right truncation of each word in the index to its given root”.

There were mixed responses to the scope and coverage of AVEL with some evaluators indicating they were impressed with the search results returned to them, while others expressed the hope that the coverage of their particular subject could be improved.

Scenario-based Testing

At the IBM Corporation, Fuccella, Pizzolato and Franks (1999) have adopted a range of techniques to obtain user feedback to incorporate into the Web design process. Scenario building is one of these. This method of usability testing has a number of advantages – not only is it relatively inexpensive and quick to implement, but its primary advantage is that it allows users to create a context for their individual requirements and tasks. (Fuccella et al. 1999) In addition, users may identify needs not pinpointed by other methods and they can even create multiple scenarios.

Some testers present users with prepared scenarios consisting of specific tasks, designed to cover the major functionality of the software system and to simulate expected real-life usage

patterns (Levi and Conrad 1996). Fucella and Pizzolato (1999), on the other hand, have constructed an online questionnaire that asks the users to construct their own scenario in three guided steps.

Step1: Your Problem

Describe a situation in which you would come to the AVEL web site. Include any problems, questions, or information that would motivate you to visit the site.

Step 2: Your Goals

List your goals for visiting the site. You might like to ask yourself :

- what would I like to accomplish in coming to the site?
- what information would I like to obtain from the site?
- how would I know that I have achieved my goal?

Step 3: Your Actions

Describe how you think you would go about completing the task using the AVEL web site. The sorts of questions that you might ask yourself could include:

- where would I begin?
- what would I click on?
- what search phrase or words would I enter into AVEL?
- what information would I expect to find?

Please be as specific as you can about how you expect to complete the task.

This scenario-based survey was mounted on the AVEL Web site in August/September 2001. It was promoted on the site, via the AVEL newsletter (which has close to 200 subscribers) and by the AVEL partners. As an incentive, a draw for the chance to win books to the value of $100 Australian dollars was offered.

Despite the publicity and the prize, the AVEL scenario-based survey was not well patronised, with only fifteen scenarios submitted. This, of course, is one of the drawbacks of passive survey collection. Fuccella et al suggest that remote participation reduces the quality of the data. Users in a laboratory setting create more scenarios. In addition, users may have more difficulty understanding the scenario task. Certainly, most responses to the AVEL survey showed repetition and confusion between the steps.

Nonetheless, analysis of the survey has produced useful data which complements and supports the research results of the other usability testing methods.

When AVEL customers were given the opportunity to individualise their responses to the gateway, the data showed tremendous variation – despite the small size of the sample. Respondents ranged from students to engineers in every field to information professionals. They were looking for information on a range of specific topics, contacts with other engineers, conferences, mathematical formulas, cutting-edge research, online course material, literature surveys, jobs, theses, products, design guidelines and company information.

Essentially, their goals were to find finely targeted quality resources that were accurate, exact and up to date. Five respondents specified that they required Australasian material, evidence that the target audience has understood the geographical scope of the AVEL collection.

The actions taken to complete tasks on the AVEL Web site support the conclusions of the heuristic evaluation and the statistical analysis of search logs. Two-thirds of respondents reported that they would use the simple search first, only two were prepared to attempt the advanced search. Statistical analysis shows that 87.5% of searches are simple queries. Furthermore, only four users said that they would browse for terms, a very similar result to the data obtained from the online survey.

Statistics also reveal that of the "canned searches" available on AVEL, the three most popular are for full-text, conference announcements and employment, in that order. Five scenario respondents were looking for some form of full-text – books, theses or full-text articles, three specified conference information and one wanted to find jobs. One information professional found the "Latest Resources Added" feature enormously valuable.

As the respondents created their scenarios, they were evaluating the AVEL site. A number of them had constructive criticisms to make. One pointed out that she would far prefer to locate conferences by topic than by date, which was a laborious process. Another pointed out that when a search failed, a friendly redirect message with other links would be far more helpful than a bald report that no records matched the query. A Canadian librarian recommended posting the latest resources on a weekly, rather than a monthly basis.

As an adjunct to other forms of usability testing, the create your own scenario method was useful. However, it would probably be more effective in a laboratory setting. Fuccella et al also recommend following it up with surveys asking users to prioritise their tasks and requirements on a ten-point scale.

Conclusion

When the Development of a European Service for Information on Research and Education (DESIRE) project staff considered what constituted a "high quality" Internet resource, they related quality to customer satisfaction and to developing systems of continuous improvement.

We suggest that for information gateways a high quality Internet resource is one that meets the information needs of the user. (DESIRE 2000*)*

Usability testing allows the customers to define what "quality" is for them in the context of a particular subject gateway and it is therefore an essential component of the continuous improvement process. The experience of AVEL has shown that cost-effective usability testing can be incorporated as an integral and ongoing part of user-interface design, resource selection policy and marketing. It may be considered one of the most vital elements in ensuring the sustainability of subject gateways.

Acknowledgements:

The authors wish to express their appreciation to the many people who have contributed to the development of AVEL. We acknowledge the financial support of the ARC and financial and generous in-kind support our partners in establishing and maintaining AVEL.

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Appendix 1

http://www.useit.com/papers/heuristic/heuristic_list.html

Heuristic	Action
Visibility of System Status *The system should always keep users informed about what is going on, through appropriate feedback within reasonable time*	• Add "Home" link from all lower level pages • Change the colour of the "Next" and "Previous" that links to take the user to the next page of search results. • Provide text alternatives to visual content ie alt tags for images. (especially for AVEL logo to indicate that it links to Home page). • Include a site map
Match Between the System and the Real World *The system should speak the users' language, with words, phrases and concepts familiar to the user, rather than system oriented terms or jargon*	• Change the metadata field displayed as search fields to be more meaningful. e.g. *AV.Publisher, AV.Resource Type, Creator* • Change labels for metadata elements displayed to user in the full metadata record. Eg "Date: Last Modified [ISO8601]", "Language [RFC1766]" • Provide an explanation of these terms at the "point of need" (i.e. from within the search box, or from within the metadata record • Suppress some "Advanced Search" fields eg *AGLS. Availability* • Change "Turn Stemming On" to reflect plain language. • Improve the results message so that it is meaningful to users by removing *"DC"* *(ie Results for " DC.Title:water" 1 - 10 of 83 results)* • Make labels more meaningful (e.g. "Jobs & Employment, "Search Other Gateways", "ENGINE Database", "SciTech Newsletter", "Australian Digital Theses", "Newsletter Archive") • Suppress "[ ]" fields in metadata record e.g."Description [ ]", Publisher [ ]"
User Control and Freedom *Includes giving a clearly marked "emergency exit" for mistakes that the user might make, and supporting short-cuts*	• Consider allowing external links to open in a new browser. User loses ability to return easily to AVEL except by using browser "back" button • Allow user to specify the search results they have returned (i.e. specify the number of results per page, view the citation only or full record) • Include "home" link on all pages • Allow users to save a previously created search string in order to run the search at later date • Allow customisation and personalisation
Consistency and Standards *Use consistent wording, labels, headers and site design. Adhere to platform conventions and internet standards.*	• Consider changing "Find" button to "Search" • Make distinction between "SciTech Newsletter" and "Newsletter" (AVEL) to minimise confusion • Provide Image and Link to "Adobe Acrobat" for PDF documents

Error Prevention *Prevent problems. Provide good error messages for problems that do occur. Allow users to recover from mistakes.*	• Redesign "Advanced Search" screen • Give examples of correct search strings • Relabel search fields used • Provide Help from within search box • Revisit "Browse" design. Confusion about which terms would be displayed when the "Display" button was chosen. One possible solution: change highlighted colour of term chosen and provide alt text for "Display" button that says "Display Records for Highlighted Term"
Recognition Rather than Recall *Make objects, actions, and options visible. The user should not have to remember information from one part of the dialogue to another. Instructions for use of the system should be visible or easily retrievable whenever appropriate.*	• Make it clear to users when they are leaving the AVEL web site (e.g. ADT link, UQ Bookshop Link, Sci-Tech Newsletter Link) Possibly include staging page. • Logically group links on the homepage to reflect links to AVEL related material and external links
Flexibility and Efficiency of Use *Accelerators -- unseen by the novice user -- may often speed up the interaction for the expert user such that the system can cater to both inexperienced and experienced users. Allow users to tailor frequent actions.*	• Add option to "Bookmark this site" • Provide step-by-step demonstration of searching and browsing for novice users but allow experts to link directly to a saved search string.
Aesthetic and Minimalist Design Dialogues should not contain information which is irrelevant or rarely needed. Every extra unit of information in a dialogue competes with the relevant units of information and diminishes their relative visibility.	• Some additional chunking of text required. (Although most thought this was done) • Rename "Documentation Link" and reorganise the content to contain only what is of interest to the user. Remove team based information to a lower level • Move "suggest a site" and "Feedback" links from within the top right hand image, to the footer (to reflect common practice and maximise recognition) • Remove "Dublin Core" Image or provide link and alt text
Help Users Recognise, Diagnose and Recover from Errors *Error messages should be expressed in plain language (no codes), precisely indicate the problem, and constructively suggest a solution.*	• Provide alternative for error message when link is not found in repository i.e. "Command not Recognised" • Provide help or suggestion to try an alternative search if no records are returned from search string (i.e. "No records match the query!")
Help and Documentation *Even though it is better if the system can be used without documentation, it may be necessary to provide help and documentation. Any such information should be easy to search, focused on the user's task, list concrete steps to be carried out, and not be too large.*	• Provide "point-of need" for searching, giving explanation of how to use Boolean options and search field definitions adjacent to the search engine not in top right hand corner. • Make help context sensitive