

**Usability and Mental Models of Google and PRIMO  
in the Context of an Academic Tertiary Library**

**by**

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## **ABSTRACT**

Library websites and search tools are a crucial interface between the user, the organisation and its resources. Most users now have easy access to other sources of information via the Internet, such as Google, and studies show the vast majority are using these in preference to library resources. The information architecture of library search tools is unfamiliar to users and is believed to constitute a barrier to usability. This is an industry-critical issue. Products have recently become available based on decoupled architecture, where the library management system is dis-integrated from the user discovery interface. One of these products is Ex Libris' PRIMO, termed LibrarySearch at the time of this project by the University of Auckland Library, an academic tertiary library.

The researcher used qualitative methods in order to gain an understanding of users' starter frameworks and information-seeking behaviour in the contexts of mental models, usability and sense-making. The purpose was to raise providers' awareness of their own and students' mental models and the disparities between them, with a view to closing gaps from the providers' side. Results indicate there is potential to improve web design, teaching, reference and other explanatory material.

### **Keywords:**

Mental models, usability, Google, PRIMO, information-seeking, user, qualitative, Web, design, information architecture, decoupled architecture, sense making, academic, student, library

# 1 INTRODUCTION

*"I had no idea the Library had all this stuff! I've always just used Wikipedia!"*

This project aims to examine an industry-critical challenge to the traditional information professions; represented here by an academic tertiary library. The undergraduate student overheard above was not only unaware of his institutional library's resources; he'd been "getting by" in his studies with information gained elsewhere. The challenge to the profession is, he's not alone. Researchers and commentators have been drawing attention for some years to the dramatic transformation in general access to information, due to the widespread uptake of Internet technologies.

Library websites represent a crucial interface between "the library" – its resources and services, the organisation and its people – and users. However a very high percentage of potential patrons are choosing other avenues to meet their information needs (Fast & Campbell, 2005; OCLC Online Computer Library Center Inc., 2006). The OCLC report entitled *College Students' Perceptions of Libraries and Information Sources* states that only 2% of tertiary students surveyed begin their information searching on a library website, and only 10% of those fulfilled their need there. This compares with 89% who go to search engines on the Web first, and 93% who rate that experience as satisfactory or better (OCLC Online Computer Library Center Inc., 2006, p. 6.2). Libraries are in a highly competitive environment.

The usability of library applications is key to meeting that competition. The advent of the graphical user interface and the online access public catalogue (OPAC) were important leaps forward for non-professionals. However users now have other options – such as Google and Wikipedia – and most prefer such providers, even although they trust library sources more. (Fast & Campbell, 2005; OCLC Online Computer Library Center Inc., 2006). The reasons appear to be related to products that are both easy to use and supply sufficient resources to meet most requirements. Students are familiar with these

products because they are in everyday use; it makes sense to use them for study purposes as well.

Even within an institutional environment, users exhibit an enormous diversity of information needs, expectations, experiences and literacies. When they do visit library sites, those frameworks and mental models come with them. The goal of this project is to examine selected aspects of user thinking, in the context of a new model of searching for and obtaining library resources. Does this model go some way to meeting the competition? Does it make more sense to the current cohort of students than the particularities of OPAC searching? Does the new model exhibit higher usability values than the OPAC, if usability goes beyond layout to addressing user expectations, frameworks and goals?

## **2 PROBLEM STATEMENT**

This project is based on the proposition that the mental models of library website designers are the predominant influence on those sites' architecture; they are examples of provider-driven design (Kilker & Gay, 1998; Veldof & Beavers, 2001). A key search interface for all libraries is the online catalogue, which has been designed around the structure of its component data. This structure strongly influences not only the search interface, but providers' mental models of information-seeking – with implications for their interactions with users.

Both research and experience indicate that users' mental models are shaped, not by the architecture of databases, but by their own experience of information-seeking. This researcher is not the first to suggest that there may be a significant gap between provider and user frameworks that seriously impacts the usability of library website interfaces (Veldof & Beavers, 2001). An exploration of user frameworks could be the means of gaining some understanding of the nature of this gap and applying it, not only to web product design, but to other interactions between the library and the patron. Teaching, reference interviews and explanatory material could all be enriched by a deeper understanding of user frameworks.

Recently, several products have been launched which represent a new model of discovery based on “decoupled architecture” (Sadeh, 2007a). The model detaches discovery and access tools from the integrated library system (ILS), which still exists and underlies the new products. Data from the ILS is continuously piped to the new product, where it is indexed for searching. The thinking behind the model is to separate management and presentation. It is designed to meet user expectations for a “primary tool ...for discovery ...which can be integrated into the user’s environment; ...provide fast, simple, powerful searching; and ...encourage collaboration. (Sadeh, 2007a p.314) Sadeh, a marketing executive for one of the companies putting forward a decoupled product, says “the intention is to provide a unified entry point to [libraries’] many offerings.” (Sadeh, 2008 p.10) There would be significant advantage to a system which transforms discovery for users without affecting the organisation of core data – which is intrinsic and integral to the business and discipline of information science.

One of these new products is Ex Libris’ PRIMO (Breeding, 2007b; Sadeh, 2008). PRIMO, termed LibrarySearch in the University of Auckland Library test environment at the time of data collection for this project.<sup>1</sup> LibrarySearch is ‘layered’ over local holdings - represented by the library catalogue and another Ex Libris product, Digitool (a database for local image collections). LibrarySearch also provides access to federated searching of a selected set of subscription databases. LibrarySearch features: new search interfaces, including single and multiple field entry options; enriched results display; additional results management features; different pathways to access and self-service. Some aspects, such as the ability of users to tag, review and bookmark individual results, draw upon the evolving Web 2.0 environment. **Appendix A** provides a visual representation of relevant LibrarySearch screens as at October 2008 when data was collected.

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<sup>1</sup> At time of writing local holdings, including Digitool, are referred to as the Catalogue (now minus any subscribed holdings). LibrarySearch is currently the name given to a Beta testing environment for several new products – including PRIMO, Metalib and SFX configured as Citation Linker – all Ex Libris products. This environment will alter again during February 2009.



This software represents a new way of discovering and accessing Library collections and some of the subscription material. For a tertiary academic library with 40,000+ users the significance of implementing LibrarySearch is very high, as it could replace existing public access to the catalogue and allow searching across multiple databases. The decoupled architecture of the model is of high international interest for libraries; representing a significant departure from established OPAC architecture. Several suppliers are marketing products based on various configurations of decoupled or “disintegrated” models and growing numbers of libraries are taking them up (Breeding, 2007a).

In addition to attempting to describe user mental models, the specific practical problem which this project explores centres around two search options. LibrarySearch is set up with two tabs – Catalogue and Articles – the former representing local holdings; the latter a set of six major interdisciplinary databases. The University of Auckland Library website has for some time provided three main points of entry for article discovery: the Catalogue (for journal titles); Databases and Article Searching (for individual works on a topic); and Ejournals (for discovering a particular journal in online format using the catalogue software). In terms of supply and promotion there were some cogent reasons for surfacing these options separately. However, this layout may be impacting on usability. The Catalogue, for example, ‘conceals’ individual article titles under journal titles and holdings; Database and Article Searching gives access to over 700 individual databases; Ejournals also conceals individual articles under journals and their holdings. The LibrarySearch environment, marketed as a unified point of entry, still seems to provide two pathways for accessing what the Library ‘has’. Is insider knowledge required for informed choice between them?

## **2.1 Terminology**

A number of important and related concepts have been alluded to in the preliminary sections of this report.

- **Decoupled Architecture** is an information model where library and digital asset management systems are separated from user discovery, which is presented from a different platform. Data is piped from the management system to the discovery system. The concept as it relates to libraries is discussed by Sadeh in more detail (Sadeh, 2008, pp. 10,11)
- **Information Architecture** is understood to refer to the underlying conceptual framework which determines the layout and functionality of websites. Rosenfeld and Morville address the problem of definition from three angles.
  1. The combination of organization, labelling, and navigation schemes within an information system.
  2. The structural design of an information space to facilitate task completion and intuitive access to content.
  3. The art and science of structuring and classifying web sites and intranets to help people find and manage information. (Rosenfeld & Morville, 2002)
- **Information-seeking behaviour** – the physical, mental and emotional processes whereby users search for information - in this instance, using electronic technologies. Researchers have taken different approaches to the roles of cognition, emotion and action in information-seeking behaviour, but there is a consensus in the making that all three domains play a part. (Nahl & Bilal, 2007)
- **Mental model** is a term applied to a conceptual framework upon which behaviour and learning depend. As Borgman explains, the theory of mental models is still evolving and there is no one accepted definition. She suggests:
 

“mental model” is a general concept used to describe a cognitive mechanism for representing and making inferences about a system or problem which the user builds as she or she interacts with and learns about the system. The mental model represents the structure and internal relationships of the system and aids the user in understanding it, making inferences about it, and predicting the system’s behaviour in future instances.” (Borgman, 1999, p. 436)

- **Sense Making** is the name applied to Brenda Dervin's model of seeking and gaining useful information, whereby meaning is created in the process of bridging the gap between situation and outcome. A recently produced diagrammatic representation is helpful in explicating the model and elaborating on its components. (Dervin & Reinhard, 2007, p. 52 Figure 3.1)
  
- **Stakeholder groups** for the purposes of this project include users, providers and the researcher.
  - **Users** in the tertiary academic environment include under- and post-graduate students, academics and general staff. They are represented in this project by a more homogeneous group of six undergraduate Education students
  - **Providers** are those involved in the creation and supply of a product. In the context of library websites and search interfaces they include web developers, web designers, information architects, library and information professionals, managers, institutional or commercial owners.
  - The **researcher** in this instance has been employed by the University of Auckland Library for eight years and has a background in History and Education. Both disciplines have imparted an awareness of socio-cognitive thinking and the interpretive paradigm. The researcher views this project as a personal sense-making experience.
  
- **Usability** refers to a technology's ease of use; being fit for the purpose. In this context, usability is applied to library web search interfaces. There are international standard definitions of usability, such as: "the extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use". (British Standards Institution, 1998 p.2)

This project associates **usability** with **mental models** of **information-seeking behaviour**.

### **3 RESEARCH PARADIGM**

Of the three major research paradigms identified by Pickard, interpretivism best fits the thinking around this project - which seeks understanding rather than generalizable outcomes. (Pickard, 2007) Interpretivism states that reality is constructed, multiple and highly contextualised. It accords well with sense-making and with the qualitative methodologies often associated with usability testing. This paradigm allows for the exploration of user frameworks, which may be very variable, in some depth. A discursive interpretation under this paradigm can allow for the complexity of human behaviour and reach conclusions which can inform rather than delineate or direct thinking. Research under an interpretivist paradigm also acknowledges the presence and influence of the researcher, who contributes to the outcome. This contrasts with positivism where an objective reality is envisaged and the researcher stands outside the research environment. However, mental models are highly individual and constructed by nature. In order to gain an understanding of them, purely empirical methods fall short. In an investigation where mental models and information-seeking behaviour are being explored, the interpretivist paradigm is an appropriate one.

### **4 LITERATURE REVIEW**

This section reviews the literature over a number of themes: usability; evaluative approaches to usability and their theoretical bases; the applicability of usability to library websites; case studies of usability within academic libraries; user perspectives in case studies; conceptual frameworks or mental models for information-seeking; the role of affect in information research.

#### **4.1 Usability and human-centered design.**

Usability has been equated to 'ease of use' or being fit for the purpose, but the internationally recognised definition is: " the extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use". (British Standards Institution, 1998 p2) Another standard links usability to design by setting out the principles of human-centred design, namely: the active involvement of users and a clear

understanding of user and task requirements; an appropriate allocation of function between users and technology; the iteration of design solutions and multi-disciplinary design. (British Standards Institution, 1999 p.3) In recent years, usability has been recognised as a powerful lens for informing Web design. Jakob Nielsen's extensive and often cited work on Web usability proceeds from the premise that, unlike other technologies, users are empowered to experience a web product's usability before committing to the product itself: if they can't use it, they won't 'buy' it. (Nielsen, 2000a)

## **4.2 Evaluating usability**

Given that website usability is of high value to the stakeholders, and that people approach sites from differing perspectives, how can levels of usability be ascertained? For some in the field, usability testing involves representative users undertaking set tasks under close observation, often 'thinking aloud' during the process. (Nielsen, 2000a; Norlin & Winters, 2002; Rubin, 1994) Others, including this researcher, term this process 'user testing' and use the phrase 'usability testing' to cover a range of methodologies such as user testing, cognitive walkthroughs and heuristic evaluations - which Pickard identifies as the main three techniques for library researchers. (Pickard, 2007). Other sources of evaluative information mentioned in the literature include usage statistics, analysis of search logs, surveys, interviews, card sorting studies, scenarios, focus groups, paper prototyping, questionnaires and mixed methods. Both quantitative and qualitative methodologies are found in usability studies.

## **4.3 Applicability of the usability concept to libraries**

Rosenfeld and Morville's seminal work on information architecture brings together the concepts of content, context, users and their information-seeking behaviours – browsing, searching and asking - and draws a specific analogy between the information architectures of physical libraries and of websites. (Rosenfeld & Morville, 2002 p.7) A large number of usability studies relating to library websites, OPACs, digital libraries and databases have been published in the last 10 years, and usability as a concept relevant to library websites has been under examination since the 1980s. Many of the papers are case studies

and some are very descriptive, but there is also a substantial body of evidence-based and theoretically grounded research, and work on suitable evaluation models in library contexts.(Jeng, 2005) The following section of this review summarises the results of a review of sixteen case studies of academic tertiary library websites. (Wilkinson, 2007)

#### **4.4 Case studies of usability**

Formal user testing employing the established techniques of task-setting, think-aloud protocols, and close observation was a methodology of choice in all but one case study reviewed by this researcher (Wilkinson, 2007). However most usability explorations used mixed methods. All concluded that usability testing was useful, although to various degrees and with some caveats. Some of these studies were undertaken with a high degree of awareness of the research relating to usability testing in libraries, and featured well documented literature reviews and rigorous data analysis – whether qualitative or quantitative (Wilkinson, 2007). Others were less rigorous. Most studies explained the basic concepts of usability and the evaluative techniques being used. Discussion of results ranged from the merely descriptive to well reasoned and supported argument. Application of results to website redesign was often a matter of re-labelling and rearranging, rather than rethinking the information architecture. Most analyses do not specifically address the conceptual frameworks of providers and users, although there was often implicit recognition of a gap between these. However several studies explicitly recognised a mismatch between mental models and applied this thinking to interpreting results and drawing conclusions (Wilkinson, 2007).

#### **4.5 User perspectives in case studies**

Amongst the patterns observed by researchers some can be directly attributed to the particular characteristics of library sites – namely architecture and layout, terminology and relationships between resources. Other patterns of behaviours and preferences are brought to the exercise by the users. It could be useful to attribute these to manifestations of differing mental frameworks; however awareness of conceptual frameworks is often only implicit within these studies. Exceptions are found in some reports that attribute many user difficulties to low

information literacy or instructional weaknesses. (Krueger, Ray, & Knight, 2004; VandeCreek, 2005; Vaughn & Callicott, 2003). Vaughn and Callicott also compare students' information-seeking behaviours with library staff preconceptions of research strategies. Gibbs explicitly expands on user expectations, particularly with regard to the Internet, and includes a section on librarians' assumptions regarding user IT skills and knowledge of terminology. (Gibbs, 2005) McGillis and Toms join in asserting that user expectations are raised or formed by other online experiences and notes issues with 'starter' frameworks. (McGillis & Toms, 2001) Cockrell and Jayne refer to a 'transforming' experience for the librarians involved in usability testing as they encountered the gap between user behaviour and library staff expectations. (Cockrell & Jayne, 2002) One of the most interesting case studies is that of Fast and Campbell. (Fast & Campbell, 2005) Rather than conducting usability testing on a library website, use of the OPAC is compared to internet searching. Instead of a series of provider-defined tasks, users were asked to locate information on a topic using first the catalogue and then Google, or vice versa: a much more open-ended assignment. The researchers discovered a paradox: despite open admiration for the OPAC and trust of the quality of resources listed there, users still expressed a preference for free web searching. Fast and Campbell suggest a psychological influence: namely that the very highly organised structure of the catalogue implied the necessity of possessing a skill-set that users may not *believe* they have. The relevance of users' mental constructs to the design of library websites would then go beyond sensorimotor and cognitive conditioning gained from other searching experiences into the realm of affect.

#### **4.6 Mental models**

User frameworks have been examined from a psychosocial perspective by Kilker and Gay, who propose multiple social groupings of stakeholders in respect of a digital library case study. (Kilker & Gay, 1998) Groups include library and web design staff with differing goals and concepts, faculty and several student groupings. Varying levels of IT literacy, disciplinary interest, research proficiency and library expertise impacted on their mental constructs and use of the site prototype, and the evaluation process itself. The study

concluded that design is complex and should attempt to take differing user and provider conceptions into account. Recently there has been a growing body of published research linking mental models to information-seeking in various contexts. Borgman considered the impact of model-based training compared to procedural training in an information-seeking context (Borgman, 1999). Slone incorporated motivation, experience, and goals as well as mental models into a study of search behaviour on the Web (Slone, 2002). Cole and Leide tested visualization schemes of topics and information spaces to assess an information retrieval product, with inconclusive results (Cole & Leide, 2003). Veldof explicitly linked gaps between librarian and student mental models and the usability of library products (Veldof, 2003). Zhang also drew upon user perception of the Web as an information space and identified four different models (Zhang, 2008). Westbrook, in a comprehensive but 'exploratory' paper on mental models - derived from Dervin's sense-making paradigm - undertook a study of conceptual frameworks that drew conclusions with practical application (Dervin, 1999; Westbrook, 2006). Westbrook identified the components of mental models as: the user, the internet, the library and people (potential advisors), and discovered three overarching patterns of information-seeking behaviour - decision trees, networks and storms - which she suggested could be accommodated within library websites by providing various options rather than single tools. Users could identify with particular modes of interaction, and use them to search more effectively. Westbrook's study is valuable in indicating that reconceptualizing library website design, in a way that retains the integrity of library information architecture but acknowledging and taking advantage of user preferences and behaviour, could be possible. However, fundamental reconceptualisation of library website architecture has been slow to surface.

#### **4.7 Information research and affect**

There are a growing number of studies centred on psychosocial aspects of information-seeking. The phenomenon known as 'library anxiety' has been reported for several decades and it is acknowledged that it can interfere with the information-seeking process. (Onwuegbuzie, Jiao, & Bostick, 2004, pp. 36-38). These authors have identified a number of components to library anxiety, including perceived incompetence and resource anxiety; both of which can



apply to constructing effective search strategies or to finding the full text of desired items. The role of 'affect' in information-seeking behaviour and for usability is now acknowledged to be as important as other components of mental models. Nahl states that information reception is an "adaptive behaviour that involves all three biological systems: sensorimotor, cognitive and affective" (Nahl, 2007). Research into emotion and human-computer interactions is drawing on cognitive psychology, which has demonstrated that "positive affect" facilitates cognitive processing, while "negative affect inhibits and disturbs it" (Nahl, 2007, p. 31). Julien states that "affective issues such as confidence are primary variables in people's use of online information sources" (Julien, 2007, p. 243). When users of information systems are seen to be operating within social contexts; when they are acknowledged to be thinking, acting *and* feeling, there are consequences for the usability of library products and important implications for the design process. (Nahl, 2007, p. 34)

#### **4.8 The Literature: Situation and gaps**

Users and their information-seeking behaviour matter to libraries. OCLC has recently reported on tertiary students' perceptions and practice with respect to libraries and other sources of information – notably the Web (OCLC Online Computer Library Center Inc., 2006). The 2% of those surveyed who began their information searching with library resources does not constitute a "hegemony" that libraries can seek to "maintain" (Sadeh, 2007b). Any grouping of organisations with such a low 'market share' would profit from examining purpose, policy and practice, as would the individuals who work there. Library resources and services are respected but not embraced by users.

Yet much of the usability research in information science has been provider and product-centred – rearranging, renaming and redecorating the website for example. Subjects in some otherwise thorough studies have even been nascent information professionals – hardly a 'naïve' group. (Westbrook, 2006). The University of Rochester project in pursuit of "student-centred libraries", while seeking to understand and learn from students' work practices in a larger-than-library context, does not examine their information-seeking in depth (Foster & Gibbons, 2007). In addition, the published literature linking mental models to

information-seeking is not extensive, and user studies of searching the Web are more likely to be found in Computer Science than Library journals. Most information studies reviewed neglect psychological factors and focus on the cognitive and mechanical aspects of behaviour, a pattern that Given notes is common to the field (Given, 2007).

There is value in research at the local and particular level, especially when a new discovery model is an object of deep interest. Around the inception of this project an opportunity arose to examine a product touted as part of the solution. To date, little published research on PRIMO's usability has emerged, except from those partnering Ex Libris. The University of Auckland may become the first tertiary library to implement PRIMO with Ex Libris' integrated library system, Voyager. Local users bring their own contexts to the mental models with which they will approach the new system.

Therefore there is scope for a study which attempts to examine local users' information-seeking behaviour in first-choice products, such as Google, as a starting point for observing and comparing their behaviour in the LibrarySearch environment. What aspects of users' mental models for information-seeking can be uncovered, and how could subsequent understanding be applied in the local context?

## **5 STUDY OBJECTIVES**

This project aims to explore usability and mental models by investigating undergraduate students' information-seeking behaviour in a Web product, Google, and in a new application, LibrarySearch. The objectives are to:

- ascertain the 'starter' frameworks of users, which will probably influence information-seeking behaviour on approaching new search interfaces
- ascertain user perceptions of the content of the Catalogue and Articles tabs in LibrarySearch, and the effects of those perceptions on user behaviour
- raise providers' awareness of their own and users' mental models, and any disparities between them

- point to possible implications of disparate mental models for website design, explanatory material and other communications between providers and users

## **5.1 Research questions.**

As the literature review showed, a well-designed usability study in a local situation, incorporating mental model approaches and acknowledging users' role in creating meaning, might elicit some significant results that could be applied not only to website design, but to the direct and indirect contact of library staff with users in teaching or consultative situations. In other words, this project aims to ask about the thinking behind user behaviour in order to leverage understanding - so information professionals can work from or within users' frameworks, rather than ascertain behaviour patterns in order to provide corrective design or educational strategies. The latter could be seen as an attempt to increase conformity with provider mental models.

As Westbrook indicates (Westbrook, 2006 p.569) ascertaining mental models is not straightforward. However, her study shows that it is possible to identify elements in a qualitative way and to construct research questions based on looking for patterns.

The following questions arise from the researcher taking a qualitative, sense-making approach which acknowledges the existence of user mental models.

### **1. How would users' mental models of Google or Google Scholar *content* be described?**

- a. Is their concept of the information orderly or chaotic?
- b. What types of information do they expect to find?
- c. How do users see the quality of information in Google or Google Scholar?

- 2. How would users' mental models of their *information-seeking behaviour and strategies* in Google/ Google Scholar be described?**
  - a. How would the researcher describe their information-seeking?
    - i. Data Entry
    - ii. Navigation
    - iii. Filtering and Evaluation
  - b. How do they conceptualize their own information-seeking in Google and Scholar?
  
- 3. What *content* do users think the LibrarySearch Catalogue and Articles tabs provide access to?**
  - a. Is their concept of the information orderly or chaotic?
  - b. What types of information do they expect to find there?
  - c. How do users see the quality of information in LibrarySearch?
  
- 4. What do users think the *relationship* between the LibrarySearch Catalogue and Articles tabs might be?**
  - a. Separate / Subset one of the other / Intersecting
  - b. Can they describe the relationship?
  - c. How does this compare with their mental model of the relationship between Google and Google Scholar?
  
- 5. How do users' existing mental models *affect* their information searching behaviour and strategies in LibrarySearch Catalogue and Articles?**
  - a. Do they use or try to use the same strategies as they do in Google / Google Scholar, or do they make adjustments?
  - b. How would users describe their information-seeking behaviour in LibrarySearch Catalogue/ Articles, compared with Google/ Google Scholar?
  
- 6. In particular, how does the provision of two pools of content with distinctive characteristics, in one search interface, affect the *usability* of web-based access to Library resources?**

a. Does having to make a prior selection of a content pool affect the users' perception of search strategies and of gaining useful results?

**7. Does the 'decoupled architecture' model represent a *bridge* between provider and user mental models of information searching with respect to Library resources?**

## **6 METHODOLOGY**

### **6.1 Rationale**

In aiming to find out about users' mental models, there is a good case for using qualitative research methodologies. Mental frameworks are very specific to individuals and the interpretive paradigm is particularly suitable at uncovering meaning at an individual level.

The purpose of this study is phenomenological, as described by Leedy and Ormerod: that is, it aims to understand the users' perspective on encountering a library website. (Leedy & Ormrod, 2001 p.157). Analysis will focus on teasing out 'meaning' from the experience. The consequence for methodology is that tools allowing for interpretive analysis, such as open-ended questions and a structure as loose as possible, should be used.

Dervin's Sense-Making theoretical framework, which has been selected to enrich the thinking around this study, is also strong on qualitative methodology - the main tool being the research interview in which a critical situation is described "in detail: first in terms of what happened first, second, third and so on; then in terms of the situations, ...gaps, ...bridges, ...and outcomes...", providing a number of entry points for interpretive analysis. (Dervin, 1999 p.334).

As the literature review explains, usability testing, a recognised means of researching user behaviour, counts amongst its most effective tools the user testing of as few as five people – again a qualitative approach (Nielsen, 2000b).

The choice of qualitative methodologies for this project also has implications for participant selection and demographics, which will be particular and acknowledged rather than random and representative. The project will be drawing on Westbrook's study, which uses qualitative methods, but her subjects were nascent information professionals, who must be seen as an insider group to some extent (Westbrook, 2006). Subjects for this study will be sought outside the domain of library and information studies, as the purpose is to uncover useful information about disparities in mental models between providers and users.

Fast and Campbell's study is of significance to this project, not only for applying a more open approach to a user testing situation by providing a 'topic' for information-seeking rather than a set of tasks, but also for addressing psychological factors, deduced from questionnaire data (Fast & Campbell, 2005). Their study proposes that user perceptions of library websites as requiring 'skills' to navigate are a significant factor in turning students away from engagement. These methods and conclusions are qualitative in nature.

Some recent research on localised undergraduate behaviour at the University of Rochester uses a number of qualitative methods to gain an understanding of students' thinking. These included photographic analysis, geographic mapping, model-building and brain-storming, as well as more structured methods such as open-ended questionnaires and interviews. (Foster & Gibbons, 2007).

A number of well-constructed case studies of library websites incorporate qualitative tools, in recognition of the enhanced understanding these allow (Augustine & Greene, 2002; Cockrell & Jayne, 2002; VandeCreek, 2005) .

Therefore taking a qualitative approach to methodology is valid for this project. The choice of approach has implications, beyond research tools, for analysis and interpretation. The data collected in this study was predominantly verbal, but there was no intention to analyse it using formal protocols such as those discussed by Ericsson and Simon. (Ericsson & Simon, 1993) The researcher has taken a post-modern approach to analysis of the verbal data and its

subsequent interpretation. In other words, issues of validity and reliability have little relevance beyond the internal consistency of data and the ethical behaviour of the researcher. Knowledge in a post-modern paradigm is said to be the result of a social construction. Truth, while not universal, can have “specific local, personal, and community dimensions”, suggests Kvale. (quoted in Onwuegbuzie et al., 2004, p. 208). A ‘social construction’ is a valid description of the interaction between this researcher and her interviewees/ collaborators. Therefore project analysis, interpretation of findings and subsequent recommendations illuminate and inform a local and particular situation in time and space. There is also the potential to shape the mental models of interested stakeholders.

## **6.2 Tools**

Two tools associated with usability testing were used; namely questioning and user testing. The purpose was to arrive at a conception of mental models by observing information-seeking; listening to users describe their thinking processes, and attempting to elicit larger concepts by asking open-ended questions. User testing can be a somewhat structured process. That imposed orderliness can be disrupted to an extent by the setting of open tasks; allowing users to follow their own search strategies; and the incorporation of user / researcher interaction into the collection and analysis of data.

Subjects were undergraduates from the University of Auckland’s Education Faculty, conferring a degree of homogeneity. The depth of interpretation envisaged and time available suggested a small group of six people, tested individually.

There were three main phases in the test sessions (see **Appendix B**)

1. Introduction and demographically based questions. The purpose of this section was to put the subjects at ease as much as possible, and to confirm the profile of the user group.
2. Questions and task-based activities around: Google or Google Scholar (user choice) and LibrarySearch (PRIMO). The purpose of these was to

focus on the research questions in such a way as to collect data that could be analysed for aspects of user mental models – behaviour, attitudes and thought processes.

3. A more open discussion between participant and researcher. This section provided opportunities for further reflection and undirected expression on the part of users. For example, an indication of whether their mental models might have changed during the course of the session.

During the task section, observation was undertaken by asking the interviewees to think aloud. This verbal data was recorded and supplementary notes were made by the researcher. During the interviews the researcher became overtly part of the process, by her presence, questioning and participation in dialogue. Some questions were pre-determined; however many arose during the interviews. In this way the researcher and user collaborated to create meaning.

## **7 DATA COLLECTION**

### **7.1 Participant selection (See Appendices C, D, E, F)**

The research proposal indicated that the pool from which participants would be drawn was the undergraduate population of the Education faculty at the University of Auckland, at varying levels of study, and training to become teachers. Two unforeseen factors influenced the selection process. Firstly, the number of people approaching the Library Information Desk at the time of Ethics Approval was lower than anticipated, as a very large proportion of students were on practicum or break. Secondly, the researcher discovered that the LibrarySearch interface would be modified two weeks from that time, which made finding six suitable candidates and carrying out the interviews a matter of urgency. With the agreement of the Library Manager, fliers were created and left on study desks, which fortunately attracted the attention of six suitable people.



## **7.2 Demographics**

All the participants were undertaking Bachelor degrees in the Faculty of Education at the University of Auckland, majoring in primary education, physical education and disabilities. Three were in their third and final year of study; one was in second year and two were completing their first year. There was a close match between their time at the University and their level of study. The demographic question regarding use of the Library was verbally qualified to make it clear that the physical buildings and all University Library resources were included. Interviewees reported varying use of Library facilities and services, which did not correlate with their level of study so much as perceived needs around finding material for assignments. The range of resources accessed also varied: from just using the catalogue to find physical material at the Sylvia Ashton-Warner Library on campus, to locating electronic course material, to one or two making use of the subscription databases at basic levels.

Four of the participants characterised their general web searching skills as 'good'; with one settling for 'basic' and another for 'advanced'. Having observed their skills over the course of an hour or so, the researcher considers these characterisations as reasonable. The two others - self-reporting 'basic' and 'advanced' skills - I would suggest have respectively under and over-estimated their abilities.

## **7.3 Interview parameters**

The interviews all took place in a consulting room at the Sylvia Ashton-Warner Library. It was equipped with a table and chairs, and a workstation with PC and internet access. Access to the Library intranet, where the test environment for LibrarySearch was located, was provided by the researcher logging in. Every effort was made to ensure interviewees were comfortable in the physical and electronic environments provided, and preliminary conversations took place about temperature, air flow, login processes etc. to assist in this aim. Interviews were recorded using a digital audio voice recorder with a lapel microphone. The output files are in WMA file format. Files were opened for transcription in Windows Media Player, which allowed variable playback speed. The researcher

practised using both devices and software prior to commencing the data collection phase of the project.

#### **7.4 Transcription process**

Transcription of the first interview began within a few days of recording. It became apparent that each hour of interview took four hours to transcribe, and another to scan and check. A total of thirty one hours was spent transcribing all the interviews, checking and annotating them with the brief hand-written notes which accompanied the recordings. The transcription process was physically demanding and very iterative. It was also illuminating as it provided the researcher with an opportunity to reflect on the data collected. Although the data collection was accomplished in just over a week, due to unforeseen circumstances transcription was divided into two phases with a lengthy interval between. This delay was unfortunate in terms of project scheduling, but did give the researcher time to develop her thinking.

#### **7.5 Observations and reflections**

The researcher found the interviewing process very rewarding and interesting, as the qualitative nature of the research and the loose, semi-structured form of the interviews allowed for pertinent digressions to occur and a depth to the discussion that would not have been possible with other instruments, such as a survey. There was some initial concern on the part of the interviewer regarding the loose structure, but this was allayed when the sense-making paradigm was recalled and the opportunity to enter into highly relevant dialogue with users appreciated. Most of the interviewees also volunteered that they enjoyed participating, which was taken to indicate they had expressed themselves reasonably freely during the session.

### **8 ANALYSIS**

The project generated the following outputs for analysis:

- Research Log – This took the form of notes entered chronologically in a spreadsheet, and accompanied by a timeline. In the case of qualitative

studies, a log supports reliability and is a mechanism for tracking researcher input.

- Pilot Interview Data – audio file of dialogue, user-generated table and observation notes
- Interview Data – audio file of dialogue, transcribed answers to questions, transcribed dialogue and descriptions of navigation, user-generated tables, observation notes

### **Research Log**

A review of the research log has contributed to the researcher's reflections on the project. (See **Appendix M**)

### **Pilot Interview Data**

The pilot interview was undertaken with one third year student under the Proposal research protocol. It was very useful and resulted in:

- Rewording of some interview questions for clarity
- Checking the LibrarySearch image collection for relevant material
- Confirmation of approximate Interview timing (an hour)
- Practice at using the recording device and transferring files
- A confirmation that an informal conversational style could generate an atmosphere of some trust, in which meaning and 'sense' could be teased out between the researcher and participant
- A realisation that visualizing and /or describing information-seeking strategy and behaviour may be very novel to the user. Prompting can act as a catalyst.
- A realisation of the benefits of allowing for digression - in the interests of in-depth explanation or unexpected approaches to information-seeking (in this case, a strategy of using 'pdf' as a keyword to obtain articles from a Google search)

- Rethinking coding categories. This process continued during the interviews proper and was finalised after transcription of all interviews

### **Interview Data**

Interview sections 1, 2A and 3A (**refer Appendix B**) were designed to describe the sample population and to put the participants at ease with some straight-forward questioning. The results are tabulated (**Appendix G**) and discussed under Data Collection (p. 20). The demographic profile matched that outlined in the project proposal.

The transcriptions of the main Interview sections comprised dialogue and associated observer notes. (**Appendix H**) These transcriptions were coded on a spreadsheet (for example refer **Appendices I and J**) by categories that related to the project's problem statement and research questions. These categories were substantially different from those originally proposed, as it became clear as transcription proceeded that coding needed to reflect the purpose of the project, if findings were to be interpreted in that light. In addition, the researcher decided that it was preferable to allow users to self-define their behaviour rather than impose patterns upon it. Looking for clear patterns amongst six individuals could be of dubious value. Therefore coding categories away from the metaphorical and towards particular concepts mentioned in the research questions were settled upon. Potential categories drawn from other research projects were also discarded in favour of those locally generated. Some concepts were retained around sense-making, information-seeking behaviour and mental models, but held over for discussion rather than coding. (Dervin, 1999; Kuhlthau, 2004; Westbrook, 2006)

Even so, the coding process itself was more complex than the researcher expected. For example, a single action and associated dialogue could be classified under several headings - perception of content, information-seeking behaviour and strategy. A great deal of detail was entered into the worksheet, but the researcher became aware that coding is a subjective process. A project with a different purpose could generate a completely different configuration of the same data.

A summary of the user-generated perceptions of content tables was compiled (**Appendix K**). Instructions were to tick where participants were confident information types could be found. If uncertain or thought absent, then users were to leave the space blank. Therefore the summary gives an **indication of certainty of presence**. Data input format (ticks) allowed for analysis by visual impression – the data not being statistically valid.

Analysis of the coded data and the summary of the user-generated tables was undertaken with reference to the research questions and is represented in **Appendix L**. This was an interpretive as well as an analytical process. The findings follow.

## 9 FINDINGS

Findings are discussed in terms of the research questions.

### 9.1 Research Question 1

#### 1. How would users' mental models of Google or Google Scholar content be described?

Participants all expected Google to provide access to information on 'anything', including material suitable for university work, but excluding University of Auckland exam papers and course reading lists. The universality of Google-accessed content was both described in conversation and indicated by the table relating to information types. (**Appendix K**) Several personalised their descriptions: "*information that relates to me*"; "*links to where I want to be*". It seems that Google is regarded as a personal gateway for locating study material and teaching resources; for recreation, communication and staying current in areas of personal or professional interest.

Only two of the six interviewees had heard of and used Google Scholar (Scholar). Three others were prepared to comment on their initial impression when introduced to the Scholar homepage. The perceptions

of Scholar were that it focuses on material relevant to study and research at university or academic levels.

**a. Is their concept of the information orderly or chaotic?**

The data drawn upon for answering this question was obtained by observation of information-seeking strategies and techniques, and also the descriptive or visualized mental models provided by users themselves.

Participants' approaches to searching Google and Scholar provide one lens for viewing their conception of the information. Their navigation within the Google environment indicated that they were very aware of pre-search filters such as Images, "I'm feeling lucky" and pages from New Zealand. They also had various data entry strategies for filtering information, such as using information types (articles, online book, pdf) as keywords in the initial search. This could indicate that they themselves were trying to bring some order to a mass of undifferentiated information. Participants **B** and **D** moved between Google and Scholar according to information type, probably for the same reason, and **B** used post-search filters – Recent Articles, Key Authors.

Their descriptions and visualizations of Google information were illuminating. Several participants spoke of large unstructured spaces. Participant **E** imagined *"a cloud up there... everyone's thoughts and words... random"*; for **A** it was *"a big ocean"* full of colourful fish. **B** was finding her way along a trail, where the information was perhaps a wilderness or forest. Participants **D** and **F** chose to describe their information-seeking rather than visualize it. Both talked about moving from a breadth of information to something narrower. Participant **C** had trouble describing, in any mode, what she did.

In all cases the sheer volume of information available in Google was a feature; and it was the use of filters or search and retrieval processes

which imposed a semblance of order for users. Users seemed to have their own strategies for ordering results information rather than expecting Google to present results in manageable form. To summarize, Google was seen to give access to a huge unstructured aggregation of information that could be manipulated for useful results.

**b. What types of information do they expect to find?**

When first questioned, users expected Google to provide a wide variety of information types: websites, recipes, games, music, videos, forums, lesson plans, articles and conference papers (sometimes). Three participants did not expect or had not discovered access to books via Google. Towards the conclusion of the interview a table of information types was presented and they had the opportunity to consider again what Google provided access to. Although not statistically valid, the strong impression is of a consensus for a very wide range of publication types.

**(Appendix K)**

There was, unsurprisingly, much more uncertainty about Scholar - although participants were inclined to select academic and official publications such as journals and government reports. A visual representation in the summary table shows Scholar content to be seen as strong in these areas and weaker for popular culture and non-textual material, such as music, maps and movies. Of the two users accustomed to Scholar, both used it to search for the specific article citation and one used it for all tasks except locating images.

**c. How do users regard the quality of information in Google or Google Scholar?**

Five participants regarded Scholar information as being of research-level quality. Four suggested mechanisms involving screening the mass of undifferentiated information accessible through Google – “separated”, “selected”, “filtered”, “removed”. They considered that popular, personal, non-textual and in E’s case “offensive” material would have been

excluded from Scholar content. The remaining person, **D**, thought it was a matter of different ranking criteria; that academic material was prioritised in Scholar and that Google results were ordered by popularity. It was interesting to note that several of those for whom this was a first exposure to Scholar said they would be investigating it further.

Users' information-seeking techniques made it clear they understood that the quality of information in Google was very variable, and had developed strategies to sift the wheat from the chaff. See below.

## 9.2 Research Question 2

### 2. How would users' mental models of their *information-seeking behaviour and strategies* in Google/ Google Scholar be described?

It became apparent that all the participants were very familiar with the Google interface and had individually developed techniques and processes for working with it in their own ways. For example, none hesitated when asked to locate the product. Access was gained in four instances by typing in the url for either the *.com* or *.co.nz* versions of Google from memory. Participant **C** used the Google search box in the menu bar - typing Google as a search term and selecting the top result. Participant **B**, who used Scholar for university work, went to this product via the Library's A-Z Databases page, but indicated that on her own laptop she would have used the browser history to reach the Library's Scholar Connect page.

The information-seeking behaviour and strategies data generated by the coding of transcripts comprise a significant proportion of what was analysed, and provides a solid basis for assessing usability in the sense of information architecture. This project seeks to uncover interviewees' conceptual frameworks as one aspect of usability. Therefore the findings are more related to patterns and actions that illuminate participants' thinking, rather than addressing navigation pathways, terminology and



the like. It has still been useful, however, to classify their information-seeking into categories. **(Appendix J)**

**a. How would the researcher describe their information-seeking?**

i. **Data Entry:** The research tasks were ordered by degree of complexity, beginning with a very simple one designed to put participants at ease and provide an early indication of their basic frameworks for information-seeking. The first task was to find information on global warming. Five of the six entered the keywords *global warming* in either Google or Google Scholar without qualification, but Participant **D** entered *global warming quick facts*. The researcher was very interested in what could already be seen as a divergence from the norm. Subsequent discussion revealed that this strategy was frequently used by **D**. It provided basic information for building upon and for discovering definitions and related concepts. **D** felt that this technique filtered out a great deal of extraneous information from the results list and brought more condensed and factual information to the top.

Data entry for the second task, articles on global warming, made it clear that some interviewees use plain language queries or pared down versions of them in Google or Scholar: *article[s] about global warming* featured twice; the other participants added *articles* either before or after their existing search terms.

All interviewees were familiar with the Images link in Google [**B** returned to Google from Scholar]; navigating to it quickly and entering data for the third task. None used *images* as a search term. Thus participants were able to modify their strategies in Google according to publication type and the options made available by the interface.

The last two tasks were more complex, involving locating known items and finding the full text of both. For the first task - discovering an online copy of Gulliver's Travels - participants tried a variety of strategies for entering search terms, largely in line with their previous practice. Five

participants entered either the title, or the title plus author name in full or in part. e.g. *gullivers travels swift* One person used the plain English query mode: *Gulliver's Travels by Jonathan Swift*, which was how it was typed on the task sheet. Punctuation and formatting was variable across the group: some omitting the apostrophe and/or using lower case; others not. Participants **D** and **E** qualified their keywords by publication type: *ebook* preceding and *online book* following title keywords, respectively.

Choosing an appropriate strategy for the entry of search terms for the known article gave most participants pause for thought. Two typed in the entire article reference. This was less successful than omitting the journal, issue and page information, which another user did, finding the article in question at the top. Two participants entered title and author keywords from the given reference: e.g. *vitousek global warming ecology global change* and located an appropriate result on the first page. One person began with the author's name and initials and the publication year: *vitousek, P. M. (1994)*, which brought up the correct work - complete with link to pdf - as the second result. All participants located the PDF version of the article eventually. However Participant **F** had trouble finding a suitable result - entering various combinations of citation components (including issue and page numbers), and becoming confused between article and journal information.

ii. **Navigation:** Users were confident at navigating the Google environment - using links to *Images* and *Web, I'm feeling lucky, pages from New Zealand, Next* pages; scrolling and scanning results lists; clicking on hyperlinked titles. They all used the Browser Back button rather than the Google logo to return to the homepage. The person most familiar with Scholar said she made use of the *Key Authors* and *Recent Articles* links. The same participant (**B**) noted a changed hyperlink colour for one *Gulliver's Travels* result from the previous session and used it immediately. The researcher changed login procedure to prevent a recurrence. All in all, Google page layouts were familiar territory and navigated with confidence.

iii. **Filtering and Evaluation:** These terms are used in the context of narrowing down results to those judged most relevant for the task: an activity which may occur pre- or post-search. Although coded separately, re-consideration of data during the coding process has given the researcher the impression that, for participants, filtering for relevance occurs alongside evaluation for quality. The first 'filter' is the selection of an interface from the Google suite – in this context, between the Google homepage, Images and, for two participants, Scholar. The choice of search terms by several users to indicate a publication or information type represents another filter, used to position certain results higher up the list. One participant uses post-search refinements offered by Scholar, as mentioned above. The next stage occurs when participants scan the list of results, a process which all described to the researcher and was to do with both relevance and quality. For each result, the heading in bold and the couple of contextual lines following are of primary importance in assessing the worth of an item. Participant **F** gave more weight to headings, and to initial words in a title or phrase. Interviewees considered wording particularly – looking for matches with the topic. They also made judgements based on writing style, URLs, whether the first person voice was used, the presence of images and their own familiarity with the source or brand. An item from Google Books was selected by **F** for that reason. Participant **B** looked for pdfs to evaluate further. When accessing likely results users continued with these techniques, but only Participants **D** and **E** stated they looked for 'validation' on a site, such as reference lists or authorial qualifications. However for most of this group evaluation occurred when viewing the results listing.

Four users regularly check Wikipedia entries, which are often near the top of the results. Two of these trust the source and use it for definitions and information about topics. Two other participants, **D** and **E**, know that entries can be of doubtful provenance, but go anyway "to see what Wiki does say" (**E**) and would reportedly seek other authentication of the information (**D**). **E** volunteered that she avoids sponsored links, news,

anything about money, and zipped files. Participant **B** used Scholar for most tasks, which apparently excludes Wikipedia. **F** had used it in the past but now understood that entries could be changed and thought it wasn't suitable for university work. Participant **D**'s 'quick facts' strategy, when used, also excluded this popular source from the first page of results. This raises another aspect of narrowing down the list for consideration: only one interviewee on one task went beyond the first page, and from discussion the researcher understands this is common amongst the group.

**b. How do they conceptualize their own information-seeking in Google and Scholar?**

Although consideration of their own information-seeking was a novelty, interviewees were prepared to think aloud in the context of a dialogue with the researcher. They conceptualized these processes very individually, but all expected to find relevant material on a topic in Google or Scholar, and quickly. Participants **C** and **D** found it difficult to express their strategies and behaviour in terms of an analogy, or preferred a descriptive approach. The others could construct more metaphorical conceptions which, as Westbrook showed, can be a useful tool for describing behaviour (Westbrook, 2006). None took up the offer of drawing their frameworks. The following paragraphs are ordered from the least to the most descriptive responses.

Participant **C** goes to Google for answers to questions, definitions, and explanations. **C** was inclined to 'question' Google with natural language search terms e.g. *articles about global warming*, putting in the "main thing" and then looking to see what "sticks out". The way she worded this process made the researcher think about consulting oracles, but **C** herself had difficulty going beyond a process-based description of her behaviour. When prompted, she thought looking for the known article might have been like searching through a filing cabinet, but this analogy broke down with respect to topic searching and **C** was then lost for further explanation.

Participant **D** was more self-aware, but also preferred description to interpretation. Going to Google is an exercise in the quick return of results on a concept. Key concepts are entered and often modified by the type of information required e.g. *definition, quick facts, ebook*. **D** believes that Google results are related to other people's searching: they are ranked by popularity, and those in Scholar by relevance. This person saw themselves as making decisions based on the provenance of a site, writing style and indications of reliability.

Participant **F** provided a mixture of descriptive and analogous insight into her own behaviours. **F** said she begins with a reason for searching and looks for specific things to do with the topic. The New Zealand pages might be selected at an early stage. With regard to data entry, the first word is the most important and a small number of keywords are often qualified by a publication type e.g. article, map. From the first set of search results, it is a matter of "defining down", which **F** likened to an ice-cream cone: starting out with a huge pool of information and narrowing it down by removing or altering keywords. She used the words 'defining down' or 'refining down' a number of times, accompanied by hand movements outlining the shape of a cone. **F** said she looks at the results list one by one from the top down, considers the main headings, how familiar or professional the sites seem, and if are they relevant or interesting. The known article search was described as a case where the defining or refining down was most marked. The researcher agrees there were a number of iterations, although not all these served the purpose of refinement. Sometimes **F** accesses works "randomly" if she is having difficulty settling on relevant results. **F** was the only interviewee who said she would use Google's Advanced Search if her initial searching was inconclusive.

Participant **B** used the phrase "narrow, narrow narrow" to describe her searching within the Google environment. In the course of conversation, she came to see herself as being on a trail, which starts out broadly and becomes more delineated as she makes choices and selections along

the way. Key “things” may trigger related possibilities, so the trail is not necessarily singular or straight. “Guidance” comes initially from the information she is given to work with, and she makes decisions about direction as she goes. The space she is working in (Google or Scholar) is a comfortable place to be in.

Participant **E** constructed an interesting model of the information upon which Google draws. She saw it as a cloud of “everyone’s” thoughts and words, randomly aggregated and “definitely up there”, as she gestured towards the ceiling. **E** was confident that she could enter a “mish-mash” of search terms and get usable results. She visualized Google itself as a mechanism that “hooks in” to this information. On being asked how this might be described **E** crystallized her thinking and described Google as an elevator which you can choose to enter. You can tell it where to go by pushing buttons – analogous to entering search terms. When the doors open, you view results and can assess their relevance. If not useful, the doors close, more keywords are chosen or modified and the elevator moves off again.

Participant **A** was very much at ease with visualizing her searching behaviour, closing her eyes and leaning back while she did so. **A** saw the information accessible through Google as a “big ocean” full of colourful fish. Entering a search is akin to diving into the sea and swimming around; the selection of results she compared to catching beautiful fish by hand. She would reach out for the information / fish, which are of different hues, and choose one. This metaphorical description was accompanied by hand movements around reaching out and catching ‘the fish’.

### 9.3 Research Question 3

#### 3. What *content* do users think the LibrarySearch Catalogue and Articles tabs provide access to?

Users drew on their experience of the existing library catalogue, Voyager, to provide initial impressions of what the LibrarySearch Catalogue might contain. There was a consensus that the catalogue would list the physical items held by the Library and that the topics covered would be those taught or researched at the University. Two participants were particularly certain that the Catalogue only listed items with physical locations. “Anything hard copy that you can hold in your hand from the library that needs a call number” was the assertion made by **B**, one of the more competent participants. However opinions differed initially as to whether the Catalogue would describe ‘something about everything’; electronic items apart from digitised course readings; or non-textual material.

Faced with the adjacent Articles tab, (**Appendix A**) interviewees considered that its scope would be restricted literally to articles – from journals and possibly magazines. No-one mentioned book reviews, conference papers or newspapers in the early phases of interviews.

##### a. Is their concept of the information orderly or chaotic?

Conceptions of the information available through LibrarySearch was of a more orderly and relevant aggregation, substantially smaller in scale than that available through Google. “Packaged” thought **E**. “More directed” was how **D** described it, and **B** settled for a plantation forest rather than a wilderness. Relevance was also mentioned, as though irrelevant material would not be present in Library offerings. Several participants alluded to having to be more careful about searching; implying that there were certain characteristics associated with the information that made it harder to find.

**b. What types of information do they expect to find there?**

Books were mentioned by all participants when considering what publication types might be in the Catalogue. There was little consensus about anything else: some mentioning journals and articles; some not. The summary table, from data taken later in the Interview, reinforces this perception (**Appendix K**). The visual pattern for Catalogue is much more patchy than for Google; an uneven profile. There was considerable agreement that the Catalogue listed University Course readings, magazines, music (audio) and book chapters (the latter incorrectly, apart from digitized readings). Interviewees consistently underestimated the breadth of information types represented in the Catalogue: only two identified government reports or musical scores, for example. Half the participants believed that the Catalogue listed articles even after experiencing an environment where articles were specifically identified aside from the catalogue. This is a very common misconception, identified earlier.

To users, the Articles tab appeared unambiguously labelled - as the Images link in Google must seem. In fact, it provided a search interface to selected databases which would have contained references to ebooks, book reviews, conference papers and reports as well as journal articles. Two participants volunteered reactions to the unspoken possibility that there might be more. "I hope it would just be what it says" (**E**); "you'd think it would be just exactly what it says" (**D**) The Articles column in the Summary Table (**Appendix K**) shows that when presented with other possibilities, participants were prepared to identify some as being present - but this column has the thinnest coverage. More publication types were attributed to Scholar, although this is not necessarily so. The Google brand may have given interviewees more confidence in Scholar's breadth of coverage.

**c. How do users regard the quality of information in LibrarySearch?**

Participants' perceptions of Library resources listed in the Catalogue and Articles were that they would be of sufficient quality for university study



and teaching practice. Works of personal opinion and popular culture would be absent or have a minimal presence. These perceptions were reflected in their search strategies, which lacked the evaluative techniques observed in their Google searches. The users were not looking at writing style, provider identity, use of the first person or validation of the information. There was an acceptance in both the Catalogue and Articles environments that the results presented would be of a suitable standard for university work. As an aside, one of the Scholar users regarded it as a way of obtaining reputable information because it is included (and proxied) in the Library's Database listings.

## 9.4 Research Question 4

### 4. What do users think the *relationship* between the LibrarySearch Catalogue and Articles tabs might be?

Understanding the relationship between the searchable content accessed through the Catalogue and Articles tabs is crucial to completing the known article task. With respect to journal articles, the tabs provide access to two partially intellectually associated but separate pools of information. The Catalogue can be searched for journal titles for which the Library has either physical or electronic access for specific issues. Available issues are identified by volume, issue, and date information for particular physical or electronic locations. As recommended by the supplier, the Articles tab in the test environment provided a federated search interface to a provider-selected group of databases, which are searchable by key citation information such as article title and author. However the selected databases may or may not include references from particular journals and issues - which may or may not be held by the Library. Therefore the Articles interface may or may not provide access to a specific article's citation.

#### a. **Separate / Subset one of the other / Intersecting**

Two users thought that the Catalogue and Articles tabs gave access to completely separate pools of information. The flaw in their concept is

that known articles can be discovered through the Catalogue by way of the journal title. Three participants were convinced that the information in Articles was a subset of that in Catalogue. Two provided a reason for the existence of the Articles tab in that articles were a frequently sort-after information type and hard to find. However articles per se are not listed in the Catalogue and would not be found by searching for article titles or authors – the default strategy of all participants. One interviewee initially thought that there might be an intersection of searchable content, but then decided that articles were a subset of the catalogue. This conclusion seemed to stem from a belief that the catalogue listed everything the Library has access to, and that if searching for information on a topic the Library would not expect users to have to search in more than one environment. This assumption is erroneous.

**b. Can they describe the relationship?**

One metaphorically-minded user described the Catalogue as a big umbrella and Articles as one section of it. Others were content to say that Articles were a part of a larger Catalogue whole, or separate, as the case may be. No-one attempted to describe the situation in any more complexity, or to consider that for article searching purposes you might have to use one interface (Catalogue) for known items and the other interface (Articles) for articles on a topic.

**c. How does this compare with their mental model of the relationship between Google and Google Scholar?**

In general, users thought that Scholar content was a selected subset of Google proper. Their experiences searching for articles on a topic and a known article bore this model out. Two thought that Scholar also linked out to information not available to the general public but that you had to be a member of an organisation or subscribe for access. One interviewee had another conception of the two environments: that the information was identical in each, but ranked differently. However it can be seen that all believed, correctly, that article searching would be

successful in Google, whether for a known item or on a topic. In comparison with the LibrarySearch environment, their models for the relative configuration of Google and Scholar were functionally accurate and much easier to conceptualize.

## 9.5 Research Question 5

### 5. How do users' existing mental models *affect* their information searching behaviour and strategies in LibrarySearch Catalogue and Articles?

Interviewee **A** expressed her impressions on this point in vivid terms. “I don't feel so comfortable. I wouldn't jump!” and, “Maybe I decide to be in the boat and catch the fish ... with a fishing rope” [sic]. **A** thought that the information was presented in a “different setup”; it was “unfamiliar to me, I don't feel so comfortable”. It would be logical to assume that this was because she had only just been introduced to the new products, but **A** had expressed similar thoughts earlier about the existing catalogue. “I'm still uncomfortable about [using the Voyager Catalogue], after 3½ years! I don't know why”. In this feeling she was not alone, but did participants' actual behaviour alter in LibrarySearch?

#### a. Do they use or try to use the same strategies as they do in Google / Google Scholar, or do they make adjustments?

Interviewees used many of their Google search strategies in LibrarySearch, entering similar combinations of keywords for example. However they quickly made adjustments to some aspects of the new environment. All used the Articles tab for finding articles on a topic, although LibrarySearch's automatic carry-over of keywords from the previous Catalogue query and instant searching of same was seen as problematic by most. Their accommodation of the fact that Images was not an easily found option meant that they resorted, in four of six cases, to adding “images” to their search query. **C** entered *images about Samoa* and **D** entered *Images: Samoa*, because he believes that entering a colon ensures the results will have that aspect to them – like a subject

heading. Two participants thought there might be an Images option in the Advanced Search. **B** found it in the drop-down menu for Material Type very quickly and made use of Subject Contains for the Samoa keyword entry option. **F** became rather lost – consulting the (minimal) Help and searching across the entire Library website before eventually coming across the Images option in Catalogue Advanced Search. However it was dealing with the results that caused initial difficulties for all participants.

LibrarySearch results screens were sufficiently alien to provoke reactions ranging from bemusement to consternation, along with some appreciation as the minutes ticked by. Most interviewees scrolled up and down the page as they scanned the layout. Some focused on the results list; others noticed the faceted refinement options. Individuals discovered different aspects of the page at different stages in their self-orientation. Eventually all discovered that they could 'View Details' of one entry either by clicking the link or the title of the work. There was universal disappointment that the first page didn't provide a couple of relevant lines of text, as Google does, and that another action was required to get further information. All except one used the Online Resources link to find the ebook; the other person used the 'Refine My Results' by 'Resource Type' facet to narrow the results to that format. However the top result was not the work itself, and **C** gave up quickly at that point. Other participants also displayed a more tentative approach to checking out results, which could be attributed to unfamiliarity or thinking they had to drill deeper for location and availability information. Google of course, provides straight-in access from the heading links.

Users' behaviour was modified with respect to filtering and evaluation, as well. Results high up and on the first page again received most attention but once discovered the refinement options were used, or appreciated for their potential usefulness. Exploration was encouraged by the researcher, so there were digressions from both tasks to hand and logical pathways. Interestingly, Participant **F** incorporated the presence

of thumbnail images into her filtering strategy. She made selections based on bright attractive images and was disinclined to check out results where thumbnails were absent - on the basis that they were “incomplete” and might be deficient in other ways. There was very little concern over provenance; participants openly expressed their belief that what the Library provided would be of sufficient quality for University level study. However, descriptions in the Details view were checked for relevance to task.

The known article task was much more difficult than participants expected and each modified their strategies when faced with failure. Most changed their keyword entries, adding or subtracting terms from the reference and in several cases entering the entire citation - punctuation and page numbering included. It was notable that this action was taken not only by those who had used it as an initial strategy in Google. Several expressed concern at not seeing an easy route to full text, especially in pdf format, and spent time wandering about the screen before, in three instances, suggesting they would give up and use a Google interface in preference. Participant **F** entered six variations before giving up, while indicating that outside the research context she would have done so sooner. Two people tried using the Catalogue tab instead, which would have been productive if they’d searched for the journal title, but they didn’t. Despite these changes in tactics only one person happened upon the article, compared with the 100% success rate in Google or Scholar.

**b. How would users describe their information-seeking behaviour in LibrarySearch Catalogue/ Articles, compared with Google/ Google Scholar?**

As described above, Participant **A** was far less at home in the LibrarySearch environment and in the existing Library Catalogue, Voyager, than in Google. She felt that it was very easy to make a mistake in Catalogue searches and that small things made a big difference to the outcome. **A** believed that information was harder to find

in LibrarySearch unless you were knowledgeable and experienced. Google was simpler; it was easier to reach the information and she felt more comfortable there.

Participant **B**, surprisingly considering her skills, had a very emotional reaction when she encountered the LibrarySearch results page. She talked about “panic” as her first impression. “there’s no information here, but it’s got ‘add to eshelf’ and it’s kind of like... I feel like I’m going somewhere I shouldn’t go... that looks like a no go zone”; “[my] first instinct is just to get out of this part”. **B** was further disconcerted when her attempts to move on by clicking facet options resulted in modified results lists. The information she wanted wasn’t there - namely descriptive text, call numbers and locations. **B** didn’t like the article searching either, saying that in Scholar she would have done the search, saved all the relevant pdfs, had a closer look, deleted some and looked again: a refining process she hadn’t delineated previously. However, the apparent absence of pdf links meant her strategy wouldn’t work in LibrarySearch. She thought she would start broadly and add keywords to refine as before, but would have been reluctant to spend much time there without knowing how to find pdfs; preferring Scholar. With reference to the trail analogy, **B** considered her tactics to be similar but that she was finding her way through a ‘planted’ environment rather than a wild one.

Participant **C** believed she was using similar strategies to those she pursued in Google. However her success rate for getting to the point of access to items was low and she was easily discouraged. Her explanation was that she was doing something incorrectly, but had no idea what that might be and would have approached the Information Desk at the Library. **C** mentioned, in relation to this, that she would use Google at home as she was confident of getting to the information, but turn to the Catalogue on campus, as she could access physical items.

Participant **D** departed from his strategy of beginning searches with a ‘quick facts’ qualifier, or similar, when it came to LibrarySearch. This was

because he “knows it will be there” - in other words that the Library would have relevant factual material - “more directed information”; “better sources”. As others also indicated, **D** would have preferred more information on the first page so he could “scroll over everything in one go”, rather than having to check out entries one by one. In this respect LibrarySearch Catalogue and Articles forced changes in practice on participants.

Participant **E** was happy to explore the Catalogue environment while trying to find access but was perplexed that marking for EShelf did not provide it. Her experience with the auto-search feature led her (and others) to either manually delete or pre-enter keywords when working between Catalogue and Article, often unsuccessfully. She was in the majority who did not notice the New Search feature. **E** thought that the information accessed through the Library was a scaled down “mini-cloud” – although with more than she expected in terms of online books and of better quality than Google. “[It] feels more like a package”, she said, using her hands to indicate an enclosed shape. **E** thought that the material would be more relevant for University work than that in Google, but that LibrarySearch was less forgiving – entering a “mish-mash” of terms probably wouldn’t bring up useful results. **E** vocalised an overriding issue for all participants: “[The] most important thing [is], is it here and where will I find it?”

Participant **F** was a very persistent subject who faced a number of unsuccessful returns with some stoicism. She was prepared to change tactics for data entry and try different features within LibrarySearch. **F** said that she expected book and article searching to be the same as it was in Google, but it wasn’t. Her narrowing down ‘cone’ still applied, but she was having to be more specific, careful and thoughtful – and for the known items tasks, to no avail.

## 9.6 Research Question 6

### 6. In particular, how does the provision of two pools of content with distinctive characteristics, in one search interface, affect the *usability* of web-based access to Library resources?

None of the participants showed that they understood the nature of the Catalogue and Articles interfaces, with respect to content, prior to embarking on the search tasks. The Catalogue was seen primarily as a finding tool for physical books and course material. There was a perception that Articles would be searchable for known articles, when this was not necessarily the case. When questioned, several believed that the information in Articles was also searchable in the Catalogue. Their beliefs about the respective content affected their success rates; several attempting to find the Vitousek article in the Catalogue by its title, rather than the journal title.

#### a. Does having to make a prior selection of a content pool affect the users' perception of search strategies and of gaining useful results?

Four of the participants made specific comments about having to make choices upfront. "I don't understand why [Articles] is separated here" – **A** would have expected it to be an option in the faceted Refine my Results list. **B** said: "[You] have to know in advance what information type you want... [in] Google [you] don't have to do that." **E** commented that you "have to make choices and know certain things". **F** admitted to being quite confused - not knowing which tab to use, particularly for electronic material. It seems that having to work between environments left participants nonplussed or uneasy. They mostly persisted with keyword modifications and exploration of LibrarySearch features, but it was clear from their comments that outside the test environment they would have resorted to Google and/or sought assistance. Perceptions around gaining useful results were mixed, as some features of results displays such as refinement options and thumbnails were appreciated; others, not so. With respect to gaining useful



information after having to make prior choices around content, participants felt that Google was “easier”, “better”; that in LibrarySearch you had to be “knowledgeable”, “experienced”, and “meet specifications”. Two more participants referred back to the existing online Voyager catalogue, saying they had similar feelings about that – even after training sessions.

## 9.7 Research Question 7

### 7. Does the ‘decoupled architecture’ model represent a *bridge* between provider and user mental models of information searching with respect to Library resources?

Users’ mental models of information searching are being described in this project in terms of their behaviour in Google, on the premise that these strategies are habitual for individuals and provide a starter framework for searching other environments. However these users also have pre-existing ideas about searching for Library resources based on their experience with, at least, the Library’s Voyager catalogue. Their comments around LibrarySearch were influenced, sometimes explicitly, by their past experience of Voyager.

Perceptions of content were that the Library products covered all useful topics for University study and that the material was more reliable than in Google. The ability to refine results after searching - a feature enabled by the architecture of Library records - was generally seen as very positive. Participants were comfortable with the single search box of the Simple Search, and approached it with much the same strategies for data entry as they used in Google - depending on the task. However the overall searching experience presented some difficulties, and they were frustrated in the ‘getting it’ aspect of discovery. Some typical comments follow:

**A:** “[LibrarySearch] could be a bit more simple. Little things make the difference.. [it’s] easy to make a mistake... [makes] it hard to find information”

**B** said she would have to have more understanding about how library software works, more skills. “I don’t have enough knowledge and it just adds to the stress”. **B** did find most of the required information in terms of item records, but she and the others were dissatisfied because of perceived difficulties in completion – entry by entry evaluation; hard-to-find location and status information; complicated ways to search for images; an inability to track down pdfs.

**E** liked the simplicity of [layout of] LibrarySearch [but] “is still more comfortable in Google ...can always find something...”

Participants **B** and **F** revealed something of their frameworks around using Voyager. Both had done training courses, but remembered little and found using Voyager difficult and confusing. **B** suggested that usability could be vastly improved if training was incorporated [integrated] into first year papers, not just introduced in an hour at one point in the programme. LibrarySearch’s improved features were not seen as being on a par with Google and Scholar; indeed, those who hadn’t encountered Scholar before were all intending to use it again. It seems that interviewees’ expressed tendency to use the Library Catalogue for finding the physical location of known texts, and Google for most other things, was still in place at the end of the interview period. Several did say that they would look harder at Library resources from now on.

In short, users’ considered LibrarySearch went some but not all of the way towards a more productive and satisfying experience of searching for Library Resources. The researcher’s thoughts on whether the LibrarySearch product represents a bridge between user and provider frameworks will be discussed in the next section.

## **10 DISCUSSION**

In the previous section findings have been extracted and associated with the research questions in a manner which, allowing for the interpretivist nature of this project, closely relates to the data. The following sections canvas the researcher's interpretation of these findings in a descriptive and discursive way.

### **10.1 Construction of meaning**

Components of mental models are fitted together by individuals to create meaningful structures. In respect of this study, components and models could be:

- user-created before or during the interview process
- reached collaboratively during interaction between researcher and participant
- supplied to the user by the researcher - from pre-existing models or from insights gained during the interview itself
- reached by the researcher subsequent to the Interview

The researcher acknowledges that her preconceptions of user behaviour have been brought to the interviews and to this discussion. Her existing frameworks have been shaped by her own searching patterns, professional and personal interactions with users, some familiarity with relevant literature, the processes of design, implementation and reflection for this project, and membership of a project team investigating Ex Libris products (configured as LibrarySearch) for the University of Auckland Library. The latter project focused on user-testing for easily modifiable elements of web usability such as navigation, terminology and explanatory information - although issues around information architecture did arise.

### **10.2 Mental models**

The findings outlined earlier have brought some factors forward which could be seen as components of users' mental models. These building blocks include preconceptions, expectations and perceptions as well as established

navigational tactics and patterns of behaviour. Listed below are some of the elements identified during the research process as contributing to users' mental models of information searching in the Google and LibrarySearch suites. As the elements vary in nature and are not discrete, arrangement is not systematic.

- Content – subject coverage, publication types, formats, quality, relevance, degree of orderliness, relationship between search types
- Information-seeking behaviours - data entry, navigation, filtering and evaluation of results
- Information-seeking strategies – user and researcher-supplied metaphors; descriptions of behaviour, thought processes and reasoning
- Prior experience – Google, Scholar, Voyager Catalogue and Database searching
- Expectations – degree of difficulty, success rates, own skill levels, general usability of Google and Library products
- Definitions of success and failure – goals, time taken, return of usable and relevant information, ease of access to full versions
- Psychology of searching - emotional disposition and associations, degrees of comfort, anxiety and stress

The following sections represent the researcher's construction of user mental models from these elements, gleaned from project outcomes to date and reflection.

### **10.3 User mental models of Google and Scholar**

User mental models for the Google suite are crucial to this project, as the research proceeds from the premise that these constructs are integral to individuals' searching behaviour. The Google models therefore provide a framework for users to search other electronic environments, such as those on the Library's website.

The first point is that Google and/or Scholar is the search tool of choice for these users. They all had established ways of accessing the suite and were familiar with the information architecture - which testifies to prior and frequent usage. The project premise that their concepts of Google could be equated to a 'starter framework' for information searching is confirmed by observation, by direct questions during the interview and by the literature (Fast & Campbell, 2005; OCLC Online Computer Library Center Inc., 2006).

Interviewees regarded Google as an enormous source of information covering all areas of professional, research and personal interest. The content was seen as easily accessible and to range over most publication and information types – articles and websites; recipes and forums. User descriptions and analogies emphasised the large scale and diversity of the resource.

Although participants were conscious that much of the information would be extraneous to their purposes, they all had pre- and/or post-search strategies in place to filter the content for relevance and quality. The researcher was pleasantly surprised to uncover some useful tips. For example: entering 'quick facts' within the search query to find the kind of information usually supplied by a Reference collection; or 'pdf' to locate academic articles. Interviewees relied heavily on wording, writing style and information gleaned from scanning headings, urls and brief excerpts to evaluate items. They were confident of locating relevant content - usually from the first page of results. Some information professionals and educators might dispute their methods for determining quality, as Wikipedia results were considered worth accessing by most. However the reality as found in this study is that Wikipedia is a component of user mental models: two people were open about their trust in the resource; another used it in comparative contexts; a fourth anthropomorphised the product and referred to it familiarly as 'Wiki'.

Scholar was seen as privileging material suitable for study and research at tertiary level, such as academic papers and government documents. Users mostly thought Scholar content was a selected subset of that available through Google, although one person believed the same content was ranked differently.

The two people who regularly used Scholar navigated cleanly between the academic and home environments in the Google suite, according to the nature of the task. All participants used the Images link with confidence, showing high awareness of the discrete interface for that publication type.

Data entry usually consisted of keywords taken directly from the target topic and representing a minimum of concepts, although it should be noted that the tasks set were not complex. The exception was the request to locate a known journal article, and it was plain that some users enter the whole reference as one of their search query options. The researcher noted that this behaviour was exhibited by the first year students; and that several participants were noticeably unsure about identifying the components of a citation.

Users were all confident at navigating the Google suite of products – within and between the search interfaces and results lists. The researcher can identify sequential steps that brought users closer and to their goals. The first would be selecting a search interface within the suite; the second being data entry; then post-search refinements such as scanning from the top down for quality and relevance appropriate to the task. Selected results would then be accessed, often in parallel with preliminary evaluation. The progressive and linear nature of these steps correlates with most of the interviewees impressions of their behaviour – following a trail, experiencing an elevator ride, refining and defining. One person did refer to making digressions when unsure of what to do, and there was also the more exploratory metaphor of catching fish by hand. The most frequent modifications of searching behaviour were revisions in data entry by selection of different combinations of given reference components. None of the interview tasks necessitated users broadening their search queries, which might have entailed the entry of synonyms. However this action may be infrequently needed in Google searching anyway, and would probably require the Advanced Search option - which only one participant attempted to use.

The eliciting of user-described strategies was one of the most unstructured stages of the interview process, as information-seeking as an object for discussion was novel to all the interviewees. The researcher was conscious at

the time, and is now, of prompting participants - even making suggestions. It would be correct to say that two of the visualizations were a collaborative exercise in creating meaning in unfamiliar territory. Likewise the reasoning behind some strategies was elicited by close questioning and focused conversation. However these were some of the most interesting data collection moments, and validate the interpretivist method for surfacing otherwise inaccessible data. They occurred once participant and researcher had become immersed in dialogue. Several interviewees felt that they would be more self-aware of their searching behaviour subsequently. The researcher surmises they may be adding a reflexive component to their mental models. The transcripts provide a record of very individual thinking processes – some ‘correct’, some not, but mostly workable in Google’s accommodating environment. An example is the weighting accorded by one individual to initial terms within search queries and result headings.

Users’ stated expectations of Google were that it is easy and simple to search and that they will be successful in locating usable information. In other words, that the products’ usability is high. Their ideas of success appear to revolve around reaching ‘enough’ relevant and apparently reliable information, quickly and in full. Failure was often defined in terms of not reaching the full text of an item immediately, and such items were quickly discarded in favour of others. The person who had most trouble finding the known article blamed her own skill level rather than Google. The occasional negative experience did not appear to affect users’ attitude towards the Google environment. Overall, the results of Google searches were successful enough to reinforce user behaviours and encourage them to keep going.

Participants’ emotional perceptions of the Google suite appeared to be overwhelmingly positive. They were comfortable in and connected with Google, and said so directly, obliquely while referring to their own search experiences and implicitly through their analogies. Participant **A**’s account of searching Google could almost be described as pleasurable. Usability studies by information professionals have often concentrated on the sensori-motor and cognitive aspects of behaviour. However, the affective aspect is a crucial

constituent to mental models of information searching (Nahl, 2007). This researcher believes positive affect can be seen as an expression of a satisfactory and workable mental construction, as well as a significant factor in understanding motivation and behaviour.

As mentioned earlier, a number of researchers have discerned and described patterns of behaviour or mental models. When considering the shape of this project, the researcher wondered if users could self-describe their mental models as they emerged from the interview process. This has certainly happened to some extent and individuals' constructions began to emerge through the interview process. However there is still something to be gained from attempting to describe an archetypal model at a 'big picture' level.

As a result of this study the researcher suggests this generic and over-arching mental model for users' information searching in Google:

**A familiar and user-friendly environment for an exceptionally broad range of content, which can be manipulated by individuals' search strategies and behaviours to provide straightforward access to the full text of 'enough' relevant and apparently reliable material in a short time.**

#### **10.4 User mental models of LibrarySearch Catalogue and Articles**

If user perceptions of Google-accessed content were relatively uniform, the same could not be said for LibrarySearch Catalogue and Articles. A degree of consensus around relevance for University work and research-level quality was present. With regard to publication types, participants were all certain the Catalogue could be used for finding physical books, but views diverged on other types and formats. They took the Articles tab at face value and assumed you could locate known articles there as well as articles on any topic. Even after using the LibrarySearch environment, as discussed in the Summary table (**Appendix K**) shows, there was a divergence of opinion and a great deal more uncertainty about the content of Catalogue and Articles. The researcher has



encountered similar misconceptions about the perceived coverage of the existing Voyager catalogue and Database environments many times. It appears this particular LibrarySearch layout does little to alleviate the confusion. Several participants alluded to the smaller scale and 'packaged' nature of their model for Library Resources, which seems to point to perceptions of orderliness not attached to their Google frameworks.

Interviewees' navigational and searching strategies were initially very similar to those used for parallel tasks in the Google environment, and some appreciation was expressed at the default single search box format. Their behaviour diverged in LibrarySearch in two ways. LibrarySearch results pages present a number of post-search refinement options, including links to Online Resources, other facets such as Location, Date and Creator and the ability to mark and save selected results. Although initially taken by surprise, most participants appreciated these filtering options, and were happy to use them as time went on. The other way their behaviour differed from the Google environment was in the iterative nature of their searching. This appeared to be forced upon them by what seemed to be unsuccessful discovery experiences and was noticeably frustrating. The initial results page appeared to them to be lacking in information that could be evaluated and the actual whereabouts of the items was not obvious. All participants embarked on some exploratory behaviour, but none welcomed the necessity of going to another level - item by item - for descriptions, locations and status.

Measured against previously mentioned user conceptions of success and failure, Catalogue and Articles came up short of Google in some areas. The reaching of a particular target, time taken and ease of access to full versions seemed more problematical to them in LibrarySearch. However interviewees were confident that results returned would be appropriate for tertiary level study or useful as teaching resources. They also considered the new searching environments to be an improvement over Voyager in many respects – especially the post-search refinement options and Simple Search data entry.

During the course of thinking aloud or when invited, participants were amenable to repeating the experience of trying to encapsulate their information-seeking behaviour. Participants thought that they were attempting similar strategies but often found themselves stalled or off-track in the LibrarySearch environment. Data entry and return of results was not an issue; the obstacles to smooth discovery occurred subsequently. Users became held up by the lack of what they regarded as key information on the results lists e.g. descriptive information, location, indication of pdf format. They were bemused by the outcomes of some actions e.g. auto-searching between interfaces, and mystified by some functionality or its labelling e.g. EShelf. The pervasive perception was that there were ways of using LibrarySearch that they hadn't grasped. This tallied with their prior experience of Voyager, which they knew has particular search protocols. e.g. search type selection, omission of the initial article in a title, left-anchored searching affecting data entry. Unfortunately none of this group felt at ease searching the existing catalogue for known items, which they saw as its prime function (outside the provision of course material).

Interviewees expectations, which this researcher suggests are a significant component of their mental models for searching, are probably influenced by earlier encounters with Library web products. When speaking of LibrarySearch, several participants veered into discussing their experience of searching Voyager. Parameters mentioned included: degree of difficulty – markedly higher than Google; success rates – lower than desired; and their own skill levels – seen as inadequate. Users expected a Library product to present them with challenges and, apart from simplified data entry and the opportunity to refine results options, LibrarySearch still did.

In terms of the psychology of searching behaviour, users' emotional associations and prior experience with library catalogues were unhelpful components to the mental models they constructed around LibrarySearch. This was expressed in varying ways: frustration with Voyager and the inadequacy of single de-contextualised training sessions; visualizations of the new environments shadowed with caution "I'd stay in the boat and use a fishing

rope” (A); self-deprecating comments about their own library search skills; and open admissions that outside the research environment they would have resorted to Google to complete required tasks. Users remained well-disposed to Library material, appreciative of the quality and relevance of the resources, but wanted to be able to access it easily. “I don’t have time; it just adds to the stress” (Participant B).

The researcher therefore suggests this generic and over-arching mental model for users’ information searching in LibrarySearch Catalogue and Articles in this research context:

**An unfamiliar environment for accessing a broad and reliable range of content appropriate for tertiary study, that requires particular understandings by the user. LibrarySearch offers valuable options for refinement of results but fails to surface required information, such as descriptions and the location of full versions of works, soon enough in the information-seeking process.**

## 10.5 User models – points of difference

The following table is another representation of some key aspects of user mental models of Google and LibrarySearch, highlighting points of difference.

<b>Mental Model Component</b>	<b>Google</b>	<b>LibrarySearch</b>
<b>Access and content</b>	Single point access to an enormous, broad and undifferentiated range of information. Quality and relevance variable	Selection required between two access points to a circumscribed range of information. Understanding of protocols required with respect to known article searching. Quality and relevance high
<b>Architecture</b>	Results presented in single layer. Relationship between interfaces simple and intuitive	Results presented in multiple layers. Relationship between interfaces concealed and ambiguous
<b>Filtering strategy</b>	Apply to search query	Apply to search query and subsequent actions
<b>Evaluation</b>	Key descriptive and location indicators displayed with first listing of a result	Key descriptive and location indicators on next [ Details or GetIt ] layer
<b>Perception of success rate</b>	Very high	Low for known articles and full text versions
<b>Usability / ease of use</b>	High / easy	Lower / can be tricky
<b>Associated attitude of user</b>	Confident. Getting it right	Lack of confidence. Getting it wrong
<b>Effect of mental model on usage of product</b>	Regular	Irregular, when necessary

## 10.6 Making sense of usability, mental models and gaps

Returning to the problem statement around which this project is designed, the researcher postulated a “*significant gap between provider and user frameworks that seriously impacts the usability of library website interfaces. An exploration of user frameworks could be the means of gaining some understanding of the nature of this gap...*” (p. 2).

Is there a gap between provider and user frameworks? The findings of this research indicates that if the information architecture of LibrarySearch is regarded as an expression of provider frameworks, then the answer is: Yes. Users’ mental models for information-seeking are highly conditioned by their experience with the Google suite, and their familiarity with those products. LibrarySearch, although ‘decoupled’ from the ILS and presenting a much improved search interface for discovery in the catalogue, still falls short in two key areas – results list display and access to the full version of works. In addition, users had learnt already – from experience or training - that searching the Library catalogue is ‘tricky’. This perception affects their motivation, their confidence and their behaviour in the new environment. One would assume that, unlike most users, information professionals feel ‘at home’ in the catalogue and approach it with the confidence of frequent usage.

The decoupled model is a significant point in the history of providing public access to library catalogues. However it still relies on the data of the original records, and their architecture can be seen in the Details display. How much the organisation of records is determining display in LibrarySearch is unknown to this researcher. Library and information professionals are accustomed to consulting ‘records’ to guide full access, and perhaps want to offer full display of undoubtedly useful information – such as tables of content or access to the originating record showing the presence of multiple copies at one location. Other users, whose search experience is shaped by Google, are accustomed to key informative details being made available earlier in the search process, and full access offered at one click of the mouse from the first listing of results.

This study indicates that the gap between provider and user frameworks is still significant, and complicated by the psychological dimensions to information-seeking. The researcher has sought to uncover the usability of LibrarySearch with reference to Google, and believes that users' mental models of the new environment, together with their actual experience of the product, points to lower usability in their minds - which is surely the perspective which really matters. In a study of the emotional dimensions of situated information, Dervin asserts that in a sense-making interview (a collaborative exercise) "interviewees [are] knowledgeable informants" (Dervin & Reinhard, 2007, p. 53). This researcher concurs with this characterisation.

Dervin's Sense-Making metaphor includes: 'situation', 'gap', 'bridge' and 'outcomes'. Attributes of the 'gaps' include emotions, questions, muddles and angst. They can be 'bridged' by thoughts, attitudes, narratives, strategies and emotions, amongst other things (Dervin & Reinhard, 2007, pp. 52, 53).

The following is an attempt to apply the 'sense-making' metaphor to the Interview component of this project. The 'situation' could be described as users approaching a new Library product, bearing their existing mental models and patterns of behaviour for information-seeking. The model built around Google products is of something familiar, successful, reliable and easy to use. That built around their existing experience of the OPAC is of good quality resources that can only be reached through a search engine which is unfamiliar, difficult to use and demoralising.

The 'gap' is users' experience of the new product, LibrarySearch, in this research context— during which they demonstrate several marked attributes of 'gap' – confusion, questioning and angst. The 'outcome' for users within the research context was a degree of closure through question and answer, cognition and exploration. These are all features of 'bridging'. Outcomes included improved confidence and understanding. Outcomes for the researcher will be canvassed in a reflection (**Appendix M**).

## **11 CONCLUSION**

Designing library websites to cater for a broad spectrum of users who have other viable options is an industry-critical challenge for the information profession. New products are being marketed to libraries as more closely meeting user expectations and experience. This project was designed to test one of these products, known as LibrarySearch, under a broad conception of usability. In the process, the researcher hoped to discover more about users' actual expectations by leveraging mental model and sense-making theory in the realm of information-seeking behaviour.

The problem statement for this project postulated a gap between provider mental models (represented by the information architecture of library products) and users' starter frameworks (represented by their information-seeking behaviour in Google) affecting the usability of library web products. Anyone who has entered a well-designed maze will know that a high degree of organisation does not equate to a straightforward pathway. The existence of a gap has been confirmed by the findings - as a comparison of the archetypal user mental models in the discussion section shows (pp. 51, 54, 55). What was not explicitly anticipated was the emergence during the data collection of mental model components around 'library', 'catalogue' and information seeking therein. Both the findings and a review of the literature testify to the importance of these library-related components, which include sensori-motor, cognitive and affective factors.

The specific purpose of this project was an exploration of usability by investigating undergraduate students' information-seeking behaviour in a Web product, Google, and in LibrarySearch. Results have confirmed that participant-users possess information-seeking models encompassing thought, action and emotion. These models appear to be largely based on their experience with Google – acknowledged as a highly preferred source. Users attempt to transfer these mental models and patterns of behaviour to Library products, but do not carry over the self-confidence they display in the Google suite. The reason for this is their perception of existing library discovery and delivery environments, which have been correctly viewed as more complex and far less

accommodating than Google. User frameworks around searching Google and around 'library/catalogue' **both** impact on usability in the new LibrarySearch environment, where usability is understood to go beyond the sensori-motor and cognitive domains into affect.

Ex Libris' PRIMO is a relatively new product based on decoupled architecture, where the discovery and delivery environments are somewhat detached from the ILS. The development in itself testifies to difficulties inherent in delivering information from the underlying structures of library databases. Yet despite this advance the information architecture of the ILS is still apparent in LibrarySearch/PRIMO. Sometimes this is to advantage - as with the refinement features – but sometimes not, as with the carryover of field-dominated Details views for revealing description and delivery options/holdings. The product is partially successful in creating a new search environment by enabling searching across collections and providing a looser protocol for queries via the Simple search. However users in this study did not consider there was enough information surfaced in the results listing to make selections and retrieve works. Descriptive information and delivery options were to all effect concealed – the first on an underlying layer and the second by inadequate signalling of the 'GetIt' function. So there is room for improvement which would make the user experience far more satisfying and successful.

One key issue to be addressed was the association of Article searching with the Catalogue. The situation as presented does not correspond with Sadeh's "unified entry point to [libraries'] many offerings" (Sadeh, 2008 p.10). The content offered under the Articles tab is comprised of citations from about six of the Library's 750+ subscription databases, albeit some of the largest. This is very confusing for users who are being asked to make distinctions by what appears to be a simple choice of information type. The choice is actually between local collections and a subset of subscribed holdings with distinctive but unexplained characteristics, with significant consequences for search results - especially for known items. This aspect of the design appears to have been provider driven. Perhaps technical and administrative factors, such as retrieval time and licensing limitations, act to eliminate the goal of providing one



searchable pool of content. If so, this should be acknowledged and made explicit to all stakeholders in ways appropriate to their understandings.

The value of this project has been in illuminating particular aspects of user behaviour in a local situation, with a significant new discovery and delivery tool for the University of Auckland Library. Because of the qualitative nature of the research, specific recommendations around design and architecture will have limited general application. However providers in this and other organisations will be able to draw inferences around expansive conceptualisations of usability and mental models which could be tested further, and which have implications for practice, both individual or corporate.

## 12 RECOMMENDATIONS

In the course of this report, implicit and explicit reference to 'gaps' has been made in two interrelated contexts:

- between user mental models of searching in Google and of searching in library products
- between user mental models (as above) and provider mental models as expressed in library products

The following recommendations could serve as *bridges over gaps* within either or both *situations*.

### 1. Information architecture and design of PRIMO, configured as LibrarySearch (October 2008 version)

- a. Remove the **Articles** environment from proximity to the **Catalogue**. [This action was taken by the University of Auckland Library during the course of this project.]

Recognise the importance in users' minds of the **initial Results listings** in Catalogue (as opposed to **Details** screens) by:

- b. adding brief **descriptive information** to each result returned in the listing. **Subject headings** would be ideal as they feature on nearly all records. Consideration would have to be given as to whether to make the subject headings access points from this view or to leave that option to Details screens
- c. removing the **GET IT** link altogether and providing access to holdings information and electronic versions of ebooks etc from **Titles**. An alternative would be to make **GET IT** much more obvious and place this link with the main body of text for each work on the result list rather than to the far right of the result - perhaps next to its title
- d. moving the **View Details** link so that it is neither adjacent to nor shares a link with the titles. Suggested placement of this link would be subsequent to the descriptive information / subject headings
- e. dissociating **EShelf** from delivery mechanisms such as the GET IT link, with which it is currently in line. This would be achieved if either alternative in recommendation 1d. is adopted
- f. removing **GET IT** from the **Details screens** and accessing holdings information from the title information. Alternatively, place GET IT next to the title.
- g. Include explanatory information about the range of Digitool items (Images)

**2. Provider Awareness and Understanding** (especially those in web design, teaching, reference and publishing roles)

- a. **Find out more about users' frameworks for information-seeking** while using their first choice products such as Google and Wikipedia. More complex tasks could be set, such as those found in tertiary assignment questions or projects. Graduate students and academic staff may demonstrate other behaviours, or there may be discipline-related

parameters to explore. User-generated descriptions of their own information-seeking would continue to be illuminating. Investigations could be in the form of formal user studies, semi-structured usability testing or action research.

- b. Consider applying the findings to facilitating the **improvement and enrichment of users' own information-seeking**, rather than attempting to convert users to a provider-driven model
- c. **Engage in self-reflection** on the subject of their own information-seeking behaviour, with the aim of bridging gaps between provider and user models

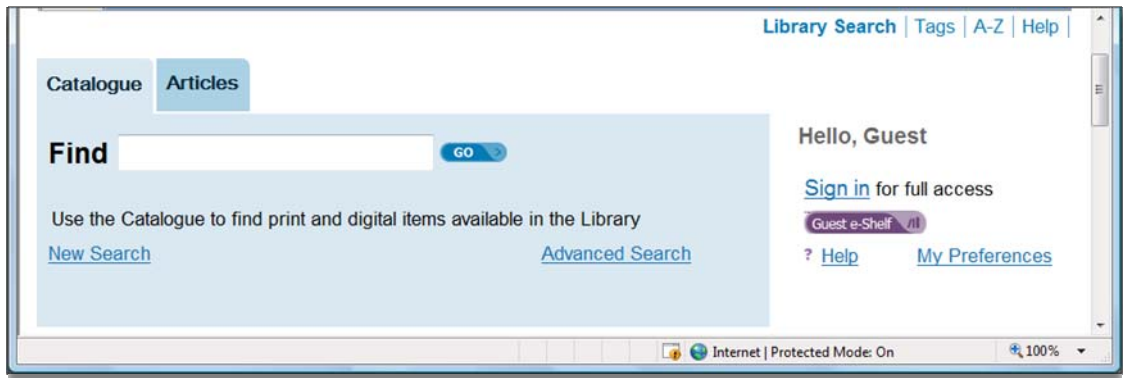
### **3. Provider Behaviour**

- a. **Build upon users' starter frameworks** as much as possible in web design, teaching, reference and publishing contexts. Use products such as Google, Scholar and Wikipedia in the context of explicating information-seeking at tertiary level
- b. **Facilitate straightforward, successful experiences** for users in the Library's discovery and delivery environments
- c. **Extensively promote the new search interface for the Catalogue** as more user-friendly (especially if Recommendation 1 is implemented in all its parts.)

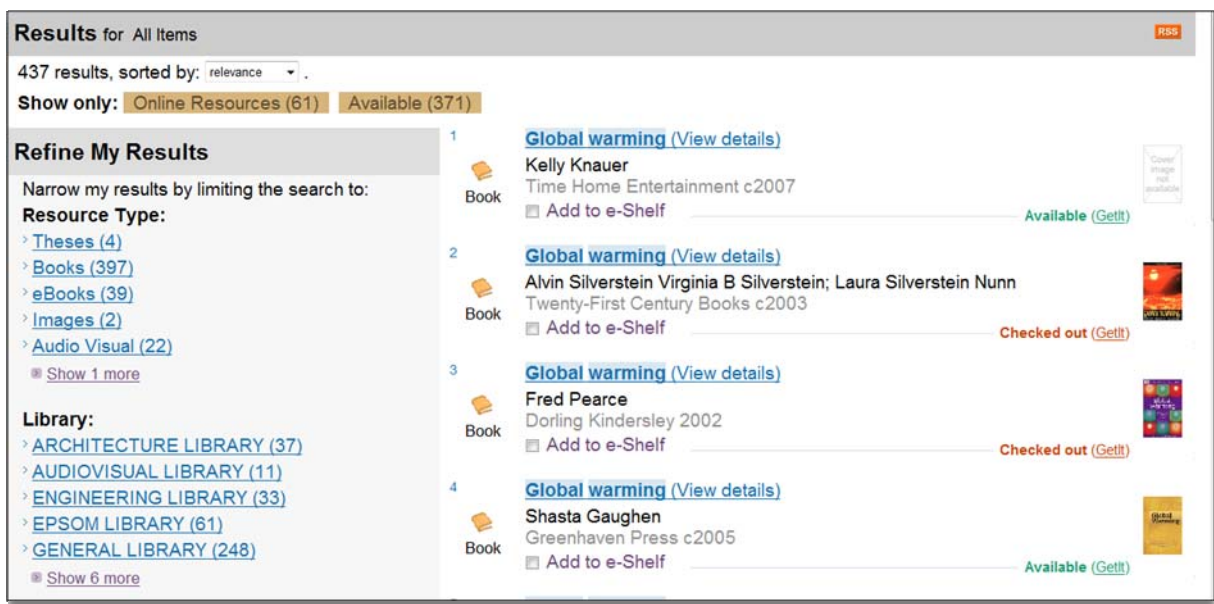
# 13 APPENDICES

## Appendix A: PRIMO / LibrarySearch\* Images

*Ex Libris' product, PRIMO, was termed LibrarySearch in the University of Auckland's test environment as at October 2008*



**Figure 1. Catalogue Tab View LibrarySearch\* homepage.**



**Figure 1a. Results page Catalogue Tab View. Search was global warming**

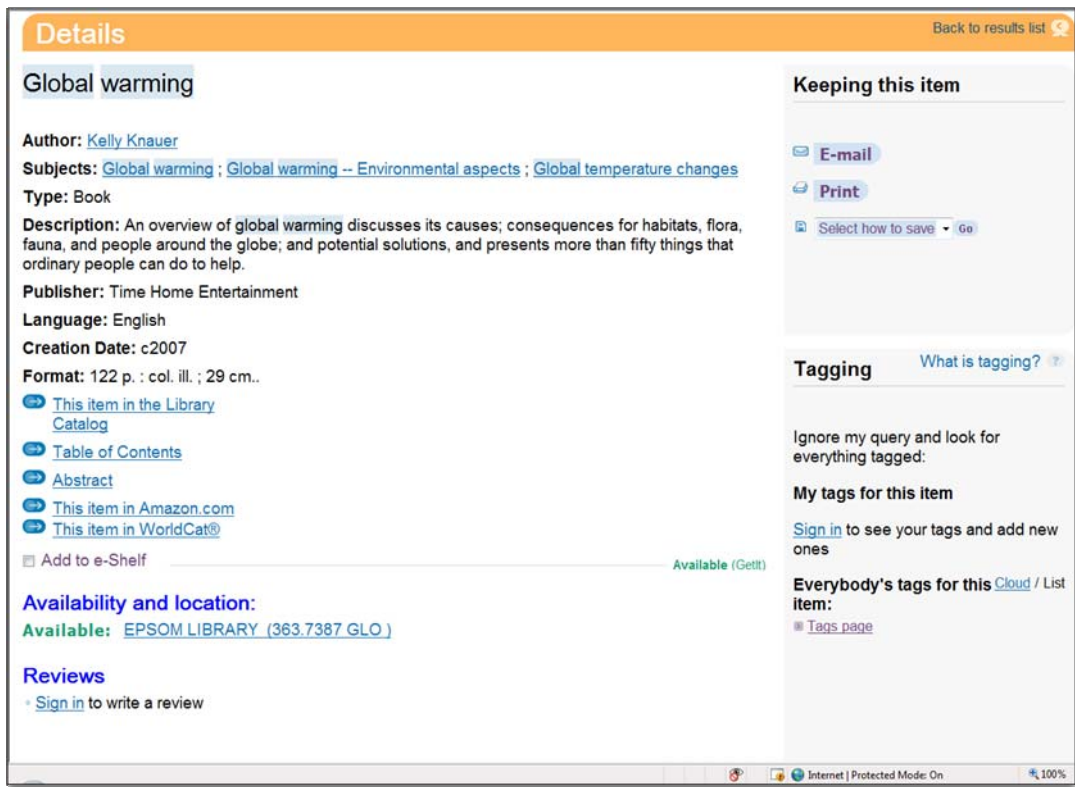


Figure 1b. Details page for first result. Catalogue Tab View. Search was global warming

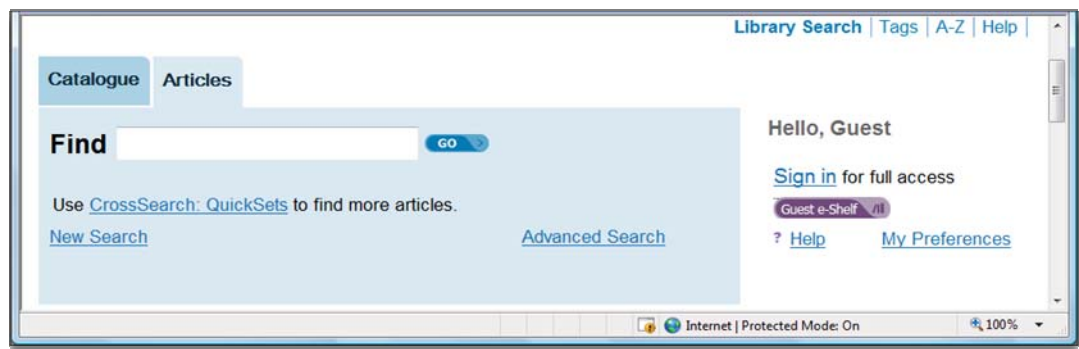


Figure 2. Articles Tab View LibrarySearch\* homepage.

## Appendix B: Questions and Tasks

### 1. INTRODUCTORY & DEMOGRAPHIC QUESTIONS & WARM UP

- Explain structure and timing of session
- Emphasise investigating software, not user skills

Given Name:

Main Subject Area:

Qualification enrolled in:

Level:

Years at UOA

- Use of Library, including Library website:

Often / Sometimes / Hardly Ever or Never

- General Web searching skills:

Basic / Good / Advanced

### 2. GOOGLE / GOOGLE SCHOLAR

- A. Do you use Google or Google Scholar to find information for university or other work?  
How often?

Google Y / N    Often / sometimes / never

Scholar Y / N    Often / sometimes / never

- B. Concepts

What kind of information would you expect to be able to find in Google searches?

What kind of publication would you expect the information in? [eg website, image, book, ]

What kind of information would you expect to be able to find in Google Scholar searches?

What kind of publication would you expect the information to be in?

- C. Tasks. [*Close observation; think aloud protocols, observer takes notes*]

Use Google or Google Scholar to search for:

1. Any information on **global warming**

2. Articles on **global warming**

3. Images about **Samoa**

4. *The book, **Gulliver's Travels, by Jonathan Swift** [so you can read it online]*
5. **Vitousek, P. M. (1994). Beyond global warming: ecology and global change. *Ecology, 75(7), 1861 – 1876* [so you can read it online]**

- D. Take a few moments to visualize how you see the information available in Google / Google Scholar and what you are doing while you search for it. Could you draw or describe how you see your searching?  
*[Observer may suggest some examples to choose from if participant finds this difficult e.g. following a trail, fishing in an ocean, looking through orderly files, scanning a horizon, looking for needle in a haystack, panning for gold, trying different lenses]*
- E. Do you think the information in Google and in Google Scholar might be related? If so, how would you describe this relationship; can you draw it?

### 3. LIBRARYSEARCH

- A. Do you use Library software to find information?  
 How often? Often / sometimes / never
- B. Concepts  
 What kind of information would you expect to be able to find in the Catalogue searches?  
 What kind of publication would you expect the information to be in?  
 What would you expect to be able to find in the Articles tab searches?  
 What kind of publication would you expect the information to be in?
- C. Tasks.  
 Use either or both tabs in LibrarySearch to search for:
  1. *Any information on **global warming***
  2. *Articles on **global warming***
  3. *Images about **Samoa***
  4. *The book, **Gulliver's Travels, by Jonathan Swift** [so you can read it online]*
  5. **Vitousek, P. M. (1994). Beyond global warming: ecology and global change. *Ecology, 75(7), 1861 – 1876* [so you can read it online]**
- D. Take a few moments to visualize how you see the information in LibrarySearch Catalogue and LibrarySearch Articles and what you are doing while you search for it. Could you draw or describe how you see the information and your search for it? *[some clues here? eg following a trail, fishing in an ocean, looking through a set of files, scanning a horizon, beachcombing]*
- E. Do you think the information in LibrarySearch Catalogue and in LibrarySearch Articles might be related? If so, how would you describe this relationship; can you draw it?

#### 4. INFORMATION TYPES TASK

Tick the boxes to show where you think the following information types might be found.

You can choose none, one or several providers for each type of information.

INFORMATION TYPES	Google	Google Scholar	LibrarySearch Catalogue	LibrarySearch Articles
Academic Journals				
Art images				
Articles				
Book Chapters				
Book Reviews				
Books				
Conference Papers				
Film (documentaries)				
Film (movies)				
Government reports				
Magazines				
Maps				
Music (audio)				
Music (lyrics & scores)				
Newspapers				
UoA Course Readings				
UoA Exam Papers				
Websites				

#### 5. DISCUSSION

Openers:

- Any comments on searching LibrarySearch compared with Google / Google Scholar?
- Are you more comfortable searching one rather than the other? Why do you think this is?
- Before today, if you needed information for your University work, where is the first place you would usually go? Please explain why.
- After today, do you think you will change anything about the way you search?



## Appendix C: Library Manager permission



Sylvia Ashton-Warner Library  
Private Bag 92019  
Auckland 1142  
3rd October 2008

Dear Ms Ross

**Web Usability and Mental Models in the Context of Academic Tertiary Libraries – Elizabeth Wilkinson**

This is to confirm that Elizabeth Wilkinson has permission to recruit subjects for her research from the Sylvia Ashton-Warner Library, Faculty of Education.

Yours sincerely

Chris Moselen  
Library Manager, Education

## Appendix D: Flier

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### Want a *Free Movie Ticket?*

All you have to do is:

- ...be an undergraduate Education student
- ...use Google sometimes
- ...have an hour to spare between Wed. 8th Oct. & Fri. 17<sup>th</sup> October.

*I'm a Masters student in Library Studies, looking for people to test and talk about some software, one on one, for my research project.*

*Looking forward to hearing from you!*

Liz Wilkinson

Ph: 6238899 Ext 48612

or ask for me at the Sylvia Ashton-Warner Library

[e.wilkinson@auckland.ac.nz](mailto:e.wilkinson@auckland.ac.nz)

Mob: 027 2483067



## Appendix E: Participant Information Sheet



### Participant Information Sheet for INFO 580 project:

#### Web Usability and Mental Models in the Context of Academic Tertiary Libraries

**Researcher:** Elizabeth (Liz) Wilkinson: School of Information Management, Victoria University of Wellington

I am a Masters student in Library and Information Studies at Victoria University of Wellington. As part of this degree I am undertaking a research project leading to a research report. The project I am undertaking is exploring information system usability, by investigating and comparing information-seeking behaviour in Google with a new University of Auckland application, LibrarySearch, for the purposes of:

- trying to understand people's expectations when they are looking for information, which probably affects how they search
- in particular, trying to find out what people think the content of the Catalogue and Articles tabs in LibrarySearch might be, and the effects this has on how they search
- raising library staff's awareness of their own expectations compared to student expectations
- pointing to the implications of having different sets of expectations - for the design of library websites and the help library staff can provide

I am inviting a small number of undergraduate students in the Education faculty at the University of Auckland to participate in this study. It involves undertaking simple searching tasks on a PC and answering some questions. This will take place in the Sylvia Ashton-Warner Library consulting room and will take about an hour and a half. No particular skills are expected and every experience is valuable. You and I will be the only people in the room. I will take notes and our discussions will be recorded for transcription by myself later.

The transcriptions and notes will form the basis of my research and will be put into writing on an anonymous basis. It will not be possible for you to be identified personally. Grouped responses will be presented in this report, or you may be referred to as Participant A, for example. All material collected will be kept confidential. No one besides myself and my supervisor, Dr Chern Li Liew, will see the transcriptions or notes, or hear the audio recording.

The report will be submitted for marking to the School of Information Management and deposited in the Victoria University Library and potentially, the University's institutional repository. It is possible that the material will be submitted for publication in scholarly journals, presented at a conference or used in library staff training. Transcriptions, audio recordings and notes will be destroyed two years after the end of the project.

If you want to withdraw from the project, you may do so without question at any time before the 31<sup>st</sup> Oct. 2008.

If you have any questions or would like further information, please contact me or my project supervisor:

Liz Wilkinson,  
c/- Sylvia Ashton-Warner Library  
Epsom Campus  
University of Auckland.  
Ph: 09 3737599 Ext: 48612  
[e.wilkinson@auckland.ac.nz](mailto:e.wilkinson@auckland.ac.nz)

Dr Chern Li Liew,  
School of Information Management  
Victoria University of Wellington  
P O Box 600  
Wellington  
Ph: 04 4635213  
[chernli.liew@vuw.ac.nz](mailto:chernli.liew@vuw.ac.nz)

Signed:

Liz Wilkinson

## Appendix F: Consent Letter



### CONSENT TO PARTICIPATION IN RESEARCH

#### Title of project: Web Usability and Mental Models in the Context of Academic Tertiary Libraries

I have been given and have understood an explanation of this research project. I have had an opportunity to ask questions and have them answered to my satisfaction. I understand that I may withdraw myself (or any information I have provided) from this project (before 31<sup>st</sup> October 2008) without having to give reasons or without penalty of any sort.

I understand that any information I provide will be kept confidential to the researcher and the supervisor; the published results will not use my name; and that no opinions will be attributed to me in any way that will identify me. I understand that the audio recording file, transcripts and notes will be kept confidential for two years from the end of the project and then destroyed.

I understand that the research report will be submitted for marking to the School of Information Management and deposited in the Victoria University Library and potentially, the University's institutional repository. It is possible that the material will be submitted for publication in scholarly journals, presented at a conference or used in library staff training. Transcriptions, audio recordings and notes will be destroyed two years after the end of the project.

I would like to receive a summary of the results of this research when it is completed.

I agree to take part in this research

Signed:

Name of participant  
(please print clearly)

Date:

#### Contact Details:

Liz Wilkinson  
c/- Sylvia Ashton-Warner Library  
Epsom Campus  
University of Auckland.  
Ph: 09 3737599 Ext: 48612  
e.wilkinson@auckland.ac.nz

SCHOOL OF INFORMATION MANAGEMENT  
FACULTY OF COMMERCE AND ADMINISTRATION

## Appendix G: Demographic Questions, use of Library & Google

<b>Section 1: Demographic Questions</b>	<b>PARTICIPANT A [ESL]</b>	<b>PARTICIPANT B</b>	<b>PARTICIPANT C</b>	<b>PARTICIPANT D</b>	<b>PARTICIPANT E</b>	<b>PARTICIPANT F</b>
Main Subject Area	Primary Teacher Training	Disabilities	Primary Teaching	Physical Education	Primary Teaching	Primary Teaching
Qualification	BEd	B Social Science	B Ed	BPE	B Ed	B Ed
Level	3	3	3	2	1	1
Years at UoA	4	3.5	3	2	1	1
Library use, including website	Often, 3x per week	Sometimes, once a month	Sometimes, fortnightly	Often, once a week	Sometimes, once a fortnight	Often / sometimes. Every few days
Web searching skills	Good	Basic	Good	Good	Advanced	Good
<b>Section 2: Google / Google Scholar</b>						
A. Do you use Google...	Yes, often	Yes, but not for university work	Yes, sometimes, fortnightly	Yes, often, once a week	Yes, often [includes personal use]. Monthly for assignments, every night when on practicum	Yes, often. Weekly when assignments on
B. Do you use Google Scholar...	No	Yes, often, weekly	No	Yes, sometimes, once a month	No	No

## Appendix H: Transcript Sample

[R = Researcher. Participant B entered a search for *global warming* in LibrarySearch Catalogue, Simple Search. Results listing has come up]

R now when google comes up it comes up in a list, this is obviously a slightly different look. Do you want to talk to me about what you think?

B [laughs] umm, well, panic! Kind of really, straight off

R what's panicking?

B um well cos automatically I was drawn to this and it's got book

R the icons in the middle

B yeh

R yeh

B and then, there's no information here, but it's got "add to eshelf" and it's kind of like... I feel like I'm going somewhere I shouldn't go if you know what I mean

R ok

B but then over here [Refine My Results facet groupings], after I've like breathed! there it's got like theses, books, ebooks, images which kind of automatically made me want to click on there to get out of here

R ok so

B it made sense. Cos that [results list] looks like a no go zone

R it worries you that there's not enough information here?

B yeh! and just being able to add things... I don't know, just

R and you're not sure what "add to eshelf" is going to do?

B yeh

R ok so um... but on the left there are things, there are links that you could use and you felt you could use those to just get out of this uncomfortable situation?

B yes and probably find more information, more specific to what I want

R ok

B first instinct is just to get out of this part

R yes, this list down the middle

B yes

R ok, can you find a way to get any more information about those things?

B um, well they all say book, so I'd be inclined to click on book

R ok, so you're going to go to books on the left [facets list]

B yeh, which I think does pretty much the same thing

R yeh

B which now would make me want to go to ebooks

R ok, so you've clicked on ebooks

B ok same thing. [a list of results] I don't know I just feel like I've kind of hit a wall

R you've hit a wall?

B yeh

R ok. So you're in a catalogue search and you want to find things. You expected to be able to get through to call numbers [from previous conversation]

B yeh

R and things like that in a catalogue. You haven't been able to do that

B yeh [nervous laugh]

R and it worries you

B yeh

R ok

B obviously yeh, I'd have to click on each one to find out more details

R do you want to click one?

B hope I'm not bust anything!

R no, you won't bust anything, I promise!

B and yeh. [clicks on book title] See I'd feel a bit, I'd feel better if this kind of stuff [Details screen] came up, it'd give me a bit more

R so if the details had come up in that first screen, you'd have been reassured.

B yeh

R ok. Now can you get to the point where you can find what you're looking for, the call number?

B um, [ looks around; sees Availability and Location heading ] there..

R yeh, ok, alright, great. Um

B but yeh, umm, I don't know, I mean I would assume that would be up here, not under all of here, cos that's quite related to that?

R ok so the availability and location number should have been higher

B yeh, I think it should be under the book

R under the book. it's most important to be up higher, up there by the book [title, author, description] details

B yeh

## Appendix I: Coding Categories – from Research Questions

<b>CONTENT</b>
Google
Scholar
Catalogue
Articles
<b>INFORMATION SEEKING</b>
Google data entry
Google navigation
Google filtering
Google evaluation
Scholar data entry
Scholar navigation
Scholar filtering
Scholar evaluation
Catalogue data entry
Catalogue navigation
Catalogue filtering
Catalogue evaluation
Articles data entry
Articles navigation
Articles filtering
Articles evaluation
<b>LIBRARYSEARCH CONTENT</b>
Orderliness
Information Types
Quality
<b>RELATIONSHIP Catalogue / Articles</b>
Separate
Intersecting
Subset one of the other
Describe
<b>STARTER FRAMEWORKS - Strategies</b>
Google / Scholar
Catalogue
Articles
<b>MENTAL MODELS - USERS (cognitive, emotional)</b>
Internet / Web / Google space
Google tool
Library resource space
LibrarySearch tools
<b>USABILITY Catalogue / Articles</b>
Making choices upfront
Perceptions content
Effect on strategy

## Appendix J: Coding – Sample (Participant B)

CODING by Category and themes	Participant B
CONTENT	
Google	not usually used for uni
Scholar	specific areas to do with papers, author names, Articles. Educational, well-researched. Is in Google as well but harder to find. Separated out in Scholar. Scholar is subset but also links out to other info not available to public
Catalogue	call numbers of particular books; anything hard copy that you can hold in your hand from the Library that needs a call number
Articles	Articles, journals, maybe book chapters
INFO SEEKING	
Google data entry	Images link - "global warming". Keywords "gullivers travels swift"
Google navigation	noticed hyperlink colour; followed links to book chapter
Google filtering	used hyperlink previously noted
Google evaluation	doesn't necessarily trust Google for uni. Quick read - 1st person? Would normally have some basis for reflection
Scholar data entry	"global warming"; links to recent Articles. To find Articles, just skips book results. Specific article "global warming ecology global change vitousek"
Scholar navigation	scrolls results; browser back button; Images link expected in Scholar same position. Back to Google via url history.
Scholar filtering	English, Key Authors, specific area to do with topic. Scans date and jnl info under headers
Scholar evaluation	Scholar thru library - higher educational value
Catalogue data entry	Catalogue Simple Search "global warming". Samoa. Has looked at results to find images format. Not there, so went to Advanced Search. uses Images Material type option and Subject contains Samoa. Catalogue Advanced for gulliver. Uses title contains, author contains ie GT and Swift. All items.
Catalogue navigation	was able to access more info about a result, by clicking on title - needed prompting to look for a way to get more info. Tried links to books on facet list, online resources. Eventually got to Details and Location / availability but not where expected - should be higher up. Online resources for GT Manually removed keywords and refinements - crashed LS.
Catalogue filtering	inclined to look at top result or online resources or one with multiple versions eg GT
Catalogue evaluation	only one image from Catalogue, so checks out Articles tab for Images option
Articles data entry	auto searching for gw. Uses Advanced search for vitousek article. Keywords in top field, then author name, then year period. No result. So reduces info by replacing keywords with Ecology (journal title)
Articles navigation	found Articles tab ok
Articles filtering	looking for full text pdfs, would dismiss others
Articles evaluation	

LIBRARYSEARCH CONTENT	
Orderliness	
Information Types	
Quality	valuable
RELATNSHIP Catalogue / Articles	
Separate	Catalogue for books, Articles for articles.
Intersecting	as to topic but not info type
Subset one of the other	
STARTER FRAMEWORKS - Strategies	
Google / Scholar	google scholar via library site - connect page but uses browser history. Used both for different purposes eg images of articles
Catalogue	when faced with sequential results screens, felt like hit a wall. But seemed to realise would have to click on each one to get more info. Feels has only basic skills and uses trial and error. Would try ebook versions one by one to get full text
Articles	In Scholar would be: goes in, do search, save all pdfs, closer look, delete some, look again. Refine, refine. But can't do that here. Starts broad and would add more keywords to refine if necessary [vitousek article]. Reluctant to spend a lot of time altering search - easier in Scholar!
MENTAL MODELS - USERS (cognitive/ emotional)	
Internet / Web / Google space	key things triggering related possibilities, leading to...trail [collaborative metaphor] Starts broad and then narrow, narrow, narrow [but doesn't work so well / same way in LS]. More comfortable in google space
Google tool	some guidance there from initial info, making decisions about direction
Library resource space	initial reaction to results list said to be "panic". Participant was very disconcerted by lack of descriptive information with references and mention of 'eshelf'. Felt like was somewhere they shouldn't be and wanted to escape - refine results looked reassuring, made some sense. Idea of being able to add things [to eshelf] uncomfortable. Wanted to find information specific to goal. First instinct to get out of that part [results list]
LibrarySearch tools	auto searching disconcerting, not expected. Visualizes her searching as a trail again, but forest is different - planted. Different presentation.
USABILITY CATALOGUE / ARTICLES	
Making choices upfront	have to know in advance what information type you want eg book, article. Google better for finding info on topic cos don't have to do that.
Perceptions content	likes the no full text wording but that isn't helpful. Looking for pdfs. Perception content not so broad
Effect on strategy	Strategy for dealing with results was upset by LS presentation - not enough info to scan and filter and evaluate? Location and availability not there. When found in Details, not high enough and a different colour. First / top information important. Would have to have more understanding about how library software works, more skills. Simple things eg New Search. Scholar - can do quickly without having to think too much about it, know things. usability could be vastly improved if incorporated into first year papers, not just introduced in an hour. Is confusing, so uses google and scholar. don't have broad range of info on one page / one choice.



## Appendix K: Summary of User Perceptions of Content by Product

Refer Section 4 of Tasks. Users ticked boxes if they believed an information type was present.

INFORMATION TYPES	Google	Google Scholar	LibrarySearch Catalogue	LibrarySearch Articles
Academic Journals	√√√√	√√√√	√√√√	√√√√
Art images	√√√√√√	√√	√√√	
Articles	√√√√√	√√√√	√√√	√√√√√√
Book Chapters	√√√√√	√√√√	√√√√√√	√
Book Reviews	√√√√√√	√	√√	√√
Books	√√√√√	√√√√√	√√√√√√	√
Conference Papers	√√√√√√	√√√√	√√√	√√√√
Film (documentaries)	√√√√√√	√√	√√√√√	√
Film (movies)	√√√√√√	√√	√√	
Government reports	√√√√√	√√√√√	√√	
Magazines	√√√√√	√√√	√√√√√	√√
Maps	√√√√√√	√√	√√	
Music (audio)	√√√√√√	√	√√√√√	
Music (lyrics & scores)	√√√√√√	√	√√	
Newspapers	√√√√√√	√√√	√√√	√√√
UoA Course Readings			√√√√√√	√√√
UoA Exam Papers	√	√	√√√	√√
Websites	√√√√√√	√√√√	√√√	√√

## Appendix L: Relationships between Research Problem, Questions, Tasks and Data Tables

Aspects of Problem Statement	Research Questions	Interview Questions, Tasks	Data Tables
Describe User Sample		1, 2A, 3A	Demographic Table
Exploration of user frameworks / mental models	1 - 4	2B, 2C, 2D, 2E 3B, 3C, 3D, 3E 4 5	Coding Table (sample) <ul style="list-style-type: none"> <li>• Perceptions of Content</li> <li>• Relationships of Content pools within applications</li> <li>• Info seeking behaviour</li> <li>• Strategies</li> <li>• Mental models (user, collaborative)</li> <li>• Mental models (researcher perception)</li> </ul> Content by Product Table
Effects on strategies and usability	5 – 7		Coding Table <ul style="list-style-type: none"> <li>• Info seeking behaviour</li> <li>• Strategies</li> <li>• Usability</li> </ul>

## Appendix M: Reflection

The concept for this project came from two strands of thought in my mind. The first arose from some years spent observing the struggles of users to select appropriate access points for article searching, whether for known items or on a topic. I have also been privileged to participate in two user studies around a custom-made online tutorial for Voyager, and the redesign of the University of Auckland Library's homepage. In the course of some background research I was struck by Veldof and Beaver's diagrammatic representation of the 'Clash of the Mental Models' (Veldof, 2003, p. 130). It begins, for librarians, with: "Research is an end" and for students: "Research is a means to an end". The diagram has been pinned to my notice-board for several years. The opportunity to test and explore these two preoccupations in a project around a new type of interface, marketed as user-centred, was very welcome.

I have also been fortunate in being able to take a qualitative approach to the research, to the extent of explicitly acknowledging my role in the creation of meaning with the user-participants. I've found Brenda Dervin's Sense-Making Methodology very interesting and hope I am beginning to grasp some of the intricacies of her thinking, although I have taken liberties with the metaphor as much as the method. The interviews which I and my users undertook were very stimulating and rewarding collaborations, and my own mental models have been shaped by subsequent reflections.

I hope I will be able to follow up the recommendations with respect to provider understanding and behaviour for myself. As a subject librarian in an academic environment there are many opportunities for entering into learning conversations with users around the nature and possibilities of working with information. This might be more satisfying than trying to initiate the reluctant or bewildered into the mysteries of searching according to the strategies and protocols of library science. And, if OCLC's report is to be believed, less like flogging a dead horse (OCLC Online Computer Library Center Inc., 2006). I expect to enjoy the attempt, anyway, just as I have gained a great deal from being a participant in this project.

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