# HOW IS KNOWLEDGE ABOUT THE CONSUMER OF INFORMATION BEING APPLIED IN THE DESIGN AND DELIVERY OF INFORMATION PRODUCTS AND SERVICES?

MARK HEPWORTH

*Department of Information Science, Loughborough University*
*Loughborough, LE11 3TU, United Kingdom*
*E-mail: m.hepworth@lboro.ac.uk*

**Abstract**. This article looks at how the consumer of data, information and knowledge becomes increasingly important in relation to the design and development of electronic information products and services. In web based environment, where products are bought and sold, such services are increasingly being 'tailored' to suit the individual and community they serve. However, current situation has meant that there is an increasing need to provide access to data, information and knowledge electronically. Reasons for this include the growing number of potential users who value and need information but cannot or may not want to be serviced face-to-face even when remote access to electronic resources has become prevalent. There is a need to create electronic environments that can relate to the complex cultural, sociological and psychological needs of the consumer.

This paper provides an overview of current theories and knowledge about the information consumer. It is informed by the commoditization of information and communication technologies (ICTs), products and services, the use and non-use of information in Library and Information Science (LIS) discipline, the need to create appropriate learning environments and lastly, the perception that all people should have equal access to such products and services and that society should be inclusive.

Examples are also provided of how and where knowledge is applied, highlighting the importance of IB knowledge. The paper concludes that a deeper understanding is needs to be developed as current application of knowledge about the information consumer is rudimentary. There is a need to apply and test current knowledge.

## Introduction

The i-pod provides an example of how knowledge of the consumer has been applied to the provision of a successful information product, to the extent that the technology or device (i-pod) is now becoming a brand, a badge of consumables. Note the phrase 'which I-pod are you' implying personalisation, the visual allusions of freedom and warmth given by the dancer and, in the textual description, the use of phrases such as 'run your thumb round the click wheel', 'there's no limit to where it will take you' (Apple 2006) appeal to the sensual and the need for excitement. Design, in this case, is not just about making something visually pleasing, it has to do with designing for a community, albeit across a wide range of demographics, with specific needs living in a specific social context. The mobile phone is evolving in a similar way. To achieve this success a great deal needs to be known about the potential user. These technologies are not perfect representations of what can be done. These devices, for example, with their small buttons, tiny screens may be difficult to use for people with limited sight or dexterity. However, they do indicate how technological solutions increasingly need to embody knowledge of the consumer and that functionality alone is not enough. Similarly the end-user population of information consumers increasingly expects effective, usable, aesthetic design that relates to their work/life context and its associated information needs.

## What is Known About the Information Consumer?

Many ICT products and services develop successfully, that is, in a way that corresponds to the reality of the consumer. Development can be technologically driven but meet a demand due to some understanding of the consumer and the fact that their evolution stems from a particular environmental and social context. Sometimes success is accidental. Text messaging, for example, was not expected to be such a success by the developers. Development can result from inspiration and the knowledge of a key advocate. The success of the Bloomberg service, for example, depended on a person who through his

work had a deep insight into the needs of bond dealers. Other successful services or products develop as a result of a deep understanding of the consumer, derived from systematic market research or what may be termed user requirements analysis. Many services or products, over their lifetime, develop through a combination of these drivers.



**Figure 1. i-pod advertisement 1**



ICT
Commodification
Consumerisation
       Personalised
       Integrated into life-style and so-
       cial context
Interactive
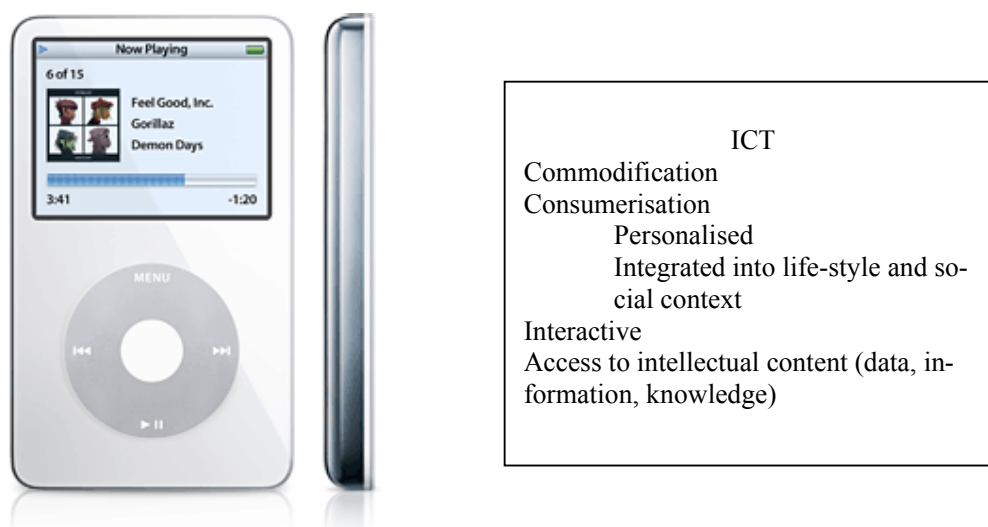Access to intellectual content (data, in-
formation, knowledge)

**Figure 2. i-pod advertisement and attributes**

The body of knowledge that relates to the design of electronic information products and services stems from a number of avenues. Primarily it comes from LIS research but also from the personalisation of learning technology and from inclusive design. There are many technologies that may facilitate the development of information products and services that relate to the needs of the consumer of information, such as natural language processing, text mining and information architecture. However these technologies do not directly attempt to generate knowledge about the consumer of information.

### *Knowledge from LIS Research*

In LIS research the study of information behaviour has generally been driven by a desire to develop:
- more successful information services;
- better information retrieval products;
- a richer understanding of information behaviour in general.

The area of user studies and courses run by LIS academic departments such as 'services to users' or 'user oriented services' are driven by a desire to deliver more successful information services. LIS practitioners have for many years done surveys of their users to help indicate the value or demand for information and particular services. In a similar vein academics have studied communities to reach a

better understanding of information behaviours and needs. These have included studies of the information behaviour of communities of common practice such as social workers (Wilson, Streatfield & Mullins 1979), business people (Choo 1994) etc. as well as people who share common information needs with regard to an aspect of their life, such as people with cancer (Williamson & Manaszewicz 2002). Some studies have stemmed from practitioners employing academics to study their target community with the objective of developing or improving information services. A recent study involving people with multiple sclerosis led to the improvement of the MSTrust's web site and the promotion of specific types of information (Hepworth, Harrison, & James 2003). Current research in the Department of Information Science, at Loughborough University, is looking into the information needs of children of parents who have cancer. The fieldwork is taking place in Malaysia and should feed into future information provision where information is currently lacking.

These studies have led to a great deal of knowledge about how to develop services that relate to the specific needs of different people and also about how to go about determining these needs. Some of this knowledge, concerning scientists and social scientists (Britain 1970), has been applied in the design and development of information retrieval systems such as online databases or at least influenced their development. However, much of this knowledge has not been codified and has not found its way outside the LIS field.

In the area of information retrieval an understanding of the peoples' information retrieval experience and the processes they go through has also led to the design and development of innovative IR systems. For example the Bookhouse project in Denmark which was aimed at users and non-users of the public library; the Alexandria project in California (US) for geographers. In addition researchers, such as Hearst, Kopec, & Brotsky (1996), have experimented with different ways of representing information objects such as citation links or the relevance of retrieved items using tiles, hyperbolic trees, rooms, three dimensional maps. These have yet to find their way into commonly available information products.

Studies of peoples' information retrieval experience have also led to an understanding of what people need to know and what they find difficult when involved in information seeking, solving problems or becoming informed. These studies have fed into the general knowledge of how people use IR systems such as search engines (Spink, Bateman & Jansen 1998). These studies have also fed into conceptions of information literacy (Eisenberg 1990, Bruce 1995) and the design of information literacy training courses (Hepworth & Wema 2006) as well as information product design.

From the earlier studies of communities several authors have gone on to explore IB in its own right and develop models of information behaviour. Dervin (1983) developed the sense-making methodology that was both a theory about how people experience information seeking and also a technique for investigating these situations i.e. the micro-time line interview. Wilson (1999) developed a number of models that helped people think about IB in terms of how people satisfy their information needs and what influenced their information behaviour. Other authors have put forward conceptual models that help to understand the facets of IB. A recent book '*Theories of Information Behaviour*' (Fisher, Erdelez & McKechnie 2005) presents a smorgasbord of different aspects and approaches to the study of IB. Approaches vary in terms of the focus of the study and the epistemological background. The book demonstrates the breadth of knowledge and the complexity of factors and explanations associated with IB as well as indicating what is not known. Other books by Nicholas (2000), Case (2002), Marchionini (2001), and numerous articles by a number of authors including Ingweresen (1991), Spink (1997), Leckie, Pettigrew & Sylvain (1996), Vakkari (1998) and many others indicate the substantive nature of the topic as well as the current knowledge. Research and knowledge tends to fall into one or more of the areas listed in Figure 4.

Over the last twenty years research has largely stemmed from a cognitive perspective and focused on the individual. These studies have identified different cognitive states associated with IB. They tend to focus on the moment of interaction with an information system or service and tasks, stages and associated states including: cognitive (thinking processes), connative (inherent factors that effect motivation) and affective (feelings). They look at how information needs are translated either passively or in an active way into actions and the process of becoming informed and in some cases using and communicating information. The latter tends to be less researched. Cognitive phenomena including thinking skills such as recognition of relevance, analysis, synthesis, induction, deduction, evaluation etc. and thinking processes such as defining a problem, (Eisenberg 1990) or knowledge of the subject/system/resources (Allen 1991), that arise or impact on IB have been identified. Connative phenomena such as self-efficacy, locus of control (Wilson 1999) and learning styles (Ford 1993) have also been shown to be associated with different types of IB. Related is research that identifies people who share IB such as monitors and blunters (Miller& Mangan 1983). Other studies highlight the affective

domain and what people feel when they are involved in IB. Kuhlthau (1991), for example, charted the emotions associated with a student undertaking the various stages in a research task. Generally such researchers relate their findings, concerning psychological states, to information seeking (IS) tasks and the use of specific resources.
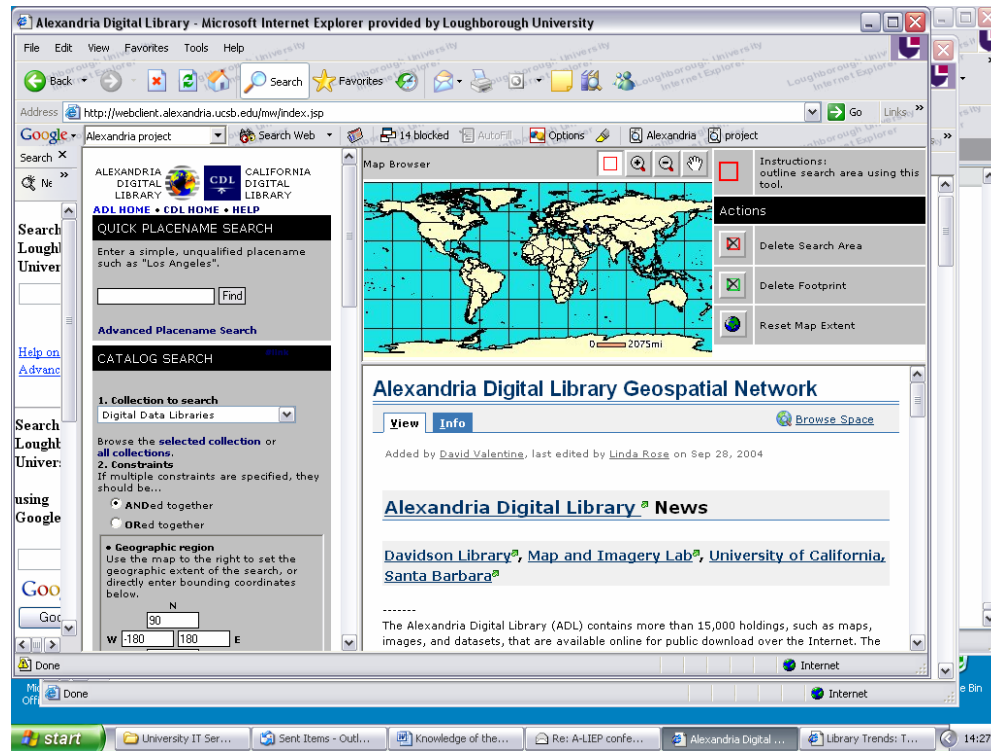


**Figure 3. Alexandria Digital Library Project**

| Locus of study | Topics of interest |
|---|---|
| *Society* | *'diffusion', 'culture', 'ethnicity', 'power structures', 'norms', evolution of IB', 'communicative competence'* |
| *Social context* | *'roles', 'tasks', 'norms', 'everyday life', 'communities of practice', 'situational context'* |
| *Individual* | *'elicitation', 'sense-making', 'browsing' 'defining the problem', 'optimal foraging', 'berrypicking', 'chaining', 'anomalous states of knowledge', 'authority', 'sharing'* |

**Figure 4. IB research - locus of study and topics of interest**

Studies that tend to focus on people in a certain social context were mentioned earlier. They generally try to identify information needs that cut across or are clustered in the community. These studies concentrate on the information seeking behaviour (ISB) (Bates 1989, Hert 1997, Hepworth 2003) and the use of and need for content (subject matter) and the nature and form of that content, such as value, authority, style, depth etc. and its usability. They also highlight the difficulties people experience when trying to satisfy information needs. Although these studies provide a clear indication of needs and are set within a social context the impact of normative values are relatively unexplored.

Few studies look at how the wider aspects of society, such as power structures, may have an impact on IB. Chatman (1999) is one of the few people who have taken a broader sociological and an-

thropological perspective. However, a recent study in Ghana (Nikoi 2006) about the IB of Non-government Organisation (NGO) staff highlighted the impact of local, national and international forces and how they affected IB. For example, the 'participative' nature of development projects is currently valued by international donors. As a result the IB of NGO workers has changed to reflect this.

The phenomena, both external and internal to the individual, that researchers have put forward as having an impact on the information consumer and affecting their needs and behaviour with regard to learning and the use of information products and services, can be summarized in the diagram in Figure 5.
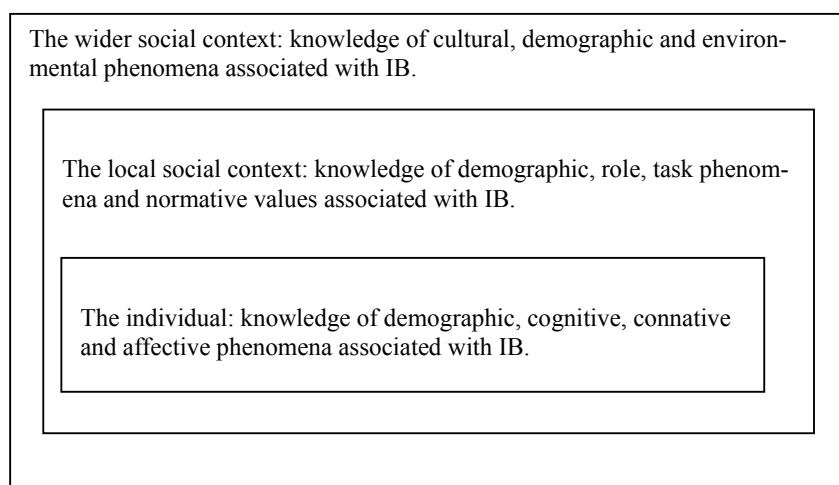
The wider social context: knowledge of cultural, demographic and environ-mental phenomena associated with IB.

The local social context: knowledge of demographic, role, task phenom-ena and normative values associated with IB.

The individual: knowledge of demographic, cognitive, connative and affective phenomena associated with IB.

**Figure 5. Categories of knowledge associated with IB research**

Authors who focus on the impact of the wider societal context, such as the hierarchical nature of society and the effect on IB (Hofstede 2001), are rare. Local social context studies tend to look at a group within society, such as the elderly, and identify IB characteristics of that group. Authors with a bias towards the individual tend to focus on factors that drive or affect the individual's IB. The term demographics is included here to refer to factors such as gender, age, physiological conditions and so on that may have significance at all three levels of abstraction shown in Fig. 4. Researchers have, of course, tended to focus on different dimensions and have taken different epistemological standpoints to help explain IB. This has led to various perceptions of IB where emphasis is given to different factors and different vocabularies have evolved, in a relative unsystematic way, to describe phenomena. From a positivist perspective a rich array of societal and social factors contribute to the creation of an infor-mation environment, the design of which is influenced by the characteristics of the individual and their ISB. The IB of the individual may, in turn, be affected by the external information environment as well as their internal psychological 'environment'. From a social constructivist perspective we can interpret these as a collection of shared labels and meanings that have evolved to help us understand IB.

An understanding of the interplay between phenomena associated with IB can therefore be seen to be important. For example, demographic data, such as medical condition and age, may be associated with cognitive phenomena, such as levels of knowledge of technology or a subject domain, and also with connative phenomena such as high or low self-efficacy and the combination of these factors will have determine their IB and needs. Understanding such information enables one to design an informa-tion intervention to meet the requirements of this particular scenario or user profile. In fact, a great deal is already known about IB and the factors that affect IB.

### *Knowledge from Personalisation and Commodification*

The current desire to personalize information products and services stems primarily from:
- the commodification and consumerism associated with ICT products as illustrated by the i-pod or services such as Reuters/DowJones' Factiva business information service;
- the recognised need to filter information due to information overload and lack of time experi-enced by many people;

- the need to develop virtual learning environments and adapt to learners' knowledge and learning style.

*Need for Commodification*

Although in its infancy, consumer ICT products have begun to be influenced by ideas from marketing and the desire to emulate, in the electronic domain, the experience of the world where people interact face-to-face or eye-to-physical product. This has led to the personalisation of shopping online that creates features such as 'My Basket' and the ability to 'tailor' the product to meet individual needs without having to physically view and choose, such as when buying a computer. Based on their previous IB or similar peoples' IB suggestions may be made to consumers that may facilitate their IS, finding other relevant 'resources', such as books, in the hope that they will view or buy these. The media vendor Amazon takes this approach where suggestions are perceived as coming from a peer rather than the vendor and hence are given more value.

*Need to Filter*

Traditionally LIS professionals set up Selective Dissemination of Information (SDI) initiatives or alerts, both paper based and electronic, and proactively provided information to consumers. These were based on, in some cases, elaborate profiles of users' information needs. Organisations, such as Newsedge, have more recently developed technologies that filter streams of information such as business news and enable the distribution of information to end users. Personalised electronic newspapers have also been offered with the help of 'intelligent agents'. However maintaining a user profile that relates to ongoing and often changing needs, let alone the complex nature of those needs, has been found to be extremely difficult.
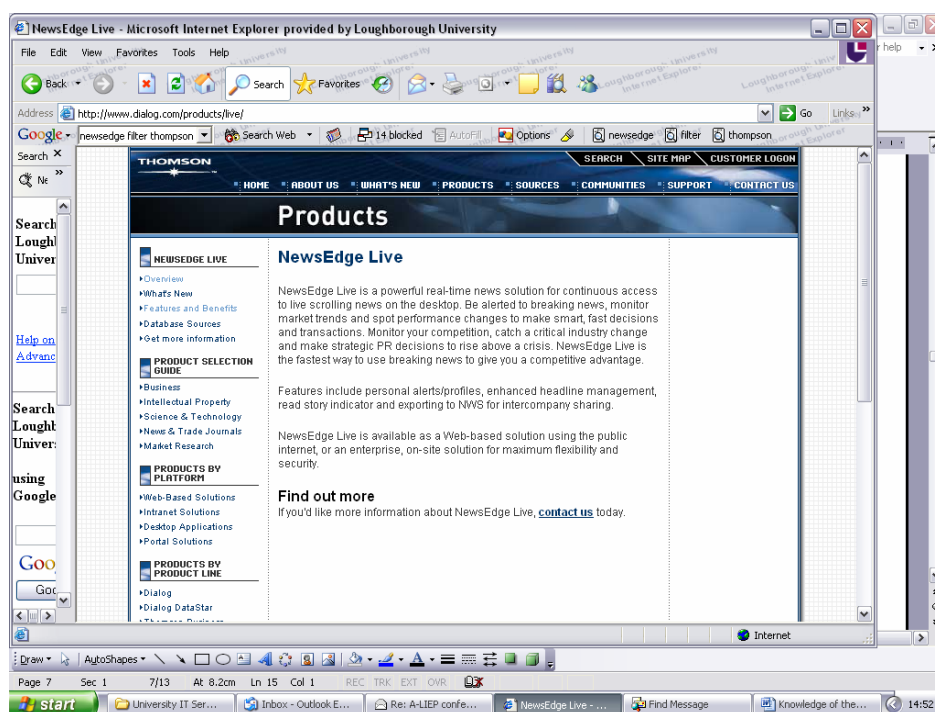


**Figure 6. Filtering (Newsedge)**

Various automated methods are being applied to help solve some of the problems. Organisations, such as Autonomy, have developed technologies that automatically classify, tag and enabled the selective dissemination information. However, the automatic classification of content and matching this with a profile of an individual and their changing needs is still challenging and objective information about the success of such solutions is hard to find due to commercial sensitivity. At Loughborough we

are currently working on an information system that filters and presents information in a way that corresponds to the profile of the user in terms of the amount, complexity and pictorial content of the information that the user desires. The profile of the user is determined by their medical condition and their need for subject matter. In addition, data about what they have read also helps to determine the information they are presented. For example, a person experiencing severe fatigue, who has reduced visual ability, is assumed to prefer information that results in less cognitive load hence including less text, less complexity of language and more pictorial content. This work uses marked up material using extensible mark-up language (XML) to code information objects and processed using extensible style sheet transformation (XSLT) in the COCOON environment to transform and create output that relates to the user profile which was captured and stored in a database. The target community for this research is people with Multiple Sclerosis who have diverse and changing needs. Other initiatives have taken place in the Consumer Health Informatics arena. The majority of these initiatives have used data from the patients record to provide 'tailored' information leaflets that relates to the patient's condition and treatment (Bental 1999). In the Health Informatics field it has been recognised that people are more likely to read and act on information that is personalized (Duman 2003). As mentioned earlier other technologies may feed into personalised information provision such as artificial intelligence (AI), natural language processing and text mining.

*Virtual Learning Environments*

At Nottingham Trent University in the UK and also in Eindhoven in Holland other people have been working on personalized learning environments. In particular they have been researching how to author learning resources and have focused on profiling the user according to the level of knowledge and what they already know. They also hope to provide learning resources in a way that relates to learning style. These and related studies have led to personalization models that include, for example, the domain model, the goal and constraint model, the user model, the adaptation model and the presentation model (Cristea & Mooij, 2003).

*Inclusion*

Another important source of information about the information consumer has arisen due to prevalence of the concept of social inclusion which implies that all people in society are perceived to have a right to participate and be able to access products and services. Inclusion, and accessibility of information, is also driven by economic factors such as the cost of supporting an elderly population. Factors, such as these, have led to legislation, such as the Disability Discrimination Act in the UK (Disability Discrimination Act 1995), that insists that products and services, including learning resources (SENDA 2001), must show that the developers are at least attempting to make them accessible to all. Similar legislation has been implemented elsewhere in the world. Human Computer Interface (HCI) guidelines have also been developed to facilitate access (W3C 1999, IBM 2006). Organisations that undertake advocacy on behalf of marginalized groups, such as the Royal National Institute for the Blind (RNIB), the Dyslexia Association and MENCAP who provide help and advocacy for people with learning difficulties, also provide advice to help designers meet the needs of people.

A number of research areas have therefore evolved that relate to information provision and the needs of the consumer of information. No one, as yet, has codified what is known in a form that provides comprehensive instruction for the design of information products and services.

### Do current information products and services, particularly those that are electronic, demonstrate a knowledge of the information consumer?

Is knowledge about the consumer of information being applied to the design and development of information products and services? The following indicates those aspects of IB, personalisation and inclusion that are being addressed and how.

There has been a rapid development of electronic information products and services. To some extent these have followed a 'cart before horse' development path. These cases, although based on the fundamental need to communicate, are technology driven. For example in a database environment the developer is primarily interested in developing an effective way of representing the database so that the user can query it. The user is therefore not helped with the related cognitive processes such as defining the topic they are researching because the developers' 'system driven' view of their product. Not that all successful developments are user driven. After all it can be difficult to visualize how to apply technology without at least having some experience of what is technically possible. As a result, in many

cases, technology is launched and people interact with it, and designers and people learn and adapt the technology and their behaviour. Search engines, for example, initially were limited in terms of their functionality; their help systems and the range of material they gave access to; and have been adapting to meet the needs of users ever since. In fact, there are an increasing number of examples of electronic information services and products showing an awareness of the needs of the consumer. The following demonstrate this and indicate in what way, and where. Furthermore, these examples point to how current and developing knowledge of IB could be more extensively applied.
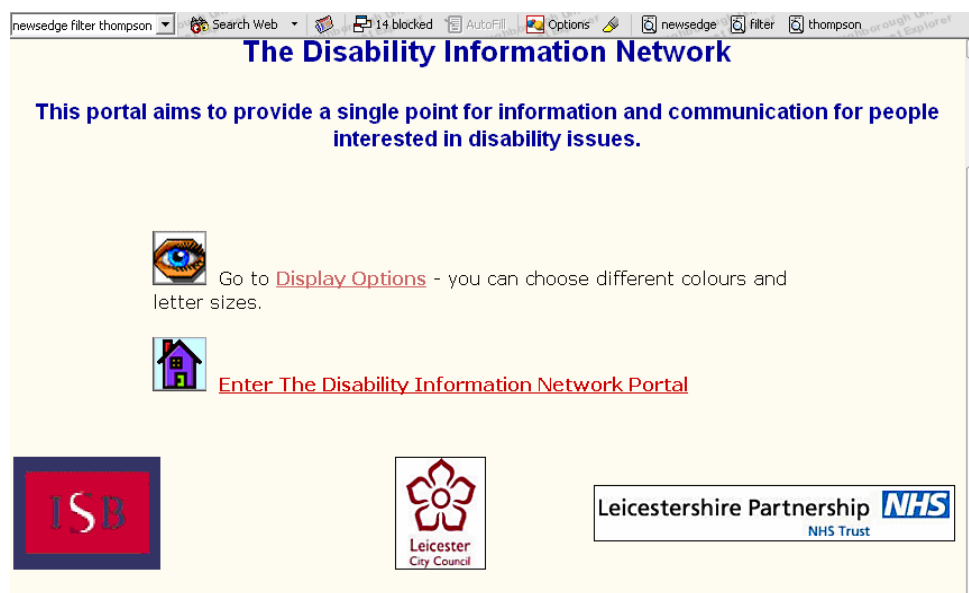


**Figure 7. Personalised accessibility**

*Use of Knowledge About Roles, Norms and Tasks*

To some extent paper based libraries have always responded to environmental, cultural, and economic structures in the wider society and local social contexts. In each context there are roles, normative values and tasks and behaviours associated with information, information products and services. Hence we have special, academic and public libraries. In fact it is in these environments where the knowledge of the consumer of information has had most impact. This is being constantly exploited. In the UK public libraries, for example, where services are being developed to meet the needs of recent immigrants, people with disabilities and people who lead a mobile existence. Academic libraries have recently introduced more flexible learning environments and areas that cater for problem based group learning and the changing norms and behaviour of users.

Another area where knowledge of IB has been applied, again not solely in the electronic domain but relating to the use of information products and services, is information literacy (IL). LIS practitioners and researchers have developed information literacy standards and guidelines based on a knowledge of IB and the IS process (SCONUL 2004, Bundy (ANZIL) 2004, CILIP 2005, ACRL 2000). Recent IL training initiatives have consciously drawn on knowledge of the roles, tasks, norms, cognitive, connative and affective situations and states associated with IB, library conceptions of IL and learning theory (Hepworth & Wema 2006).

In the electronic domain Web based information services, such as the Young Carers site, show an appreciation for the information needs of the Young Carer and reflect a knowledge of the role, tasks and normative values.

Search engines such as AskJeeves have obviously designed their interface to appeal to the young. The same could be said of Yahoo with its emphasis on popular culture.

The SCIRUS search tool has chosen to cater for the needs of the scientific community. This is reflected in the content they offer and the functionality of the service where consumers are expected to want information from authoritative web sites as well as peer reviewed papers. The presentation of the site is relatively serious and professional, in comparison to Yahoo.

Virtual Learning Environments (VLE) and portals, in academic environments, are evolving and starting to show a better appreciation of the needs of students.  Here we are beginning to see the development of services that are more integrated into the learning context.  An individual will see an interface that corresponds to their information needs and brings together relevant modules, assignments and learning resources.  In other words orienting the provision of learning resources according to the roles, norms, tasks of the individual and groups is being recognised as a way to deliver learning resources.



**Figure 8. Role related – web site for young carers**
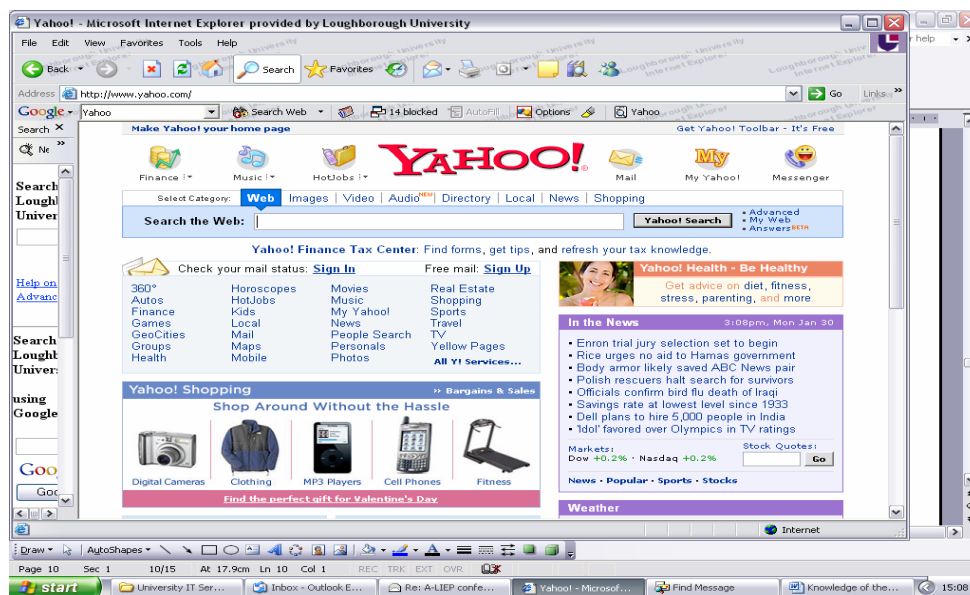


**Figure 9: Popular culture (Yahoo)**
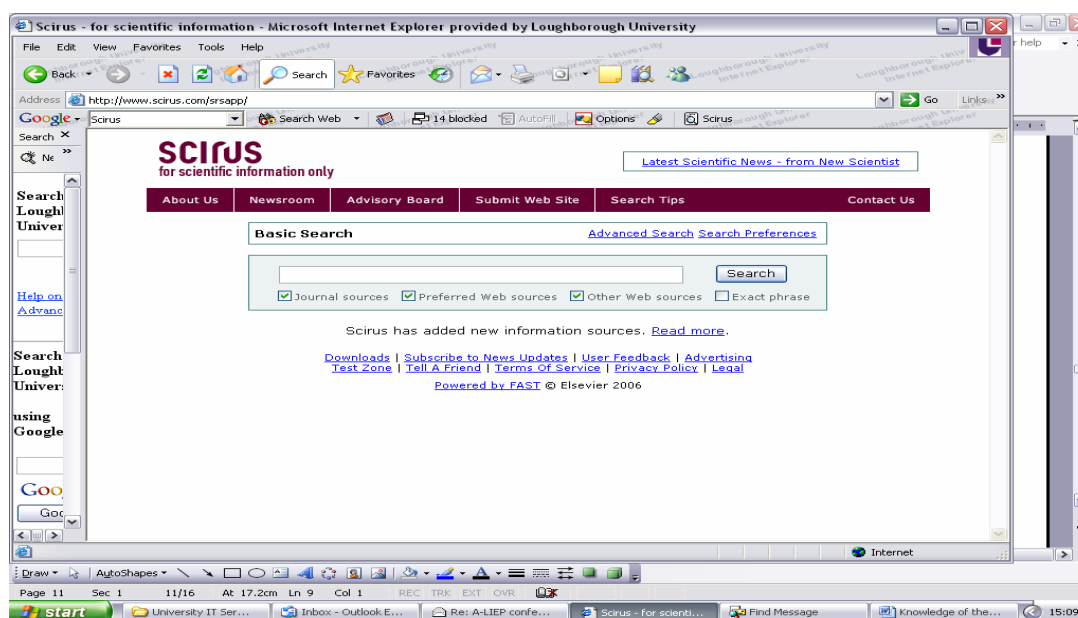
**Figure 10. Social context/role (SCIRUS scientific search engine)**
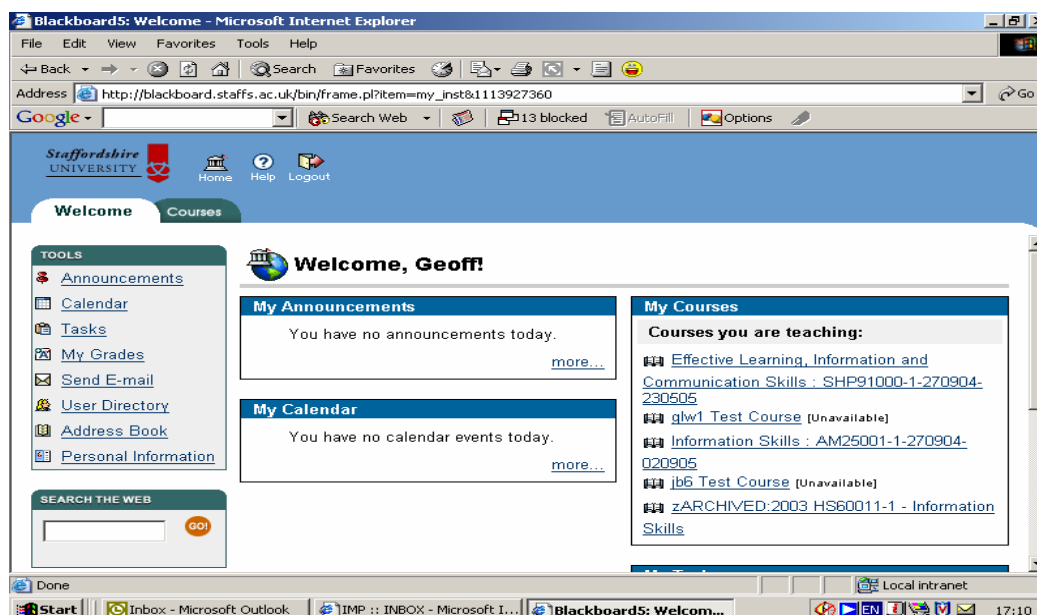


**Figure 11. Role/task related - Virtual Learning Environment (VLE)**

*Use of Knowledge About the Psychological Aspects of IB*

**Cognitive needs**: Response to cognitive needs associated with IB by information products and services are patchy and relatively limited.  Most electronic information products and services tend to offer access that corresponds to levels of knowledge, for example, simple and advanced interfaces.  The latter may also appeal to people who need information for work and need a degree of precision and control to increase the reliability of the search.  Search engines initially only had very simple interfaces due to the, perhaps naïve, belief that the algorithms in the background would do all the IR work without the user having to enter a range of criteria – plus they were consciously trying to reduce the cognitive load associated with exact match systems where knowledge of functionality was essential.

While some cognitive processes are catered for, others are not. Systems generally do not help to define the nature of the problem or map a subject topic and the related domain. WebBrain is one example where entering terms will result in the generation of related terms that may be useful in helping to visualise and conceptualise the domain.

Recent developments in university library gateways have started to address the cognitive problem of 'where should I go for information' bearing in mind that most students enter university unaware of different electronic sources.
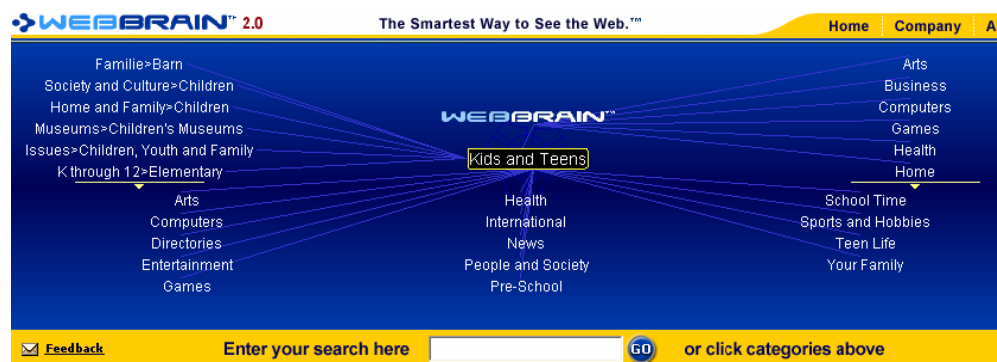


**Figure 12. Defining the topic (WebBrain)**
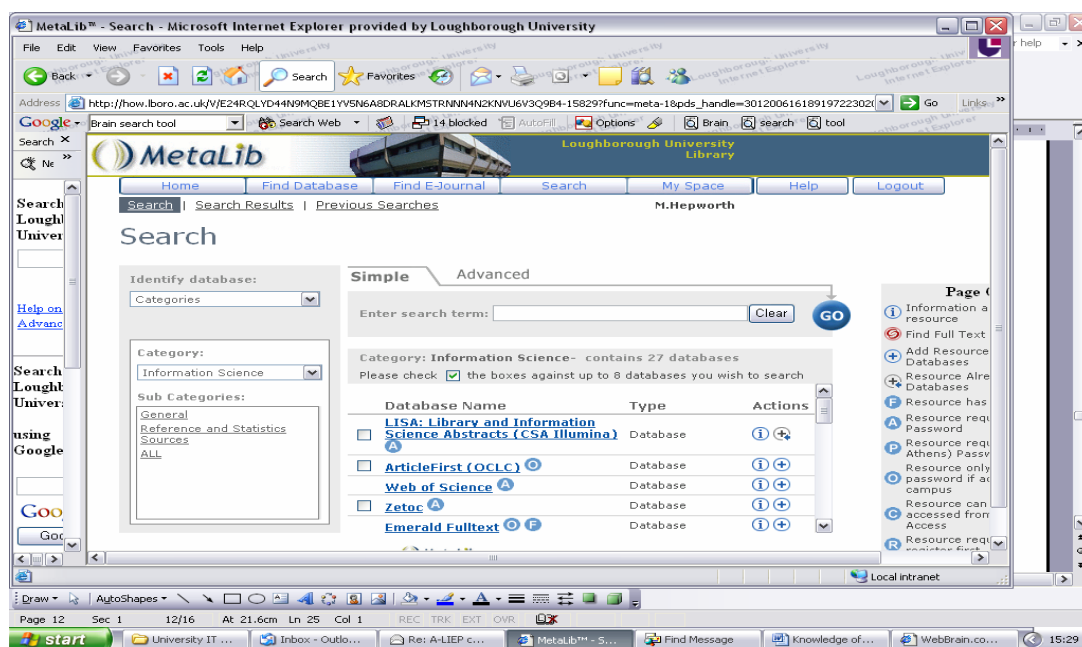


**Figure 13. Identifying resources (Ex-Libris' Metalib)**

A range of potentially relevant databases is then suggested to the user. One common interface can then be used to search several databases reducing the knowledge the user needs to have of individual databases and 'native' interfaces. Currently technological problems and commercial issues still limit this kind of solution.

Other cognitive processes such as 'chaining' (Ellis 1989) have been recognised for some time and services such as the Web of Science and SCOPUS enable users to follow articles using the characteristics of one article – such as the author 'chain' or the citation 'chain'.

**Figure 14. Chaining (SCOPUS)**

A similar notion, but also capitalizing on the fact that it is easier for the person to recognise relevance, rather than specify relevance, is the use of relevance feedback. Thus we see that most IR products offer features such as 'More like this' or 'Find similar'. Being able to dynamically define and search for other characteristics of information artifacts, such as style of presentation, and search for them is limited.

Searchers have been seen to find narrowing and broadening a search in a systematic way difficult (Hepworth 2003, Bilal 2001). Search engines do now allow one to 'search within' previously retrieved documents and hence indirectly refine the search. Teoma uses clustering algorithms to present results according to identified themes. This enables the searcher to recognise and define a sub set of the original query that is really of interest and hence refine the search and so increasing precision and reducing information overload. In the past only expert users of command line online databases could do this. Furthermore they are acting on the users' liking for tips and suggestions from 'experts' – supporting a form of knowledge management.



**Figure 15. Refining the search (Teoma)**

Surfwax enables one to get an overview, 'sitesnap', of web sites. This allows the user to quickly browse a synopsis of the content of sites before choosing the most useful. They also extract potentially useful search terms and make these available to the user, possibly helping them to identify terms for searching – a cognitive process that most users find difficult. Like other systems, it is also possible to build in a searchable thesaurus that may be helpful when searching a body of work concerning a particular subject such as law or education.

**Figure 16. synopses (Surfwax)**

It is generally agreed that to recognise is cognitively easier than to define a topic. This, to some extent, explains the success of Yahoo. The original offering of hierarchical subject headings (Universal Decimal Classifications) with broader and narrower related categories helped the searcher to define and identify what they want. In addition the manual quality control also contributed to the popularity of Yahoo, hence offering a degree of order and authority not offered by the other early internet search tools.
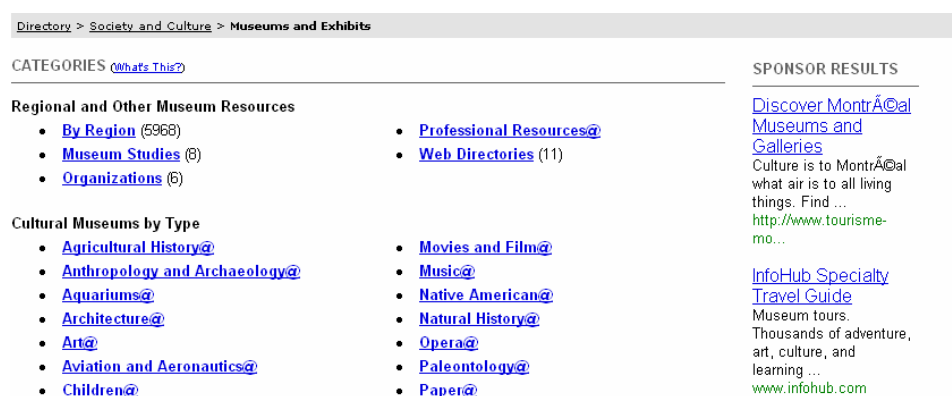


**Figure 17. Browsing subject categories (Yahoo)**

The current online databases have, on the whole, simplified their interfaces and functionality over the last fifteen years. They tend not to proactively help the user deal with common problems such as too much, too little or irrelevant results. Differences in cognitive ability are not catered for, other than simple/advanced which possibly caters to different levels of knowledge. For example no design concessions are made to people with dyslexia. The potential availability of documents in an electronic form should make access easier for people with impaired sight because they can be read using a screen reader that converts text into speech. However, the recent version of Ex-Libris' Metalib gateway is inaccessible for users of the most common screen readers in the UK, JAWS, due to poor coding and the extensive use of Java. Native interfaces are also often inaccessible. One of the few interfaces to online databases that is accessible via a screen reader is offered by Cambridge Scientific Abstract (CSA).

**Connative needs**: few attempts have been made to design information services and products according to the connative needs of the individual. However, presenting information in a way that may be more appropriate for certain learning styles has been done by some search tool providers, for example, Kartoo. In theory, presenting information in a three-dimensional, pictorial, fashion should appeal to the holistic and visual learner. Most systems are designed from the perspective of the serialist, that is, hierarchical and sequential. Whether or not Kartoo developed as a result of people consciously designing for the holist or whether it reflects the preferences of the designers is unknown.
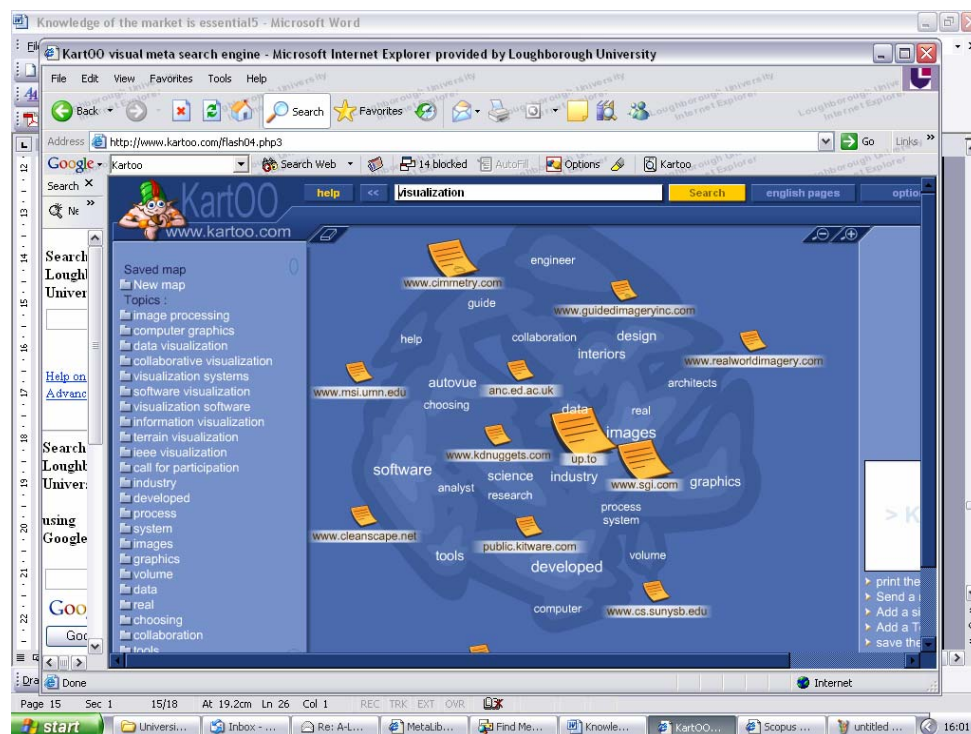
**Figure 18. Kartoo**

**Affective needs**: such as feeling anxiety and confusion during the literature review at the start of a PhD or the insecurity of the first time user are neither registered by IR systems nor catered for.  Some Web based information services do, however, reflect the emotional dimension of the consumer.  For example, the young carers site shown previously (Fig. 8) indicates an awareness of the feeling of isolation experienced by the young carer, as does the MENCAP site.  The MENCAP site, it should be noted, also enables accessibility through the use of signs and sound.

There is therefore an opportunity to personalise information products and services in ways that would help cater for different cognitive, connative and affective differences and needs.

*Use of Knowledge About Behavioural Aspects of IB*

A range of IB behavioural characteristics are catered for by information products and services.  It is difficult sometimes to separate the behavioural from the cognitive since the same terms are used to describe a mental activity and behaviour, such as browsing or chaining.  As mentioned above a number of cognitive activities that are associated with physical actions are supported.  For example, the opportunity to browse subject headings, browsing lists of thesauri or lists of sources such as in the Ovid databases.

Different forms of search behaviour including passive searching, or the need to continue monitoring a situation, is catered for by services that proactively send notice of relevant new information to consumers on whether new articles or new products for sale.  The need to store previous selections of databases, searches and results via a personal 'bookshelf' is increasingly available and meets the behavioural needs of the consumer.

The ability to personalize does, as indicated above also satisfy psychological needs.  The need to share information has been recognised and increasingly services enable distribution of information via email.  Some information services have also recognised the need for discourse between communities of practice, to share tips and to provide emotional support.  As a result, for example, the MSTrust Web site provides a venue for electronic discussion between people with Multiple Sclerosis (MS) and with experts.  This emulates the sharing of information during face-to-face encounters at therapy centres.
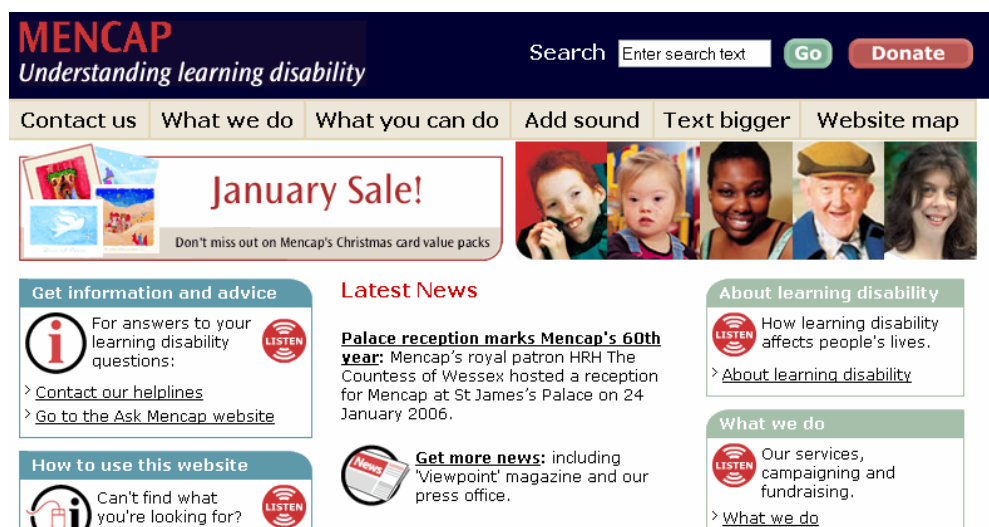
**Figure 19. MENCAP site**



**Figure 20. Personalised spaces (Metalib)**

The need of students to capture citations has been recognised by CSA who have ensured that Ref-works, a database for storing references, is integrated into their database products.

*Use of Knowledge About Personalisation and Inclusion*

It has been shown that personalization can play an important role in terms of enabling the filtering out of unwanted information, adapting information output, updating according to profiles based on their characteristics and in some cases their usage of the service. Personalisation can also enable the consumer's learning environment to be adapted to correspond to needs and wants of the consumer in terms of the use of colour, layout and content. Exactly what needs these satisfy is unclear, perhaps the need for a feeling of control and identity, the need to enter a dialogue and negotiate preferences as well as the aesthetics of creating a familiar, friendly environment. Many services have gone down this path including Google, Yahoo, MSN etc.

The impact of inclusion on the design of electronic information products seems relatively basic and patchy. Existing gateways to academic databases, for example, may not be accessible to people who are blind. A recent study (Khan 2006) showed that the recently launched gateway/portal Metalib, provided by Ex-Libris, was inaccessible to a user of the JAWS screenreader. In addition few concessions are made for people with cognitive difficulties, for example dyslexia. People with dyslexia tend to have difficulty dealing with large bodies of text, correct spelling, and remembering where one is in the search process. However, these implicit needs are not generally supported by current online public access catalogues (OPAC) or online databases or IR tools. Although the spell-check function in Google, 'Did you mean …', is very popular with this community for obvious reasons as it is for people whose first language is not English. The Google search engine and databases such as the Cambridge Scientific Abstracts (CSA) and other Web sites (eg. BBC) have shown that in spite of their sophistica-

tion, accessibility via screen readers for blind or partially sighted people can be developed.  Little, however, has been done to address the needs of people with severe learning difficulties.



**Figure 21. Capturing information (CSA and Refworks)**



**Figure 22. Personalised interfaces (MyYahoo)**

## Conclusion and Recommendations

Two questions were asked at the start of this paper:

- What is known about the information consumer?
- Do current information products and services, particularly those that are electronic, demonstrate a knowledge of the information consumer?

It is clear that there is a great deal of knowledge about the information consumer from a number of fields. Face-to-face information services have also for many years provided services that demonstrate knowledge of the information consumer.  With regard to electronic information services there is evidence of product design that reflects some knowledge of the information consumer.  However, many services are still technologically driven and users have to adapt to representations, albeit made as friendly as possible, of the system.  Individual needs and those that stem from the wider social and local context are, however, only partially catered for.

There does seem to be a need to consolidate our knowledge, to apply current knowledge in the design and development of information products and services.  This will enable us to evaluate these solutions.  For example, do people with severe fatigue really prefer information conveyed in pictorial form? We could then learn from this experience and build on this substantiated knowledge. There is also a need for further research, whether we are developing paper based, hybrid or electronic information products or services. We need to get 'inside the brain' and 'under the skin' of the consumer of information, understand their culture, their learning context, their needs, their choices, current barriers, potentially useful relevant technologies and possible solutions.  In other words, understand the phenomena in society, specific social contexts and among individuals that are connected to how people learn, their IB and satisfying their information needs.  Understanding the consumer of information, as with any other users of a particular commodity, is likely to enable the development and management of successful information products and services.  Even if a service is being provided to a broad cross section of society it is still possible to identify clusters of characteristics that cut horizontally across the community and influence their need for data, information and knowledge.  Furthermore it is possible to identify clusters of needs that run vertically thorough the community.  Knowledge from one area can

sometimes help another. For example making information available and accessible to people with learning difficulties may present solutions that could be appropriate for others, such as people who have difficulty reading. IB research involving people with special needs may be a particularly fruitful area for research since solutions to these extreme situations are likely to provide insights into how to better design in general. We are probably in the early stages of understanding the information consumer and IB. However, in our discipline, a significant amount is already known due to the long-standing role of researching and providing information services. Still, this knowledge needs to be codified and applied more generally. One of our responsibilities should be to ensure that this knowledge is accessible to people outside our own discipline who are involved in the development of information products and services.

## References

ACRL (2000). *Information literacy competency standards for higher education*. Chicago: American Library Association.

Allen, B. (1991). Cognitive research in Information Science: implications for design. In Williams, M. (ed.). *Annual review of Information Science and Technology (ARIST)*, 26, Medford, NJ: Learned Information, 3-37.

Apple (2006). Apple i-pod. Found at http://www.apple.com/ipod/ Accessed 30/01/06.

Bates, M. (1989). The design of browsing and berrypicking techniques for the online search interface. *Online Review*, 13(5), 407-424.

Bental, D. Cawsey, A. Jones, R. (1999). Patient information systems that tailor to the individual. Patient Education & Counselling. 36(2), 171-180

Bilal, D. (2001). Children's use of Yahooligans! Web search engine: ll. Cognitive and physical behaviors on research tasks. *Journal of the American Society for Information Science*, 52(2), 118-136.

Brittain, J. (1970). *Information and its uses: a review with special reference to the social sciences*. Bath: Bath University Press.

Bruce, C. (1995). Information literacy: a framework for higher education. *Australian Library Journal*, August,158-170.

Bundy, A. (ed.) (2004). *Australian and New Zealand Information Literacy Framework: principles, standards and practice*. 2nd edn. Adelaide: Australian and New Zealand Institute for Information Literacy.

Case, D. (2002). *Looking for information: survey of research on information seeking, needs, and behaviour*. San Diego: Academic Press.

Chatman, E. (1999). A theory of life in the round. *Journal of the American Society for Information Science*, 50, 207-217.

Choo, Chun Wei. (1994). Perception and use of information sources by Chief Executives in environmental scanning. *Library and Information Science Research,* 16(1), 23-40.

CILIP (2005). Defining information literacy for the UK. Found at http://www.cilip.org.uk/publications/updatemagazine/archive/archive2005/janfeb/armstrong.htm Accessed 06/10/05.

Cristea, A. & De Mooij, A. (2003). LAOS: layered WWW AHS authoring model and their corresponding algebraic operators. Found at: http://www2003.org/cdrom/papers/alternate/P301/p301-cristea.pdf Accessed 31/01/06.

Dervin, B. (1983). An overview of sense-making research: concepts, methods and results to date. Paper presented at *International Communication Association Annual Meeting*, May, Dallas, Texas, May, 1983. Found at http://communication.sbs.ohio-state.edu/sense-making/art/artdervin83.html Accessed 14/01/03

Disability (1995). Disability Discrimination Act 1995. Found at: http://www.opsi.gov.uk/acts/acts1995/1995050.htm Accessed 30/01/06.

Duman, M. (2003). *Producing patient information: how to research, develop and produce effective information resources*. London: King's Fund.

Eisenberg, M. & Berkowitz, R. (1990). *Information problem solving: the Big Six skills approach to library and information skills instruction*. Norwood: Ablex.

Ellis, D. (1989). A behavioural approach to information retrieval design. *Journal of Documentation*, 45(3), 171-212.

Fisher, K. Erdelez, S. & McKechnie, L. (eds.) (2005). *Theories of information behaviour*. Medford (NJ): Information Today.

Ford, N. Wood, D. & Walsh, C. (1993). Cognitive styles and online searching. *Information Research News*, 4(1), 6-13.

Hearst, M. Kopec, G. & Brotsky, D. (1996). Research in support of Digital Libraries at Xerox PARC. *D-Lib Magazine*. Found at: http://www.dlib.org/dlib/june96/hearst/06hearst.html Accessed 31/01/06

Hepworth, M. (2003). Information Literacy from the Learners Perspective , in *Information and IT Literacy: Enabling Learning in the 21st Century* , Martin, A. Radar, H. (eds), London:Facet, pp. 217-233.

Hepworth, M. (1999) A study of undergraduate information literacy and skills: the inclusion of information literacy and skills in the undergraduate curriculum. *Proceedings of the 65th IFLA Council and General Confer-*

*ence, Bangkok, Thailand, August 20-August 28, 1999*.  Found at: http://www.ifla.org/IV/ifla65/papers/107-124e.htm. Accessed 16/11/05.

Hepworth, M., Harrison, J. & James, N. (2003).  Information Needs of People with Multiple Sclerosis and the Implications for Information Provision Based on a National Survey, *Aslib Proceedings*, 55(5/6), 2003,  290-303.

Hepworth, M. & Wema, E. (2006).  The design and implementation of an information literacy training course that integrated Information and Library Science conceptions of information literacy, educational theory and information behaviour research: a Tanzanian pilot study.  *ITALICS*, 5(1). Found at: http://www.ics.heacademy.ac.uk/italics/vol5iss1.htm. Accessed 30/01/06.

Hert, C. (1997).  *Understanding information retrieval interactions: theoretical and practical implications*.  Greenwich, CT: Ablex.

Hofstede, G.  (2001).  *Culture's consequences: International differences in work related values*.  Beverly Hills, CA: Sage.

IBM (2006). Web accessibility. Found at: http://www-306.ibm.com/able/guidelines/web/accessweb.html. Accessed 30/01/06.

Ingwersen, P.  (1996).  Cognitive perspectives of information retrieval interaction: elements of a cognitive IR theory.  *Journal of Documentation*, 52(1), 3-50.

Khan, M. (2006).  An evaluation of accessibility of the Ex-Libris' Metalib interface using the JAWS screen reader.  Unpublished Final Year Project. Loughborough University: Department of Information Science.

Kuhlthau, C.  (1991).  Inside the search process: Information Seeking from the User's Perspective. *Journal of the American Society of Information Science*, 42(5), 361-371.

Leckie, G.  Pettigrew, K.  & Sylvain, C.  (1996).  Modeling the information seeking of professionals: a general model derived from research on engineers, health care professionals and lawyers.  *Library Quarterly*, 66(2), 161-193.

Marchionini, G. (1997).  *Information seeking in electronic environments*. Cambridge: Cambridge University Press.

Miller, S. & Mangan, C.  (1983).  Interesting effects of information and coping style in adapting to gynaecological stress: should a doctor tell all? *Journal of personality and social psychology*, 45(1), 223-236.

Nicholas, D. (2000).  *Assessing information needs: tools, techniques and concepts for the Internet age*.  London: Aslib.

Nikoi, S. (2006). Living and working in an information dryland: a study of the information behaviour of NGO development workers in the Northern Region of Ghana.  Unpublished PhD, Loughborough University: Department of Information Science.

SCONUL (2004).  The seven pillars of information literacy model.  Found at: http://www.sconul.ac.uk/inf_lit/sp/model.html Accessed 31/01/06.

SENDA (2001). Special Education Needs and Disability Act 2001. Found at: http://www.opsi.gov.uk/acts/acts2001/20010010.htm Accessed 30/01/06.

Spink, A. (1997).  Study of interactive feedback during mediated information retrieval.  *Journal of the American Society for Information Science*, 48(3), 382-394.

Spink, A. Bateman, J. & Jansen, B. (1998). Searching heterogeneous collections on the Web: behaviour of Excite users.  *Information Research*, 4(2).  Available at: http://www.informationr.net/ir/4-2/paper53.html  (Accessed 28 November 2005).

Vakkari, P. (1998).  Growth of theories on information seeking: an analysis of growth of a theoretical research program on the relation between task complexity and information seeking.  *Information processing& management*, 34(2/3), 361-382.

W3C. (1999). Web content accessibility guidelines 1.0. Found at: http://www.w3.org/TR/WAI-WEBCONTENT/ Accessed 30/01/06.

Williamson, K. & Manaszewicz, R. (2002).  Breast cancer information needs and seeking: Towards an intelligent, user sensitive portal to breast cancer knowledge online. Paper presented at Information Seeking in Context Conference, Lisbon, Portugal, 11-13 September 2002. Published in New Review of Information Behaviour Research. Vol. 3, Cambridge: Taylor Graham, pp. 203 – 219.

Wilson, T.  (1999).  Models in information behaviour research.  *Journal of Documentation*, 55(3), 249-270.

Wilson, T. Streatfield, D. & Mullins, C.  (1979). Information Needs in Local Authority Social Services Departments: A Second Report on Project INISS.  *Journal of Documentation,* 35(2), 120-136.