

## **CHAPTER - I**

# **INTRODUCTION**

This study deals with the internet browsing behaviour among the faculties, researchers and Post graduate students of the Universities in Tamilnadu. Before plunging into the empirical data analysis, a brief discussion on the importance of internet deserves due attention. Internet has revolutionized almost all fields of human activities and its impacts on education are quite immeasurable.

Education has all along been an activity, related to a very sensitive area of human relationship. The transmission of knowledge and information has been central to the educational endeavour. In this connection, there is a need to examine the internet using behaviour of professionals, research scholars and students in their teaching and learning process.

Since 1990, the internet usage has drastically been on increase and it has brought a dramatic change in the new environment. An analysis of 'information search pattern' is one of the constituents of the present study.

In the age of technological advancement, the most important challenge before the scholars is to change the mindset to the new pattern of learning. The internet, which is the end product of the

convergence of computer communication technologies, has made a significant impact on the total process of scholarly communication. E-mail and other services related with it have made real time access to information a reality. Resources shared via networking are another opportunity for the professionals to enhance their image among information seekers.

The internet itself has become a vast storehouse of networking information as well as a platform to the for perpetual symposium of human minds. Scholarly discussion lists, mailing lists, bulletin boards, different types of database and online public access to catalogue have made this possible. World Wide Web is a vast network of information. This study attempts to analyze the extent to which the faculty members, researchers and students of the universities in Tamilnadu could make use of the various information technologies to support their teaching, learning and research purposes

Advances in technology enables the learners to learn what they find most relevant to their needs and through these means they find them the most stimulating and interesting. Information technology enables 'the information professionals' to have greater control over learning. It enables learners of internet with the learning material in the manner they find desirable and effective. There is a greater access to information Technology today.

Internet enables the users to have greater flexibility in utilization of various information technology materials. Perhaps the most interesting and encouraging feature of new and emerging technologies is that the cost of various devices are coming down, making possible for greater exposure of these devices for education. Internet helps the users to have greater interactively through audio conferencing, audiographics, teleconferencing, video conferencing, computer conferencing, etc. Further, advances in technology enable one to perform rather a complex problem with relative easeness.

The internet is a global network of computers (and softwares) that are interconnected by cables. It is appropriate to define the World Wide Web (www or web) as an interactive and collaborative information environment that is mainly composed of hypermedia and hypertext documents linked to one another.

The introduction of the Internet and the World Wide Web (WWW) has opened new possibilities and directions for teaching in general and learning in particular. Schwarz and Sutherland (1997) provide the following list of advantages deliver course material via the WWW:

*“It can deliver a mixture of media (text, graphics, and programs).*

*Instructors can customize material easily.*

*Workshops can be updated quickly and easily, and updates are immediately available.*

*It is suitable for distance education courses.*

*It has a "just-in-time" delivery that avoids problems of ordering and storing printed materials.*

*It can be enriched with hyperlinks to supplemental material."*

It is difficult to argue with these advantages. But, how easy is it to locate the desired information and how much material is available for use in doing research.

## **Locating Information**

Lee, Armitage, Groves, & Stephens (1999) state: *"The World-Wide Web is one of the most accessible tools available for academics to use. It allows an easy means of publishing material, it has a low learning-curve, the majority of its browsers are graphical and user-friendly, and above all it is free to most people in Higher Education"*. This tool fits well with the direction of student centered resource-based learning. This ever-expanding resource, however, presents new problems of locating the appropriate information. In this context, there is a need to consider two main approaches for solving this problem: (1) Internet gateways, which are lists of links organized by subject and sometimes annotated,

and (2) Internet search engines, which use computer query languages to search out and index web pages based on key words the user provided. Lee, Armitage, Groves, & Stephens, (1999 ) observe that gateways are a useful starting point because, even though they are not and cannot be exhaustive in their coverage, they are typically run by “*an enthusiast, a subject expert, or, increasingly, a librarian*” who then “*bring their judgment to bear on the sites they link to*”. For certain specific topics or interdisciplinary searches, however, the selectivity of gateways may not be productive and the greater reach of search engines is needed.

Research is an intellectual activity of gathering information needed to solve a problem, which in turn contributes significantly towards innovation, technical change and nation’s progress. The universities are the centers of higher education, training and research. The university libraries play an important role for promoting research in universities and the researchers are the users of pinpointed, exhaustive and up to date information. The electronic or digital information resources are increasingly becoming available due to application of information and communication technologies. As a result, the use of electronic resources particularly, the use of back issues of scholarly journals in electronic format is growing more rapidly indicating a shift in user’s preferences towards electronic resources.

Herman points out that the integration of electronic media into academic work is progressively harnessing the new technologies to scholarly information gathering endeavors and characterizes the information activity of university faculty in an increasingly electronic environment.

A study by Research Support Library Group indicates that the migration of information from paper to electronic media promises to change the whole nature of resources. Within the changing information environment, university libraries need to understand the clients' information seeking behavior and the service demands more care than before. In the research environment, most researchers use digital finding aids to locate both digital and print-based resources. The print finding aids are used by very few researchers and these are mainly in the arts and humanities. As users of digital information, researchers place a very high value on electronic journals, but a much lower value on other kinds of digital resources. Woo observed that while respondents prefer to use online journals compared to printed journals, they prefer print books than e-books. Houghton, Steele and Henty also opine that electronic publication alternatives are supplementing print, not replacing it.

It is thus evident that the doctoral students may benefit most from using electronic resources. Databases will enable them to cover

the literature comprehensively in their fields; electronic communication can help them to build up a network of contacts; online mailing lists will alert them about useful seminars and conferences in their field and bibliographic databases will assist in management of large literature base. At the same time, it is also important to note that the print resources will not disappear and continue to play an important role in supplementing or complementing electronic resources.

So, in this changing information environment, it is necessary to know the researchers' information requirements in different formats to satisfy their needs. In order to understand the preferences towards electronic resources and usage patterns.

## **THE AIM OF RESEARCH**

At education system, technology is main facilitator that provides to contribute system under requiring needed knowledge. Technology provides us to know and follow all issues with the help of the basic item. Internet is a wide range of supporter by providing all contacts requirements and all types of information, searching facilities with its various digital tools. Technology has impact on education with today's contemporary term as Educational Technology. Within this perspective, computers and Internet are one of the part of the educational technology not replacing all technological developments

but it is part of the common concern term. By the way, it is the time to examine what are the attitudes of students' toward Internet that is apart of technology in order to clarify the role of Internet in students' life. Technology especially in education as computers and computer based system requires and concentrates to the how students can learn and use it in an effective way. Forcier, 1996) note that Internet and its multi functions are in the role of delivering information and gathering with easy navigations and paths. Technology and Internet reflect support for new dimensions under the perspective of education especially students' learning teaching cycle.

There are many components of Internet that facilitate the easy, way of doing research: and meaningful learning of students. Grabe, et al., (2001) observe that there is a concrete role of computers and included Internet in society and schools. It is discussable about bringing to educational change through computer developments. Internet provides work speed, work efficiency, work power and the removal of human error from the work activities. With these brief facilities, it is understandable that high information technology affects the students' learning and studying. With well-known advantages of high technology, students can catch the consciousness of importance about technology and main issue is how they develop attitudes toward it. It is questionable how effectively affect and what are the attitudes of students toward internet as a role in education.

As a result, technology changes social life by Internet. By this way learning styles, needs of people have been different directions according to technology. People can create different cultures under the Internet boundaries and can be free to choose whatever person needs and expects at his/her life related to their aims. Knowing is key concept at Internet to achieve individualized and equal learning standards. At the aim side of research, main consideration is to realize the attitudes of students towards internet and being aware of consciousness of students about internet.

## **IMPORTANCE OF THE RESEARCH**

At the side of importance of the research, emphasizing the role of the Internet and students' attitudes toward it has been considered. At today's life, Internet becomes our part of order by providing various functions. On the other hand, it has great function by effecting styles of education and system at all societies.

Internet is also part of the educational technology. Educational Technology is the process of visualizing, simulating, solving educational based problems with the integration of software and hardware. Educational Technology includes help of the computer and internet as hardware. It's a whole process make learning environment as a constructivist approach with any kind of new, creative educational activities for delivering information in an interactive way through

internet. Technology is the way of communicating with students and increasing motivation of students. Maddux, et al., (1997) note that educational Technology has internet-based side as well. Educational Technology is the tool to increase the quality of understanding and learning under the integration of technology and content, learning strategies. In addition to this; having consciousness of educational technology and its main part as Internet requires being more productive, willingness, to add new developments, creativeness for learning, letting individuals has own learning with cooperative and shared intelligence, making meaningful learning based on constructivist approach.

Information technology has/had a great impact on research and development in many academic disciplines, providing a wide variety of resources and many powerful tools to search for resources. Transforming text -based information into a digital format and making it available online has improved information seeking environments for users by overcoming many barriers such as feasibility, accessibility, efficiency in time, space, etc. Recently, as an increasing number of individuals and organizations use online tools as their main channel for information resources, skills in retrieving electronic information become necessary for successful learning at school and performance at work. Rasmussen, (2003) reports that over the years, techniques for information retrieval systems (IR) have been tested and developed, and

modified for online environments in order to support people's needs and inquiries in information seeking activities and the traditional systems have been modified for online environments. However, in spite of a variety of tools , IR systems, especially the online library systems , may not accommodate users' needs, particularly users with certain cognitive styles. Recent studies on user characteristics in user-system interaction claim that individuals are different in their abilities and ways of reacting to a system. Certain types of individuals are flexible and efficient in their uses of navigation tools while others are not. Thus, some may get lost or be disoriented in hypermedia environments due to an inability to understand salient cues or an overload of excessive stimuli through multiple channels. Yet, web-based information retrieval systems i.e. online catalog and databases may not take into account individual differences in cognitive styles. Therefore, it is important to explore the relationship between individuals' cognitive styles and their information seeking behaviors in order to improve the performance of information retrieval systems by identifying factors that influence the information retrieval process.

### **Individual differences in cognitive styles**

Information related activities are heavily subjective and user-focused activities; individuals differ in their needs, value judgments, and styles of seeking information. The use of information system is the

personal decision of the inquirer, depending on situations and contexts. Furthermore, according to Kim (1997), in system evaluation studies, individuals with different characteristics react to systems differently. Particularly, learning style is one of the characteristics that greatly influence performance in systems. Literature suggest that learning styles are the composite of cognitive, affective, and physiological factors that serve as relatively stable indicators of how individuals perceive and respond to their learning environments.

The outline of field-related learning styles suggested by Witkin, Oltman, Raskin, & Karp (1971) is one paradigm of cognitive styles, measuring individuals' perceptual characteristics of information processing. Witkin et al., (1971) claimed that individuals have varying degrees of field dependency. In that cognitive style, three types of learners viz., field independent, field dependent, and field neutral are identified by their levels of field dependency. They have different characteristics in their ways of perceiving, processing, storing, and recalling information; field independent (FI) learners tend to be more analytical and organized in their learning, possessing strong problem solving skills while field dependent (FD) learners are less structured, presenting difficulties in reorganizing information and attending to salient cues. In addition, FI learners are not easily influenced by surrounding environments, separating objects discretely from their backgrounds while FD learners are easily distracted by backgrounds.

Many people interpret that an IR process is a problem solving activity. Kim (1997) focusing on relationships between cognitive styles and individuals' success in retrieving information on the Web have revealed that FI learners with strong problem-solving skills perform more efficiently in a searching process, spending less time. Furthermore, Daniel & Moore, (2000) FI learners feel more comfortable with navigating in multifaceted hypermedia environments while FD learners can be cognitively overloaded by excessive stimuli or dissonant cues contained in multiple channel messages, and thus feel lost in hyperspace. Wang et al, 2001) on the other hand, many studies failed to detect any significant interaction between learning style and students' performance in online learning environments. While many studies did not find any correlation between learning styles and learning achievements in online environments, still a majority of studies find individual differences in information seeking behaviors in online IR systems.

### **Information seeking behaviors**

Studies propose several different models of information processing and seeking behaviors on the Web. In spite of a great variety of architectures of IR systems , when examining the stage of information process, users seem to experience similar stages in their ways of processing in each stage as a whole; yet they are very different

within the context of searching strategies, sequencing the steps, accessing, extracting, and evaluating information. Thus, many researchers agree that technical and operational aspects of systems may not be sufficient enough to explain an IR process. Instead, investigation focusing on users' mental activities such as sense-making (Kulthau, 1993), cognitive, and behavioral approaches (Choo et al., 1997; Ellis, 1997) should be employed in order to deal with the complex nature of user's information retrieval activities (Wang et al., 2000).

Kulthau (1993) interprets information seeking behaviors as a sense making process. Information seeking is a process of constructing understanding from a state of uncertainty. While Kulthau focuses heavily on human cognitive status based on a traditional IR process, Ellis (1997) describes information seeking patterns, balancing both human and system approaches based on the Glaser and Strauss's (1967) 'grounded theory' approach. His model was derived from the observations of engineers and research scientists and includes eight categories; (1) surveying, (2) chaining, (3) monitoring, (4) browsing, (5) distinguishing, (6) filtering; (7) extracting, and (8) ending. Choo et al., (1999) adopted Ellis' version in order to create a behavioral model on the Web by comparing his patterns with Web moves. Through several studies focusing on user behaviors, the researchers agreed that "each mode of information seeking on the Web is distinguished by the nature

of information needs, information seeking tactics, and the purpose of information use". The information seeking process is a personal activity that is situated by individual circumstances. Thus, the variables that influence an IR process depend on a combination of internal and external factors that users might have; familiarity with IR systems is one of the important factors in the success of IR activities along with their abilities in evaluating information.

### **Online Information Retrieval Systems**

Information retrieval systems provide a means of access to databases that contain vast amounts of information, responding to a user inquiry. The objectives of IR systems are to support users to generate search queries and present those results in a format that helps users determine relevant items. The process of IR systems includes item normalization normalize the value of word using stems, selective dissemination of information, document database search, and index database search.

The online library systems are composed of many features such as catalogs, databases, loan services, reserved materials, etc. Usually, resources are arranged by subject areas and groups of related fields. All the features have menu-driven interfaces that allow searching by author, title, author title combination, subject heading, and call number. Certain systems allow Boolean combinations of these;

however, there is a great variety in the types of command for search techniques. Most systems are sensitive to case, word-order, space, and symbols such as slash and hyphen. Certain systems limit the number of characters in the search box. The retrieval rate varies by the amount of data that the systems carry and the number of databases and electronic resources i.e. e-journal the libraries subscribe to or purchase. The number of steps required to complete a search varies by systems as well. Therefore, if students are not familiar with the library systems, “the overhead” to obtain the information they want will increase, not because of the actual searching process, but because of the system analysis. Online library systems serve thousands students everyday as a primary tool for research and academic performance. Graduate students particularly are required to be systems competent in order to produce quality work. However, students often encounter difficulties in using the systems, complaining that unless they intentionally learn how to use the systems, they will not be able to use the systems effectively. Each University has different library systems and online catalogues and the databases that are used most frequently have different ways of operating depending on vendors. Most students do not exactly know how the systems work, but depend on their own instinct, navigating through the systems, and spending a great amount of time.

Recently, due to the popularity of online reviews, it has become an important source of product information for consumers. Many consumers believe that these reviews are credible, because they come from actual users. Some consumers perceived online reviews to be as trustworthy as information on the official product web sites. Wilson and Sherrell. (1993) reports that others believe that consumer-created information is likely to be more credible than seller-created information. Chen and Xie 2008; Lee et al. 2008) note that online reviews may start by one user based on personal usage experience. The initial message may then attract others to post responses, additional information, and other messages.

In spite of encouraging research results found in previous studies Chevalier and Mayzlin 2006 and Duan et al. 2009, only explain when online reviews may benefit companies. The detailed reasons why online reviews relate to sales and how they affect purchasing intention are rarely explored. What information online consumers adopt may explain the reasons why some consumers buy a product and others do not. When online consumers make a purchasing decision, they may only refer to the information that they would like to adopt or trust. Thus, understanding the process of online information adoption may help explore the complicated relationship between online reviews and product sales further.

Given the importance and potential research opportunities of online reviews, there is a need to synthesize previous studies related to the topic and propose a model for further research. The proposed model incorporated the Heuristic-Systematic Model (HSM) into the discussion of information adoption and online reviews. According to HSM, the truthfulness and value of a message can be examined heuristically and systematically. When processing messages in a heuristic mode, people make a quick decision according to experiences or learned knowledge structures. When processing messages in a systematic mode, people evaluate the message content for completeness, consistency, and logics. Heuristic information process is usually faster than systematic information processing. The two information processing models could occur concurrently. Based on these assumptions, HSM could be used to help understand the formulation of information adoption and subsequently help understand how online reviews affect people's attitude toward a product.

## **THE INFLUENCES OF ONLINE REVIEWS**

Chiou and Cheng (2003) note that consumers believe that online reviews are more credible than vendor-generated information, because they are the voices of other consumers. Consequently, online reviews might have a considerable influence on consumers' attitudes toward a

product. Potential consumers may become more curious and pay more attention to products with many online reviews. Park and Kim (2008) opine that large number of reviews helps a product distinguish itself from other products that have not received as much attention. Studies also have shown that a large number of reviews positively affected sales.

Due to the positive relationships found between online reviews and product sales, many vendors sponsor online review forums for their own products. However, not all online review forums are beneficial to sales. The timing to elicit online reviews is critical. Only in the early phases of the lifecycle, when most consumers are unfamiliar with the product, online reviews may help increase sales volume. Delaying online reviews could be a better strategy, only if the number of expert users is relatively large and the cost of the product is low. Amblee and Bui (2008) refer that product brand is another factor that affects the quantity of online reviews. Products of a highly rated brand in the early phases of product lifecycle are more likely to have additional reviews than products of a poorly rated brand.

### **Conformity behavior**

There are two situations when conformity behavior happens. First, a sufficient amount of group pressure may influence what the individual believes. Second, in the absence of objective standards or

accepted authority, an individual will turn to other people for judgments and evaluations. Howard (1963) notes that the individual may ask anyone who is available on that circumstance for assistance.. Thus, group characteristics such as group size and the proportion of the group that have already acted have an influence on the conformity behavior. The conformity effect may explain why a large volume of online reviews could have a direct and rapid impact on users. Consumers may use the majority views as heuristic cues without detailed message processing.

### **Online reviews and online recommendation**

Maes et al. (1999) note that online recommendation usually provides what product to buy to online customers through personalized computer agents based on consumers' needs. Like, online reviews, online recommendation also can increase firms' revenues, overcome information overload and improve their decision making. However, the influencing process and major consideration of online recommendation are different from online reviews.

The major concern of online recommendation is trust, which should put in a higher priority than online reviews. Since firms provide online recommendations, they may provide online recommendations either on the benefits of online consumers or on the benefits of firms (Wang and Benbasat 2005). Trust is closely related to the adoption of

online recommendations. To understand the complicated adoption phenomenon, the relationship between trust and adoption, trust beliefs (Komiak and Benbasat 2006; Wang and Benbasat 2007), providers' credibility (Xiao and Benbasat 2007), the reason to trust (Wang and Benbasat 2008), and the process of trust and distrust (Komiak and Benbasat 2008) are discussed. Most researches suggest that firms should build trust among online consumers before giving them online recommendations.

### **A RESEARCH MODEL FOR THE STUDY OF ONLINE REVIEWS**

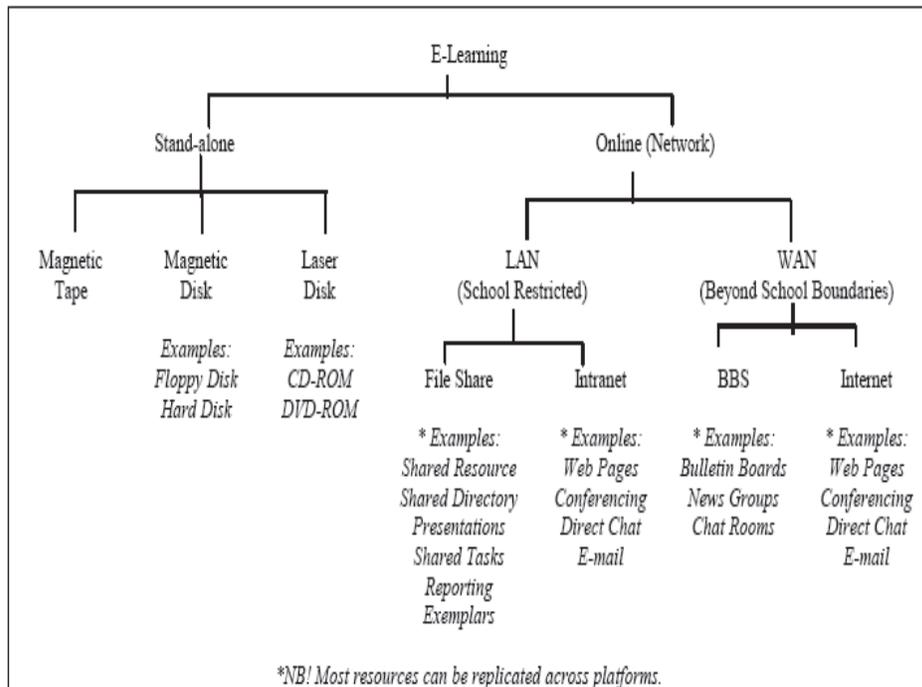
To discover the relationship between online reviews and purchasing intention, this study explores the role of online reviews on information adoption. Information adoption is the extent that people believe the received information is meaningful and usable, after assessing its validity (Zhang and Watts 2008). When consumers adopt different information to form purchasing preferences, their purchasing intention and behaviors may be different. To study the process of information adoption may help to understand the process of formulating preferences for online products and serve as the basis of understanding their behaviors.

### **Systematic processing of online information**

Systematic processing is the use of a comprehensive, analytic method to access, scrutinize, and integrate all useful information to form their judgment (Chaiken et al. 1989). In previous researches, systematic processing is often assessed by argument quality, which measures the strength or plausibility of persuasive argument (Eagly and Chaiken 1993; Sussman and Siegal 2003; Zhang and Watts 2008). Argument quality may also include checking the completeness, consistency or accuracy of information (Sussman and Siegal 2003). The assessing of argument quality for online information is the same as offline information. Online consumers can judge the validity of online information by checking the logical arguments, comparing to common sense, and mapping to own knowledge. The more argument quality online consumers perceived in the online information, the more likely they will confidently adopt the information and follow the suggestion of the information (Eagly and Chaiken 1993; Zhang and Watts 2008).

## **KEY CONCEPTS**

E-learning covers a broad area within ICT Education and comes in many media formats as seen in Figure 1



**Figure 1. Media Formats of E-Learning**

Today the most common format for e-learning is the Internet, which itself is a broad field of study as outlined by Palmer (2001, p. 314):

The Internet offers a new range of educational technologies to educators that includes: electronic mail, file transfers, the multimedia capability of the World Wide Web, low cost desktop videoconferencing, online, interactive tutorials, real time group conferencing, remote access to laboratory experiments and 3D interactive modeling.

E-learning involves the use of computers to aid in the learning process. If a computer is standalone, then we have Computer Learning (CL) that can be used as either Computer Based Learning (CBL) or Hong et al., (2001) Computer Assisted Learning (CAL). CBL involves the computer taking the place, for the most part, of the teacher, and is popular in distance education. CAL involves a teacher using e-learning “to supplement face to face teaching”. This also applies to computers networked to the Internet with web page access. As with CL, Online Web Learning (OWL) can either be Online Web Based Learning (OWBL) or Online Web Assisted Learning (OWAL). Figure 2 demonstrates the parallel relationship between CL and OWL.

## **THEORETICAL FRAMEWORK**

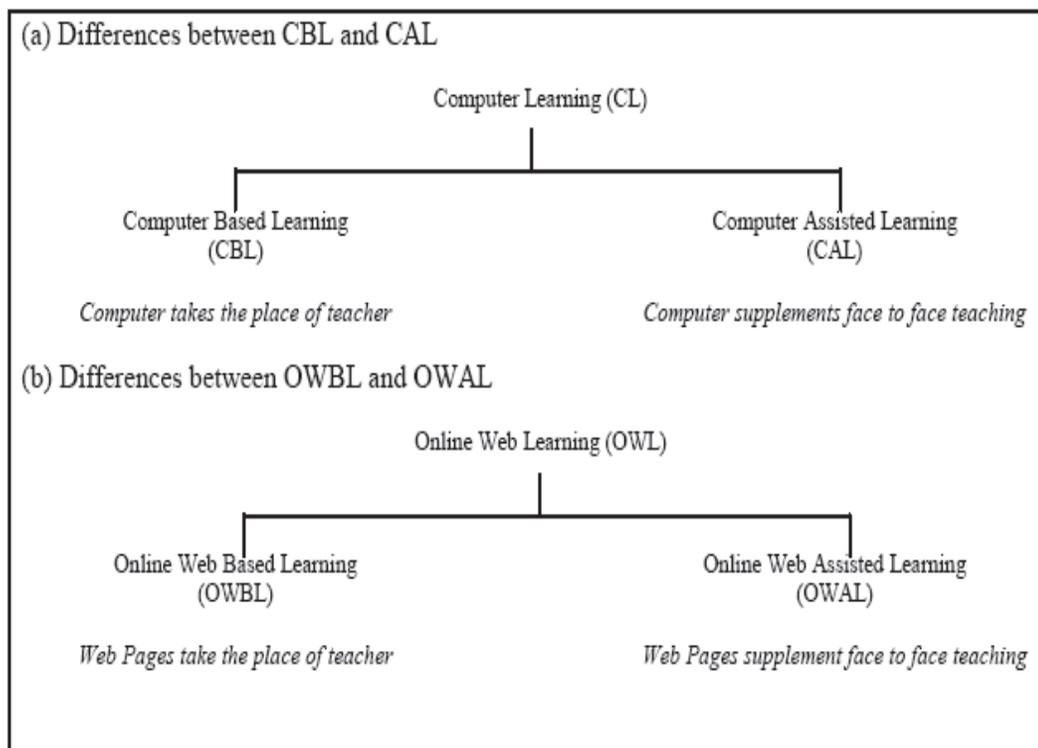
### **E-Learning**

In a longitudinal study spanning 4 years at Deakin University Palmer and Bray (2001) found that “Student computer usage was rising... Student access to the Internet was rising ... Student usage of the Internet was rising ... The proportion of students with access to the Internet at home was rising ... Student usage of email was rising”.

Woodrow (1994, p. 309) makes the statement, “it is of critical social and educational importance to research the circumstances under which student and teachers feel comfortable learning about and

utilizing the computer as an essential tool for learning”. Another study, *100 E-Learning: A Study on Secondary Students’ Attitudes towards OWAL* Hong et al. (2001) reveals that e-learning is becoming progressively an integral part of the secondary school’s curriculum learning processes:

Schools from elementary levels to universities are using the Web and Internet to supplement classroom instruction, to give learners the ability to connect to information i.e. instructional and other resources and to deliver learning experiences.



**Figure 2. Comparisons between Computer Learning and Online Web Learning**

Alessi and Trollip (1991) make a number of statements and recommendations about developing good e-learning material for students that appear pertinent for today's publishers of Open Was Learning. They consider the following good publishing elements:

- Text Presentation – “A critical factor affecting the quality of a e-learning tutorial is the length of information presentation”,
- Graphics and Animation – “Pictures, especially animated ones, capture attention more than text”,
- Colour – “Colour is effective for attracting attention”,
- Text Transitions – “It is difficult for a student to distinguish a change in display that represents a continuation, from one that represents changing to an entirely different topic, the equivalent of changing chapters in a book”,
- Help Menus – “Students ... frequently need help of two types, procedural and informational”,
- Questions and Responses – “A lesson which presents information without demanding interaction with the student will not be successful”, and

- The Response Economy – “The amount of typing or other physical activity required to produce a response should be as little as necessary”.

Alessi and Trollip’s work was used in the development of the OWAL activities used in this study.

## **Attitudes**

Burns, (1997) note that educators have known that learner attitudes and responses are interconnected and that a positive correlation exists between the two. Burns’s study supports this with the statement that “attitudes are evaluated beliefs which predispose the individual to respond in a preferential way”. Educators therefore have had the dynamic task of improving the curriculum, its delivery and resources in an attempt to fuel positive learner attitudes knowing that, in turn, it would improve learning outcomes.

Massoud (1991) points out that the interconnectedness of attitudes and responses also exists in ICT education. However, as a result of ICT emerging across all facets of education, anxieties are rising, especially among staff. Massuod (1991) states that, “the existence of computer anxiety is often based on computer attitudes”. Consequently, it is suggested that schools identify and address individuals’ attitudes so that anxieties can be kept to a minimum while

at the same time allowing learning to progress and be cultivated in a positive manner.

Additionally, prior ICT experiences influence attitudes towards ICT. Shashaani (1994) states that, “recent empirical studies have shown that computer experience is positively related to computer attitudes”. Woodrow (1991) also points out that “awareness of student attitudes towards computers is a critical criterion in the evaluation of computer courses and in the development of computer-based curricula”.

### **Cognitive style and attitudes**

There are numerous clear theoretical advantages of online instructional methods. Firstly, such methods provide for flexible learning, meaning that the student can progress at his or her own pace; secondly, such methods provide the facility for student centred learning, making the student responsible for his/her own learning. Finally, implementing online methods of instruction, means that material can be made available on demand from anywhere at any time provided the learner has the facility for taking advantage of such a system.

A variety of different online learning paradigms are now being utilised across higher education and therefore it would now seem timely to evaluate such systems in terms of their effectiveness. Three online methods are utilised. These are a literature search, an online discussion and an online assessment system. These three methods can be chosen as being representative of the types of tasks students typically engage in through the medium of e-learning. It is also suggested that individual difference factors such as attitudes towards computer-based learning and cognitive learning style may be relevant to include in this investigation.

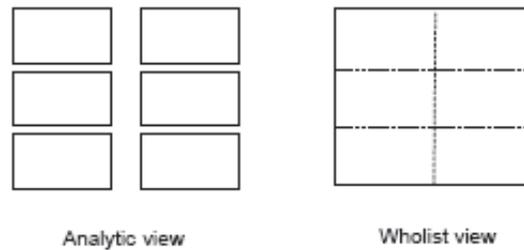
## **Cognitive Style**

Riding (1991) suggested that all cognitive styles could be categorised according to two orthogonal dimensions. These are the wholist-analytic dimension and the verbaliser-imager dimension.

### *Wholist-analytic style*

Wholist-analytic cognitive style can be defined as the tendency for individuals to process information either as an integrated whole or in discrete parts of that whole. In practical terms, analytics are able to apprehend ideas or concepts in parts, but have difficulty integrating such ideas into complete wholes. However, wholists are able to view

ideas as complete wholes, but are unable to separate these ideas into discrete parts (Figure 1).



**Figure 1:** Analytic and Wholist views of information (Riding, 1991)

### *Verbaliser-imager cognitive style*

The verbaliser-imager cognitive style can be defined quite simply as an individual's tendency to process information either in words or in images. Verbalisers are superior at working with verbal information, whereas imagers are better at working with visual and spatial information.

### **Online literature search**

Searching for information sources online is now a skill with which most research scholars have to be familiar. Previous research suggests that the skill of searching for information is in some respects related to cognitive style. For example, cognitive style differences have been noted in searching for information in a database and this topic was investigated by Ford, Wood and Walsh (1994) and Wood, Ford and

Walsh (1992). In these studies, searching strategies were classified in terms of relative breadth or depth. A high usage of the operator 'OR' to link keywords represents a relatively broad strategy, whereas a use of 'AND' a relatively narrow strategy. Their results showed that wholistic learners displayed a broader approach than analytic learners, in that they made significantly greater use of OR in searching. However, they also used more truncation than analytic learners, and made more use of 'AND', a finding not in accord with their hypothesis. While the issue of the use of different search strategies between individuals with different cognitive styles seems unsettled, the success rate at searching for information may yield more useful data. It is this issue that the current study seeks to address.

### **Online discussion**

It would seem to be generally accepted that educational environments where students interact in seminars leads to good collaborative learning. Research shows that there are clear educational advantages to be derived from collaborative learning activities Slavin, (1996). When students work in groups and small teams, the interactions and activities frequently involve higher order and reflective thinking. Face to face talk therefore theoretically assists students to share knowledge and interactions often lead to the creation of new ideas. However, the issues surrounding online discussion are perhaps

less well understood. In a traditional face-to-face environment, support for learners can be provided immediately. Yet, with online systems, support for learners in the form of interaction with instructors is not always so immediate.

Furthermore, in computer-based learning environments, the language through which new ideas are expressed are reduced to print and graphics and interactions between learners and instructors are reduced to levels that can be supported by the technology. Also, in online discussion sessions, other factors such as non-verbal cues are removed, making discussion between participants more difficult.

Given these factors it is pertinent to investigate whether attitudes to educational technology and cognitive style are useful learner characteristics to take into account when designing learning environments that include an element of online discussion. This is principally because cognitive style also has a bearing on the way in which individuals interact socially. Riding, (1991) refer that verbalisers are typically more outgoing than imagers, therefore it is theoretically possible that verbalisers will be less reluctant to engage in online discussion compared to imagers.

## **Online assessment**

Online assessment may be defined as a method of using computers to deliver and analyse tests or exams and such systems have been around since the seventies. Yet in many ways the internet provides a new way of delivering assessment material. This is because it is independent of time and place. Assessment can essentially be divided into two types. Firstly, formative assessment at the end of a period of study, whereby the results are used in order to determine examination outcome. Secondly, summative assessment, which is an assessment which may be administered during the presentation of a course as a means of checking on student learning. Furthermore, students may also assess themselves periodically in order to check on progress.

Within any assessment system question types may vary. For example, questions may include short essay type questions, true or false type questions, or multiple-choice questions. There are many potential advantages of online assessment to learners. For example, tests are available on demand and at any time. Furthermore, computerised assessment systems give immediate feedback to the user; therefore users learn by taking the test. However, online assessment systems also have a drawback in that students who perceive themselves as possessing poor IT skills may be disadvantaged. Therefore a study of individual differences in attitudes towards computer-based learning is relevant here. Riding and Read, 1996) note

that individual differences in approach to different question types have been found between individuals possessing different cognitive styles, and therefore it is possible that this may have an impact on the success with which they engage with online assessment.

Teaching and research in higher education are increasingly dependent on primary and secondary sources that are available in forms other than traditional paper-based books, journals, and manuscripts. To reflect the diversity of materials, especially in digital form, and their importance to academic pursuits, it is increasingly common to refer collectively to these sources as “assets” of a college or university, or of the academy in general. The notion of “managing digital assets” is also surely meant to allude to the realm of finance and insurance, and to suggest that we are operating in a realm where change is rapid, and where prudence, skill, imagination, courage, and a good deal of risk taking are coins of the realm. However, it could be noted that plainly at the outset that the digital assets that are the subjects are resources for research and teaching in higher education, and that the aim of academic institutions in managing them is to advance knowledge and improve education.

There is a need to emphasize, as a corollary principle, that these assets—these resources for research and teaching—are the lifeblood of the academy. It could be noted that not every college and university

recognizes the centrality of their research and teaching resources in explicit declarations like mission statements or even in practical day-to-day decision making. Pelikan identified four core and enduring functions of higher education: research; teaching; the dissemination of knowledge through publication; and the preservation of, and access to, the scholarly record in libraries and archives. The latter two functions—dissemination and preservation and access—refer to the life cycle of scholarly resources that are used and produced in teaching and research and are the objects of scholarly communications.

If, as seems evident, scholarly resources in digital form are playing an increasingly important role in scholarly communications, then one must also acknowledge by way of introduction, that the allocation of roles and responsibilities for managing these resources will be equally important and will shape the future of higher education. These roles and responsibilities are in flux and the future is uncertain, but as we plan for the future, we might usefully turn for comfort and lessons to the history of the development of other communications media, such as print, with which we are more familiar. One of the primary theses is that print, which we now all but take for granted, did not simply emerge in the conventional form that we now know it. The development of printing, according to Johns, was nothing less than the working out of a complex “taxonomy of practices labeled piratical—from piracy itself, through abridgement, epitomizing, and translation,

to plagiarism and libel,” and the allocation of trust and credit to some of these practices and distrust and discredit to others.

In its narrow formulation, open access publishing would disrupt the current system by shifting the burden of generating revenue from the demand side through widespread use of subscriptions, to the supply side “by charging authors or their sponsors for dissemination, or by some kind of institutional subsidy,” making use cost-free. Such a shift would have the benefit, in theory, of putting the principals—the scholars—back in the economic driver’s seat, and it would have the broad public policy benefit of lowering the economic barriers to reading and using the publications. Discussion of this idea has quickly revealed that in very few disciplines do scholars have sufficient funds from grants and other sources to pay author fees, and that there would be an administrative nightmare if academic institutions that are already financially strapped for funds were to massively reallocate budgets from library acquisitions and other sources to support author fees in any kind of fair and equitable fashion. Publications adhering to this model of open access will undoubtedly continue to be created and survive, but they will probably be limited in number unless and until sources of supply side revenue can be found other than grant support, and that do not require fundamental administrative and financial overhauls of our institutions.

A broader approach to open access recognizes these practical difficulties and focuses on other ways to lower the barriers to access, such as by encouraging publishers to make articles freely accessible after a limited time during which they exploit subscription revenue, or by embracing the older call for authors to “self-archive,” that is, to retain rights to make their articles openly accessible in preprint and post print form. One theory is that if enough authors are self-archiving, then new services could arise to collect, aggregate, evaluate, and present these articles to users. At some tipping point, as yet undetermined, these services might serve to challenge and undermine the economics and inefficiencies of the current system of publication.

The key barrier to a complete transformation following this scenario, however, is an asset management issue. Does it make sense for systems of knowledge to be built upon the fragile infrastructure of a network of personal Web sites that are subject to personal whims, not to mention the migratory habits of individuals? Institutional repositories might help, especially if they were to collect other related faculty output, such as underlying data and teaching materials.

Important as the serials crisis is, and as pregnant as the discussions about open access alternatives may be, there are even larger forces at play. These are only partially revealed in the system of scholarly publishing, and may even be obscured by a narrow focus on

pricing and open access. First, whatever happens with open access, it is not likely to result in a uniform, utopian solution. As Jason Epstein has written, “the global village green will not be paradise. It will be undisciplined, polymorphous and polyglot.” The academic world is and will undoubtedly remain highly pluralistic. Just within the domain of publishing, traditional journal production will remain with us for some time and the shift of those journals to electronic forms of dissemination is likely to continue.

The investment of both Google and the Internet Archive in re-engineering the digitization process and of significantly reducing the costs so that each could undertake its own initiative means that the vision of digitizing the holdings of our largest research libraries is not only imaginable but may actually be within reach. These initiatives and the related and competitive projects they stimulate could be incredibly valuable for the public and for the academy in particular. But that Google, Yahoo, and Microsoft are undertaking this effort, not for philanthropic purposes, but for business reasons, means that higher education at least its library and publishing arms, which are responsible for collecting, preserving, providing access to, and disseminating content of scholarly significance now has formidable for-profit competitors with considerable resources and their sights set squarely on key parts of the higher education business.

The outcomes are far from certain. The relationships between the work of the Open Content Alliance and that being undertaken in Google's library projects are unclear. Publishers and authors are now suing Google for copyright infringement in the arrangements it has made with libraries. Moreover, in making secret deals, and failing to articulate coherent and collective public interest objectives, the Google libraries may well have squandered a substantial part of the public trust, which they and their institutions have taken decades, even centuries, to earn. But let us leave these concerns aside and assume that, one way or another, large-scale digitization of the kind envisioned by Google and its partners and by the Open Content Alliance takes place.

Among the big strategic questions for higher education would be how scholarly communications should be organized in such an environment. These questions have scarcely been identified, much less aired and fully discussed.

### **The “Processed” Publication**

There is a need to draw attention to an idea that massive digitization and open access are not ends unto themselves. The central issue is whether scholars can advance knowledge in ways that were not previously possible. Scholars need to make use of digitized and open access materials. Esposito's insight is that at the highest level of

generality, what unites our interest in digitization and open access in a digital world is that the material becomes “processable,” or subject to computational processing. That is, the growth in the market of readers is not among groups of humans, but of machines, which are programmed to index, manipulate, mine, aggregate, decompose, and build up scholarly and other forms of content by algorithm. It is this machine “processability” that makes digitized objects and open access materials most valuable to scholars.

## **Intellectual Property**

The second point about intellectual property. The temptation is to throw up one’s hands in despair at the massive cost of meticulously clearing the rights of every rights holder in an object that is to be made “processable,” and either to abandon digitization of copyrighted material altogether, or to engage in efforts—also costly but often not accounted for—to stay under the radar of the copyright police. These approaches stand in contrast to a growing set of initiatives, including Mellon-funded initiatives such as JSTOR, ARTstor, Columbia International Affairs Online (CIAO), the American Council of Learned Societies (ACLS) History E-Book Project, the BiblioVault project at the University of Chicago, the Electronic Enlightenment at Oxford University, and New World Records, all of which demonstrate that communities of users and publishers can find ways to create the

needed trust and goodwill and agree to overcome the costly barriers of copyright to create highly useful, digitized and “processable” collections of research and educational materials.

For the enterprising and clever, there are countless business opportunities here to be tried and exploited. To pave the way for such entrepreneurial activity and economic growth, intellectual property, and the bundles of rights and duties that surround it, may need to be reconceptualized, but not in the terms of the already stale and vitriolic debate about copyright and “copy-left.” Rather, there may well be a need and opportunity to learn from Adrian John’s history of print and to recalibrate licenses, intellectual property rights, and even copyright law itself against a richer taxonomy of uses appropriate to digital technologies, many of which may currently be regarded by design or default as “piratical.” Google, for example, seems prepared to respond to the infringement suits by arguing that creating an index is a fair use of copyrighted material. This is a clever and enterprising argument and might be plausible if only Google swore off other uses of the copies of copyrighted materials it would make, which it is apparently unwilling to do. Because machine indexing has become such an integral part of the infrastructure today for serving the US constitutional principle of promoting “the progress of science and the useful arts,” legislation that redefines such indexing as legitimate and provides the necessary

ancillary protections may well be warranted—and preferable to an ambiguous court decision in a fair use case.

## **Search**

There is need to highlight the new and expanded search and research capabilities as one example of the type of entrepreneurial activity that is needed to build the necessary infrastructure for future scholarly communications. Google's indexing of full text in its library projects would be generated by optical character recognition (OCR) and could greatly expand and facilitate basic searching and retrieval. Serious thought now needs to be given about ways that Google and other search engines' technologies could be used to achieve the metasearch and other service objectives scholars are trying to achieve, sometimes at great expense, in the catalogs of our local systems. However, one also needs to be thinking imaginatively beyond the local system and traditional library catalogs.

The sheer volume of digitized material, for example, would require implementation of much more sophisticated indexing, searching, and filtering techniques, including broad application of computational linguistic and related statistical techniques as well as sophisticated techniques for filtering based on markup and thesauri, which would relate results to discipline-based concepts and concerns. Above all, there will be growing demand for mechanisms to link search

results flexibly across systems in ways that resemble but will be fundamentally different from metasearching across catalogs. To provide a simple example: how easily could one search for related materials in ARTstor, and JSTOR, and, say, Readex NewsBank? Google or Yahoo may be able to respond to a basic demand for cross-searching, but as scholars become more sophisticated in their use of these technologies, their needs will become correspondingly more specialized and discipline-specific in ways that it will likely be unprofitable to address for commercial companies aimed at the mass market. Search and information retrieval is a growth industry not only in the general economy but also for scholarly communications. Solutions that the large search engines cannot supply will have to come from search applications developed within and for the academy, and finding these solutions should be a high priority for the academy, its libraries and publishers, to address.

## **Research Methods**

There is need to highlight the advance of new discipline-based research methods. The development of search technologies will drive the scholarly use of massively digitized resources, but scholarly use will also shape and guide the development of particular technologies and applications for specific disciplinary pursuits. Disciplines will need to develop new and specialized methodologies and informatics of

standards and practices to identify, mark up, and explore the large volumes of digital information with which they each need to work: economists with tabular data in government publications; literature scholars with literary texts from various genres; social historians with contemporary accounts of various aspects of social life; ethicists with case studies of ethical dilemmas; art historians with evidence about the context of artists and their art; and so on. As scholars in various fields of study develop experience with these materials, the disciplines and subdisciplines will need to develop and codify practice.

### **New Publication Emphases**

As scholars begin to formulate how the use of databases and newly digitized materials could advance knowledge in their fields and begin to set disciplinebased standards for how these materials should be organized for systematic, machine use, then they will likely need to pave the way for three further types of intensive scholarly activity that will increasingly dominate scholarly publishing:

- Editorial activity will shift, field-by-field, to the markup and online annotation of digital or digitized source materials to shape them for scholarly activity and machine processability in particular disciplines.

- Given appropriately edited and marked up resources, and proficiency in new methodological techniques, scholars will begin to generate and report results based on research using these methods. These reports will refer systematically to digitized sources and may incorporate them in various ways. They will make increasing use of the power of the computer to illustrate and represent ideas graphically; to simulate physical, biological, and social systems; to engage the reader interactively; and to document ideas encyclopedically with data and other evidence that are portable and recombinant in ways that allow arguments to be tested, proved, and extended. Complex works with these features will be the natural descendant of the monograph and the journal article, but will fit naturally in neither category.
- And, as scholars learn new ways of interpreting evidence and the scholarly record, they will be learning new ways to write and will need tools and processes to assist them and to make dissemination throughout the academy easier and affordable in discipline-appropriate ways.

### **New Collection Emphases**

There is a need to highlight as strategically crucial for the future of scholarly communications is the need for dramatic shifts in the emphases in collection building in libraries. If large quantities of

published materials are available online through some common interface, it will be increasingly hard to distinguish libraries based on their holdings of these materials. Instead, libraries and their institutions will increasingly be distinguished by the special collections of rare and unique materials that they hold and by the scholarly services they provide for these materials, especially in conjunction with similar collections at museums and archives locally and around the world. Special collections are often inaccessible or underprocessed, and the forms of description do not integrate well with other kinds of catalogs. Several institutions, have been working together in recent years to develop innovative methods of appraising special collections for processing; others to simplify the cataloging.

Perhaps even more important is the need for more aggressive development of collections in new media. Recent and contemporary culture both here and abroad is documented in audio recordings, in still and moving images, broadcast media, and in various exclusively digital formats, such as large-scale, machine-generated scientific data sets, geographic information systems, simulations, Web pages, and weblogs. Scholars will increasingly need access to these materials for teaching and research. Concerted action is especially needed among libraries to ensure that these materials are actively and

comprehensively collected and processed for scholarly use. Economies of scale, and the complexities associated with intellectual property rights management may prove that individual libraries need more centralized, collaborative mechanisms to achieve these objectives.

### **Interaction between Digital Library and Learning Management Systems**

There is a need for more seamless interaction between digital library, publishing, and learning management systems. There is a pedagogical trend to incorporate the use of primary sources and research methods more deeply in the curriculum of higher education, and this trend will likely continue, but will also vary by discipline. As scholars in different fields gain experience with and develop discipline-based methodologies for using large-scale digitized content, as well as special collections and new media collections, they will need to incorporate the material and train students in the research methods. Demand will grow for deepening connections between digital library systems used for managing digital assets in various forms and combinations of licensed, digitized, and open access materials and learning management systems such as Sakai. Conversely, at least some of the content specifically created for teaching and learning will need to flow to digital library systems for long-term management and preservation. Essential for the effective management of the flows of content among digital library systems and between digital library

systems are mechanisms, like Shibboleth, for building and expressing levels of trust between owners and users of the digital assets.