

## Chapter 9

# Demographics, Socio–Economic and Cognitive Skills as Barriers to Information Seeking in a Digital Library Environment

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### ABSTRACT

*The chapter considers the importance of demographic and socio-economic factors as well as cognitive skills to information seeking in a digital library environment. Demographic factors such as age and gender were considered. Younger adults were found to respond positively to the demands of information seeking in the digital environment while their older counterparts are still struggling to come to terms with the changes. In the same vein, studies have revealed that the value placed on technology by men and women varies. While men express high level of confidence in navigating the digital environment, women still suffer low self-confidence in doing same. Identified socio-economic factors that also constitute a barrier to information seeking in a digital environment include income level, level of education, non-availability of ICT infrastructures and epileptic power supply especially in Africa among others. Unwillingness to see one's needs as information needs, inability to articulate one's information needs, unawareness of information sources, low self-efficacy, poor search skills among others were identified as cognitive barriers to information seeking in the digital environment. Based on the findings of this chapter, the study recommends that for persons who are adjudged to be the older generation, it is imperative for them to acquire requisite ICT skills that will make it easier for them to navigate the digital environment. There is also a clarion call on African leaders to provide infrastructures that will enable ICT to thrive as the digital environment is fast replacing the hitherto traditional one.*

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## **INTRODUCTION**

Demand for information is traceable to its importance and relevance to production of goods and services. The relevance of information to human existence has positioned it as a factor of production in addition to land, labour and capital. Organizational decision making and management in the 21<sup>st</sup> Century depend on information. In social parlance, treasure is sought for its worth, none seeks rot. Information is treasure sought after by many. Military operations and intelligence reports depend on information. Investments in shares, oil and gas explorations even marriages require information for decision making process. Kaye (1995) explained that good information is essential for effective operation and decision making at all levels in businesses, affirming that managers use of information in decision-making processes (strategic and operational).

The progressive speed of information acquisition, processing and dissemination has given birth to information society referred to as a society characterized by a high level of information intensity in the everyday life of most citizens, in most organizations and workplaces; by the use of common or compatible technology for a wide range of personal, social, educational and business activities, and by the ability to transmit, receive and exchange digital data rapidly between places irrespective of distance (<http://whatis.techtarget.com/definition/Information-Society>).

Furthermore, an information society is such in which the creation, distribution, and manipulation of information has become the most significant economic and cultural activity. It has therefore become pertinent to study barriers to digital information seeking considering the transformational capability of information accompanied by technologies which have given birth to the digital age. Digital libraries house millions or innumerable collections in the virtual space with the aim of meeting the information seeker's need but the aim may be truncated by certain intervening variables conversant with users.

These intervening variables are the focus of this discourse. We shall critically examine demographic, socio-economic and cognitive barriers that may limit information seekers from maximally benefiting from unlimited access to the information commonwealth that characterizes the 21<sup>st</sup> Century. Information rich and information poor are a new way of classifying nations and people around the world. The rich have greater access to available right information and are capable of using them to achieve economic, social and other survival needs, while the poor are limited due to one intervening variable or the other which serve as barrier to ease of access and use.

## **INFORMATION NEEDS AS PRECEDENCE OF INFORMATION SEEKING**

Information seeking is preceded by information needs. Without a specific need information seeking process will not have proper definition and seeker behavior that typifies the information seeking process. Thompson & Zeynep (2004) conceptualized need as a discoverable matter or fact. He further asserted that needs are objectives in the sense that they are what one must look for to support his or her profession. Needs are a matter of priority, what we need is overriding reason. Information needs could be seen as demand (requirement) and want (desire). Haruna and Mabawunku (2001) explained that needs arise when the state of possessed knowledge is less than what is needed to deal with some issues, and that information needs are diverse, consistently changing and not amenable to generalization. The uses of information vary among individuals, groups and society. Krikelas (1983) defined information need

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as the recognition of the existence of uncertainty in decision making. Information need is also referred to as the extent to which information is required to solve problems as well as the degree of expressed satisfaction or dissatisfaction with the information (Ehikhamenor, 1990).

According to Taylor (2007), information need has four levels:

- The conscious and unconscious need for information not existing in the remembered experience of the investigator. In terms of the query range, this level might be called the “ideal question” — the question which would bring from the ideal system exactly what the inquirer wants, if he could state his need. It is the actual, but unexpressed, need for information.
- The conscious mental description of an ill-defined area. In this level, the inquirer might talk to someone else in the field to get an answer.
- A researcher forms a rational statement of his question. This statement is a rational and unambiguous description of the inquirer’s doubts.
- The question as presented to the information system.

Miranda and Tarapanoff (2008) defined information need as a state or process started when one perceives that there is a gap between the information and knowledge available to solve a problem and the actual solution of the problem. Information competencies are defined as the capabilities developed to reach the solution of a problem by searching for new information or knowledge that could fill the perceived gap.

## **INFORMATION SEEKING AND BEHAVIOR IN A DIGITAL ENVIRONMENT**

Information seeking outcome in a digital library environment is influenced by many factors. An information user has specific distinguishing attributes which to a good extent, influence the information search process. Demographic, socio-economic and cognitive factors among others are critical elements this study focuses on in relation to information seeking behavior in a digital library environment. Information seekers are either propelled or inhibited by these identified factors. While access to information in the traditional environment places much emphasis on the skills of the librarian, that of the ICT age has graduated from a ‘Librarian-dependent’ to a ‘Librarian/ICT-dependent’ process where both the users’ skills as well as that of the librarian are required.

Information seeking is a basic activity practiced by all people and manifested through a particular behavior (Kakai, Ikoja-Odongo & Kigongo-Bukeny, 2004). Information-seeking behavior stems from a perceived need for information by the user according to Wilson’s model (Wilson, 1981; Wilson & Walsh, 1996). In order to satisfy this need, the model suggests that the user makes demands upon formal or informal information sources which results in success or failure in the information seeking process. If successful, the individual then makes use of the information found and may either fully or partially satisfy the perceived need or, indeed, fail to satisfy the need and have to repeat the search process. The model also shows that part of the information-seeking behavior may involve other people through information exchange and that information perceived as useful may be passed to other people, as well as being used (or instead of being used) by the person himself or herself.

Information seeking behavior involves personal reasons for seeking information, the kinds of information which are being sought, and the ways and sources with which needed information is being sought.

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This is expressed in various forms, from reading printed materials to research and experimentation. Scholars, students and faculty actively seek current information from the various media available in libraries, e.g. encyclopedias, journals and more currently, electronic media (Alemna & Skouby, 2000). Information seeking behavior deals with the psychological cognitive behavior of the seeker. It involves the searching, locating, retrieving and using of information.

Tella (2009) investigated correlates of information seeking behaviour of undergraduate students of University of Botswana. He asserted that the role that information plays in the academic activities of learners in this digital era is difficult to measure. According to him, any learner who wants to excel in academics needs to be highly informed, well equipped, and relentless in seeking information. The study found the cardinality of self-efficacy to information seeking. Information seeking behavior is an individual's way and manner of gathering and sourcing for information for personal use, knowledge updating and development. It involves complex patterns of actions and interactions which people engage in when seeing information of whatever kind and for whatever purpose. Leckie, Pettigrew and Sylvan (2006) opined that information seeking behavior is expressed in various media available in libraries e.g. encyclopedia, journals and more currently electronic media. Aina (2004) argued that the information seeking behavior of a user depends on education, access to library and the length of a time user wishes to devote to information seeking, no matter how comprehensive the resources and services of a library are.

Wilson (2000) theorized information seeking behavior as that which involves personal reasons for seeking information, the kinds of information which are being sought and the ways and sources with which needed information is being sought. He opined that information needs are influenced by a variety of factors such as the range of information sources available; the uses to which the information will be put; the background, motivation, professional orientation and individual characteristics of user. Other factors are socio-political, economic, legal and regulatory systems surrounding the users as well as the consequences of information use.

The quality of sources of information available to the users is also important because relevant sources are most likely to produce useful information. He also perceives information seeking behavior as the purposive seeking for information as a consequence of need to satisfy some goals. He added further that in the cause of seeking, the individual might interact with several information sources available. Information seekers have specific needs that determine their desire to hunt for such information. Likewise, the importance of such information will regulate their behavior. Igwe (2012) also categorized the information needs into the following:

1. Educational and academics information needs.
2. Political information needs.
3. Job opportunities and business information needs.
4. Economic information needs.
5. Social and entertainment (arts) information needs.
6. Agricultural, geographical and environmental information needs.
7. Medical and health information needs.
8. Scientific and technological information needs.
9. Religious and cultural information needs.
10. Legal and human rights information needs.
11. International and global information needs.

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Information seeking behavior is usually affected by some factors as pointed out by Boyol (2006). He stated that information seeking is situation dependent activity where a seeker's action are influenced by access to information perceived quality and trust in the information sources. Information seeking behavior is expressed in various forms, from reading printed materials, to asking friends or colleagues.

Information seeking behavior is also an aspect of scholarly work of most of the academic libraries who strive to develop collections, services and organizational structures that facilitate information seeking behavior. Ellis et al (2003) attempted to propose a general model of information seeking behavior based on studies of the information seeking patterns of social scientists in an industry firm. Ellis elaboration model describes the features of information seeking activities as generic.

According to Kingrey (2002), the term information seeking often serves as an umbrella overarching a set of related concepts and issues. In the library world, discussions of database construction and management, community information needs, reference services and many other topics, resonate with the term. Information seeking is a cognitive exercise and it involves search, retrieval, recognition and application of meaningful content. It has also been viewed as a social and cultural exchange, as discrete strategies applied when confronting uncertainty and as a basic condition of humanity in which all individuals exist. Information seeking behavior describes the multifaceted in relationship of information in the lives of human beings a relationship that can include both active searching through formal information channels such and a variety of other attitudes and actions.

Razak et al (2010) posits that information seeking behavior is a complex activity requiring access to diverse information resources to deal with work related, personal and social information problems. Information seeking behavior refers to strategies for locating information and has three elements; people, information and systems. The study of individual information seeking behavior requires the psychological state of the user that may lead to insight into their expectations and make it possible to predict information selecting activities.

In the words of Uhegbu (2007), information seeking behavior can be described as the way an information user conducts himself or acts when looking for, receiving or acquiring information; the utterance, gesture, anger, anxiety, eagerness, reluctance, zeal or any other attributes displayed by an information user in his effort to purchase, acquire or receive news, data, stories or anything that may inform or misinform his knowledge or understanding of something constitute seeking behavior.

## **DEMISTIFYING THE DIGITAL LIBRARY**

Digital library has been sandwiched between conventional libraries and unstructured online information resources which have brought about the so called information explosion. There exists a dichotomy which should be clearly identified. Digital libraries are organizations that provide the resources, including the specialized staff, to select, structure, offer intellectual access to, interpret, distribute, preserve the integrity of, and ensure the persistence over time of collections of digital works so that they are readily and economically available for use by a defined community or set of communities (Waters, 1998). Digital library is fast becoming a 'slogan' instead of a professional term for librarians. Access to internet that contains jumbled information, in an unorganized manner has given effrontery to many individuals to conceptualize the World Wide Web as the digital library of the 21<sup>st</sup> Century. This necessitates the need to demystify it. In the word Lynch (1997):

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*One sometimes hears the Internet characterized as the world's library for the digital age. This description does not stand up under even casual examination. The Internet--and particularly its collection of multimedia resources known as the World Wide Web--was not designed to support the organized publication and retrieval of information as libraries are. It has evolved into what might be thought of as a chaotic repository for the collective output of the world's digital "printing presses." In short, the Net is not a digital library.*

Digital libraries have been argued to be resident in the confines of librarians who are the professionals that mediate in the business of acquisition, processing, organization, storage, preservation and dissemination of information resources. These arguments have produced certain characteristics that should be adopted in defining a digital library (Arms, 1995; Graham, 1995; Chepesuk, 1997; Lynch and Garcia-Molina, 1995):

- Digital libraries are the digital face of traditional libraries that include both digital collections and traditional, fixed media collections. So they encompass both electronic and paper materials.
- Digital libraries will also include digital materials that exist outside the physical and administrative bounds of any one digital library.
- Digital libraries will include all the processes and services that are the backbone and nervous system of libraries. However, such traditional processes, though forming the basic digital library work, will have to be revised and enhanced to accommodate the differences between new digital media and traditional fixed media.
- Digital libraries ideally provide a coherent view of all of the information contained within a library, no matter its form or format.
- Digital libraries will serve particular communities or constituencies, as traditional libraries do now, though those communities may be widely dispersed throughout the network.
- Digital libraries will require both the skills of librarians and well as those of computer scientists to be viable.

A digital library connotes an organized rich and comprehensive content, usually in electronic format and somewhat hosted in virtual space, managed and preserved for long term, and offers its user communities specialized functionality on that content according to agreed policies. Digital resources which are offshoots of Information and Communication Technologies have reshaped information retrieval process and access. In the past, information was transferred from librarians to the user, but presently, most of the communication and transfer of information is between the users and the computers/associated devices and this is due to the existence of digital library and its management. The digital library provides more choices, enhances flexibility and will often provide the learner with instant feedback. It allows retrieval of learning materials faster and conveniently at any time and at any place (Lee, 2005).

Otubelu (2011) explained that digital resources range from archival documents to historical images and other primary sources emanating from scientific field researches. Electronic formats suitable for digital library materials include text formats, such as RTF (Rich Text Format), Markup languages –HTML and XML, PDF (Portable document format) and Image formats –MPEG, JPEG etc. Digital library collections contain permanent documents hosted in a digital environment and it enables quick handling of information resources. Digital libraries are based on digital technologies which aid compression of library materials that already existed in hard copies thereby saving physical space in the library.

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The 21<sup>st</sup> century information landscape continues to experience a shift from the traditional to a more sophisticated ICT based. To maximize the use of resources in the digital library environment, a lot of the users' characteristics come to play. This chapter therefore considers some of these characteristics which include the demographic make-up, socio-economic and cognitive skills of a user as they affect his/her information seeking behavior in a digital library environment. A digital library implies a collection of electronic information resources or service, in which resources and functions (such as acquisitions, preservation, retrieval etc.) are in digital form and performed using information technologies respectively. Borgman (2000) defines digital libraries as sets of electronic resources and associated technologies for creating, searching and using information. They are developed and organized for a particular community of users in support their information needs and use of that community. It involves a wide range of functioning and research outputs, collections of information and documents, and technologies. In this sense they enhance and add to information retrieval systems, presented in diverse forms (text, images, sounds, multimedia, etc.) and accessible online. In other words, users can have access to resources in a digital environment over a computer network either via the internet or institutional intranets from any location within the library or remotely.

Marchionini (1998) observed that practically, a digital library makes its digital resources accessible remotely through computer networks. The content of digital libraries includes data and metadata. Metadata which are traditionally called bibliographic information are data that describes various aspects of other data. It may consist of links to other data within or outside the digital library (such as author's name, titles, year of publication, and subject coverage). Digital library should contain information and documents in digital form. It may be text, images, audio files, or multimedia. The term 'hybrid library' rather than 'digital library' has been used in some literatures, to emphasize that the collection may include non-digital alongside digitized documents.

Libraries that have huge electronic resources (e-journal and e-books) together with sizeable print collections may be considered a digital library. With reference to the content of a digital library, Bawden and Rowlands (1999) stated that for a library to be referred to as a digital library a "significant proportion of the resources available to users" must exist in digital form. Marchionini (1998) observed that a digital library must have some electronic resources and services. Realistically, a digital library is a managed collection of information, with associated services, where the information is stored in digital formats and accessible over a network.

In summary, digital libraries, irrespective of content location, are accessible virtually, searched or browsed, and information retrieved by users from every part of the world. Its content which has been selected and assembled as a cohesive digital collection may physically be stored on computers in different parts of the world. In a completely digital library, nothing need ever reach paper. Furthermore, being a cheap and effective process, digitization offers diverse cultures the opportunity to organize, preserve and make available to users their own local text, image and sound files in ways that were previously inconceivable (Worcman, 2002). They are accessed and used remotely, at different location and concurrently. Its resources are defined by access, technically and economically as compared with a traditional library where resources are by their physical presence.

Trivedi (2010) observed that a digital library is not a single entity. It requires technology link the resources of many collections. The links between digital libraries and their resources are transparent to users. Digital libraries combine technology and information resources to allow remote access, breaking down the physical barriers between resources thereby allowing learners of all types to share resources, time and energy, and expertise to their mutual benefits. Remote access allows possibilities for vicarious

field trips, virtual guest speakers, and access to rare and unique materials in classrooms and at home. Digital libraries also bring together facets of many disciplines, and experts with different backgrounds and different approaches.

Digital library collections are not limited to document surrogates (bibliographic records). They are the actual digital objects such as images, texts, etc. Lynch (1994) observed that digital Libraries provide users with coherent access to a very large, organized repository of information and knowledge. According to Berkeley Digital Library Project, University of California, the digital library will be a collection of distributed information sources. The contrast between traditional and digital libraries is presented in Table 1.

It is evident that digital libraries are very different from traditional libraries, but sometimes they are could be have some similarities especially in libraries that are engaged in retrospective conversion of paper-based resources. It should be noted that people do not change because new technology is invented. They still create information that has to be organized, stored, and distributed. They still need to find information that others have created, and use it for study, reference, or entertainment. However, the form in which the information is expressed and the methods that are used to manage it are greatly influenced by technology and this creates change.

Arms (2000) explaining the cardinality of digital libraries affirmed that the doors of the digital library never close; a recent study at a British university found that about half the usage of a library's digital collections was at hours when the library buildings were closed. Materials are never checked out to other readers, miss-shelved or stolen; they are never in an off-campus warehouse. The scope of the collections expands beyond the walls of the library. Private papers in an office or the collections of a library on the other side of the world are as easy to use as materials in the local library. Digital libraries are not perfect. Computer systems can fail and networks may be slow or unreliable, but, compared with a traditional library, information is much more likely to be available when and where the user wants it.

## **FUNCTIONS OF DIGITAL LIBRARY**

Digital libraries have set the stage for the principle of information access which is the real essence of a library. The opening and closing hours that characterize the traditional libraries are eliminated with

*Table 1. Traditional vs. digital libraries*

<b>Traditional Libraries</b>	<b>Digital or Electronic Library</b>
Print collection	All resources in digital form.
Stable, with slow evolution	Dynamic and ephemeral
Individual objects not directly linked with each other.	Multi-media and fractal objects
Flat structure with minimal contextual metadata	Scaffolding of data structures and richer contextual metadata.
Scholarly content with validation process	More than scholarly content with various validation processes
Limited access points and centralized management	Unlimited access points, distributed collections and access control
The physical and logical organization correlated.	The physical and logical organization may be virtually
One way interactions	Dynamic real-time dialogue
Free and universal access.	Free as well as fee based.



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the use of digital libraries. A digital library brings the information to the user's desk, either at work or at home, making it easier to use and hence increasing its usage. With a digital library on the desk top, a user need never visit a library building. The library is wherever there is a personal computer and a network connection.

The digital library exists to perform certain functions which include:

- Providing access to large amounts of information to users wherever they are and whenever they need it.
- Enabling access to primary information sources.
- Supporting multimedia content along with text.
- Enhancing network accessibility on Intranet and Internet.
- Possessing user-friendly interface.
- Making available hypertext links for navigation.
- Possessing Advanced search and retrieval.
- Integrating with other digital libraries.

### **PURPOSE OF DIGITAL LIBRARY**

Digital libraries are beneficial to users due to qualities that distinguish them from traditional libraries. Users of digital libraries have access to an array of information because of interconnectivity achieved through the internet. Digital libraries serve the following purposes:

- Expedite the systematic development of procedures to collect, store, and organize, information in digital form.
- Promote efficient delivery of information economically to all users.
- Encourage co-operative efforts in research resource, computing, and communication networks.
- Strengthen communication and collaboration between and among educational institutions.
- Empowers librarians to take leadership role in the generation and dissemination of knowledge.

Other potential benefits of digital libraries have been viewed by Arms (2000):

- **The Digital Library Brings the Library to the User:** To use a library requires access. Traditional methods require that the user goes to the library. In a university, the walk to a library takes a few minutes, but not many people are member of universities or have a nearby library. Many engineers or physicians carry out their work with depressingly poor access to the latest information. A digital library brings the information to the user's desk, either at work or at home, making it easier to use and hence increasing its usage. With a digital library on the desk top, a user need never visit a library building. The library is wherever there is a personal computer and a network connection.
- **Computer Power Is Used for Searching and Browsing:** Computing power can be used to find information. Paper documents are convenient to read, but finding information that is stored on paper can be difficult. Despite the myriad of secondary tools and the skill of reference librarians, using a large library can be a tough challenge. A claim that used to be made for traditional libraries

is that they stimulate serendipity, because readers stumble across unexpected items of value. The truth is that libraries are full of useful materials that readers discover only by accident. In most aspects, computer systems are already better than manual methods for finding information. They are not as good as everybody would like, but they are good and improving steadily. Computers are particularly useful for reference work that involves repeated leaps from one source of information to another.

- **Information Can Be Shared:** Libraries and archives contain much information that is unique. Placing digital information on a network makes it available to everybody. Many digital libraries or electronic publications are maintained at a single central site, perhaps with a few duplicate copies strategically placed around the world. This is a vast improvement over expensive physical duplication of little used material, or the inconvenience of unique material that is inaccessible without traveling to the location where it is stored.
- **Information Is Easier to Keep Current:** Much important information needs to be brought up to date continually. Printed materials are awkward to update, since the entire document must be reprinted; all copies of the old version must be tracked down and replaced. Keeping information current is much less of a problem when the definitive version is in digital format and stored on a central computer. Many libraries provide online the text of reference works, such as directories or encyclopedias. Whenever revisions are received from the publisher, they are installed on the library's computer. The new versions are available immediately. The Library of Congress has an online collection, called Thomas, that contains the latest drafts of all legislation currently before the U.S. Congress; it changes continually.
- **The Information Is Always Available:** The doors of the digital library never close; a recent study at a British university found that about half the usage of a library's digital collections was at hours when the library buildings were closed. Materials are never checked out to other readers, miss-shelved or stolen; they are never in an off-campus warehouse. The scope of the collections expands beyond the walls of the library. Private papers in an office or the collections of a library on the other side of the world are as easy to use as materials in the local library. Digital libraries are not perfect. Computer systems can fail and networks may be slow or unreliable, but, compared with a traditional library, information is much more likely to be available when and where the user wants it.
- **New Forms of Information Become Possible:** Most of what is stored in a conventional library is printed on paper, yet print is not always the best way to record and disseminate information. A database may be the best way to store census data, so that it can be analyzed by computer; satellite data can be rendered in many different ways; a mathematics library can store mathematical expressions, not as ink marks on paper but as computer symbols to be manipulated by programs such as Mathematica or Maple. Even when the formats are similar, materials that are created explicitly for the digital world are not the same as materials originally designed for paper or other media. Words that are spoken have a different impact from words that are written, and online textual materials are subtly different from either the spoken or printed word. Good authors use words differently when they write for different media and users find new ways to use the information. Materials created for the digital world can have a vitality that is lacking in material that has been mechanically converted to digital formats, just as a feature film never looks quite right when shown on television.

## **DEMOGRAPHIC FACTORS**

Inequality characterizes digital information seekers. It has been established by Olatokun (2009) that there exists a measure of variance in individuals' access and use of information and communication technology due to socio-demographic factors. This discourse specifically focuses on age and gender as demographic barriers to information seeking in digital library environment. Islam et al. (2011) conducted a research on demographic influence concerned with inclusion of digital library on e-learning in the Faculty of Information Management at Universiti Teknologi Mara, Malaysia. According to the research, demographic factors such as level of education and gender assist in understanding and appreciating e-learning. Owolabi and Adebayo (2013) found that ease of use, accessibility and use of ICT were significantly predicted by level of education, age, gender, and income.

### **Age as Barrier to Information Seeking in Digital Libraries**

Age is a progressive natural phenomenon that has predictable influence on humans. The older an individual gets, the higher the rate of certain physiological and psychological changes. The tendency is high for persons below twenty years of age to have lesser responsibilities and be less encumbered compared to adults who have to attend to work, family and other social responsibilities which they feel are mandatory for them. Constituents of interest change as age develops and likewise the energy and speed to match up with the dynamic world in which technology has taken over. Carmen (2006) and Idowu (2004) pointed out the significance of age in relation to digital information use. Their works affirmed that younger age group appears more technology enthusiastic than their older counterpart who are slow in technology adoption and most often are too busy to experiment with new technology innovations. Young adults are more technology savvy and can easily contend with the challenges and complexities of innovations.

Age has also been found to correlate with computers and the use of electronic resources as observed by Okiki and Ashiru (2011) when they noted that younger generations are brought up with computers. They also found that there were significant age differences on the computer tasks performed by younger people compared to the older ones. While younger adults make quick decisions with the aid of computers, the older adults make few correct decisions taking longer time than their younger counterparts. Mungania (2003) while describing the e-learning users asserted that middle-aged people account for the greater part of use of digital information.

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Within social psychological approach, personality is viewed as a complex of biological, mental and social factors (Nakonecny, 1999) which can influence human information behavior. It is certain that male and female have different personalities which are biological and also portray psychological manifestations which ultimately have influence on their performances in specific tasks. The above describes sexual differences which is different from social inclination of male and female gender. Essentially, gender refers to sets of relationships attributes, roles, beliefs and attitudes that define what being a man or a woman is within the society. It is a socially ascribed attribute as opposed to sex which is a biological attribute. As a result of gender roles assigned by different cultures many women have been brought up to see technology and its use as reserved for on the male gender.

Gender studies in relation to digital information seeking revealed men and women value technologies differently (Fallows, 2005 & Agosto, 2001). In the use of technologies, women prefer social collaboration, contextual information and personal identification. Men's use of information and technologies are determined by preferences of individual work and competition. Manda and Mulkangara (2007) report that gender is associated with the use of electronic information resources, and that male postgraduate students were more likely to use e-resources than female students. They further report that even when there was controlled for attitude towards the use of e-resources or training in the use of e-resources the relationship between gender and e-resources was maintained.

For men, new technologies represent an intellectual challenge and play, while with women, more emotional perception occurs. In learning, women make use of personal identification and imagination and for them, it is important to include the information into a broader context or story (Agosto, 2001). Based on men's preferences for logical and analytical thinking, they find it easier to use Boolean logic for query formulation (Agosto, 2001). A study by Kennedy et al. (2003) has also proved that women suffer from lower self-confidence in managing technologies than their male counterparts. Ford, Miller, and Moss (2001) found that women tend to experience more difficulty in finding information online than men, and men have high preference for the Internet as the first source of information. It has also been found that due to domestic responsibilities, women are found to lag behind in the use of digital information resources in comparison to their male counterparts (Rana, 2009; Bailin & Grafstein, 2005).

### **The Place of Socio-Economic Factors in Determining Information Seeking Behavior**

One of the most remarkable developments in the modern society has been what is variously described as information explosion, information revolution, or the advent of information age or society (Tiamiyu, 2003). The catalyst of the growth has been rapid adoption and innovations in electronic technologies for creating, processing, communicating and using information. Consequently, libraries are required to provide electronic resources such as e-books, e-journals/journal articles retrieved from online databases, CD-ROMs etc which are accessed through computer-related technologies (Jerabek, Meyer, & Kordinak, 2001) and recently mobile communication devices.

Information accessed within a digital environment, which has e-books among other materials as its collection is becoming important to satisfy users' needs. To a large extent, there is a growth in the global e-book market evident since the last few years (Book Industry Study Group, 2010; Guenette, Trippe, & Golden, 2010; International Digital Publishing Forum, 2010) with predictions for even higher growth in the near future (British Library, 2010; May, 2010) and accompanied with a range of portable devices such as e-book readers, or multi-purpose devices for accessing the resources.

The emergence of these e-resources and their integration into the collections of libraries have generated a wide range of issues and challenges ranging from formation of collection development policy, up to the access point including establishment of budget and adequate funds for acquisitions. Some socio-economic factors have however been found to impede access and use of information communication technologies. As observed by the International Telecommunication Union (2003) there are digital divide in the access and use of ICTs because of sociocultural and economic factors (income and education) around the world. That is, there are gaps in access to and use of ICT among skilled and unskilled (education), high income earners and low income earners (income level), rural and urban (location) and so on.

## ***Demographics, Socio-Economic and Cognitive Skills as Barriers to Information Seeking***

Although several studies (ALA, 2008; Bertot, 2009; Brindley, 2009; McClure, Bertot, & Jaeger, 2011) have discussed barriers to internet access in libraries, this section will focus mainly on barriers from the perspective of the library patrons in a digital environment. Information seeking in a digital environment from a socio-economic perspective includes research approaches such as ethnographic, cultural and economic studies. Identified socio-economic factors that constitute barriers to information seeking and access in a digital environment will therefore be considered under the following headings.

### **Level of Education and Income**

The internet is an important platform for providing access to information and consequently has been the platform for deploying digital libraries. It has therefore become imperative to access resources in a digital environment using ICTs. The level of education has been found to have the strongest influence on the capability to use computer with internet services in Nigeria (Olatokun, 2009). Olatokun also discovered that income was significantly related to the amount of education a person receives which could be seen as a key “individual difference” that influences the capabilities and functioning that relate to ICTs.

Also, household income plays a very significant role with respect to the ability to use ICTs. Those with lower income tend to have less ownership and capability to use ICTs as their income may not be able to accommodate access to or ownership of ICT facilities. It should however be noted that income alone is not enough to measure people’s capacity to own and use ICTs, but that their level of education is also of great significance. A study carried out in the United States showed that “2.7% of families with incomes under \$15,000 own computers compared to 77.7% of families with incomes over \$75,000; and among all families with incomes under \$35,000 computer ownership of white families was three times that of African-American families and four times that of Hispanic families” (Kirk & Zander, 2004, p. 171). A study by Valletta and MacDonald (2003) also confirmed that information seekers having less education are being more disadvantaged in using ICTs facilities.

DeBell and Chapman (2006) found that parental educational level directly correlates with the percentage of students who used the internet in their own home to seek information. In the United States, census data showed a similarly strong correlation of level of education and home internet access. In view of Okuwa’s (2007) study that showed that educational status influences income, it is expected that students whose parents are highly educated will use internet more compared with students whose parents are not. Education is therefore important, not only with respect to gaining the needed skills to use ICTs that provide the platform to interact with resources in a digital library environment, but also with respect to people’s motivation to even use an ICT.

### **Information and Communication Infrastructure**

With the aid of relevant ICTs, interconnectivity of libraries which was unimaginable in the era of traditional information resource management has been made possible. Databases of other libraries can be accessed remotely thereby ensuring effectiveness and efficiency in the process of information dissemination. Also there is access to more current information and extensive links to additional resources in a digital environment. Despite these inherent benefits however, infrastructural limitations such as slow internet speed resulting from inadequate bandwidth to enhance effective access to online based

resources, insufficient workstations and required devices to meet the growing demands of the users as well as network security inhibit information seeking.

Infrastructural development in Africa has been the bane of successful deployment of ICT in the region. Africa is regarded as a region with highest concentration of countries with low ICT opportunity, measured by indices related to ICT networks, education and skills, uptake and intensity of its use (International Telecommunication Union, 2007). Understanding the barriers that impede access can help library administrators allocate the limited resources more effectively to balance the needs of patrons seeking information in a digital environment.

Other socio-economic factors that affects information seeking include erratic power supply, as some electronic devices such as computers and other ICT infrastructures needed to access resources in a digital environment depend on electricity to function. This is however epileptic in many African countries which in turn constitutes a barrier to information seekers impeding them from gaining timely access to needed information, apprehension expressed when seeking for information in a digital environment especially those that are not computer literate and accustomed to traditional library, prohibitive cost mostly in developing countries to gain access (Adomi, 2005), irregularities in subscription to electronic resources (Igbo & Imo, 2010), and frustration that accompanies prolonged e-book reading causing a strain to the eyes (Aregbesola & Oguntayo, 2014).

## **BARRIERS TO INFORMATION SEEKING IN A DIGITAL LIBRARY VIS-À-VIS COGNITIVE SKILLS**

The incapability of technology to recognise the existing dichotomy in users' heterogeneous characteristics is a major limitation. There are variables which determine ease of access and use of technology by users. One of these distinguishing attributes subsists in their cognitive skills. Brennan, Kelly & Arguello (2014) observed that although search engines are designed as one-size-fits-all tool, people do not come in one size, but instead vary across many different attributes. Information seeking is predominantly a cognitive task, hence the probability of cognitive variations among users could be viable determinants of astuteness or mediocrity in the search process.

'User-centeredness' is sine qua non to effective and efficient information delivery in the 21<sup>st</sup> century unlike the past when information users relied solely on experts for information retrieval. Advancement in information and communication technology (ICT) has heralded availability of a plethora of information resources leading to information explosion. Information explosion is not just a cliché but an existing challenge that puts information seekers in the midst of a sea of relevant and irrelevant electronic information resources; a term referred to as high recall, low precision. The Google search engine alone controls an index of more than 8 billion Web pages (Google, 2005), therefore in the myriad of available information sources and resources, cognitive skills become paramount to achieving specificity or precision in the process of information seeking in the digital environment.

The World Wide Web has made the world a global village but the need for the village to speak one language has not been achieved. Each member of the village has to possess the ability to recognize and reconcile (decode) messages to satisfy information needs. On this premise, the need to intricately discuss users' cognitive skills becomes imperative.

## **Cognitive Skills**

Cognitive skills represent mental capabilities and developments associated with knowledge, attention, memory, judgment and evaluation, reasoning and computation, problem solving and decision making, comprehension and production of language, etc. Cognitive processes use existing knowledge and generate new knowledge. It encompasses the mental functions, mental processes (thoughts), and state of intelligent entities (humans, collaborative groups, human organizations, highly autonomous machines, and artificial intelligences). The word cognition comes from the Latin verb *cognosco* (*con* 'with' and *gnosco* 'know').

Carroll (1993) explained that cognitive abilities are comprised of higher mental functions such as reasoning, remembering, understanding and problem solving. Cognitive skills vary, depending on phenomenon of study or task to be accomplished, but it is constant that they are mental activities. The following are some but not all features describing cognitive skills:

- **Attention Skills:** Ability to attend to incoming information and process for a specified need. It can be viewed in three dimensions.
- **Memory:** The ability to store and recall information.
- **Logic and Reasoning:** The ability to reason, form concepts, and solve problems using unfamiliar information or novel procedures.
- **Auditory Processing:** The ability to analyze, blend, and segment sounds.
- **Visual Processing:** The ability to perceive, analyze, and think in visual images. This includes visualization, which is the ability to create a picture in your mind of words or concepts.
- **Processing Speed:** The ability to perform simple or complex cognitive tasks quickly. This skill also measures the ability of the brain to work quickly and accurately while ignoring distracting stimuli (<http://www.learningrx.com/what-are-cognitive-skills.htm>).

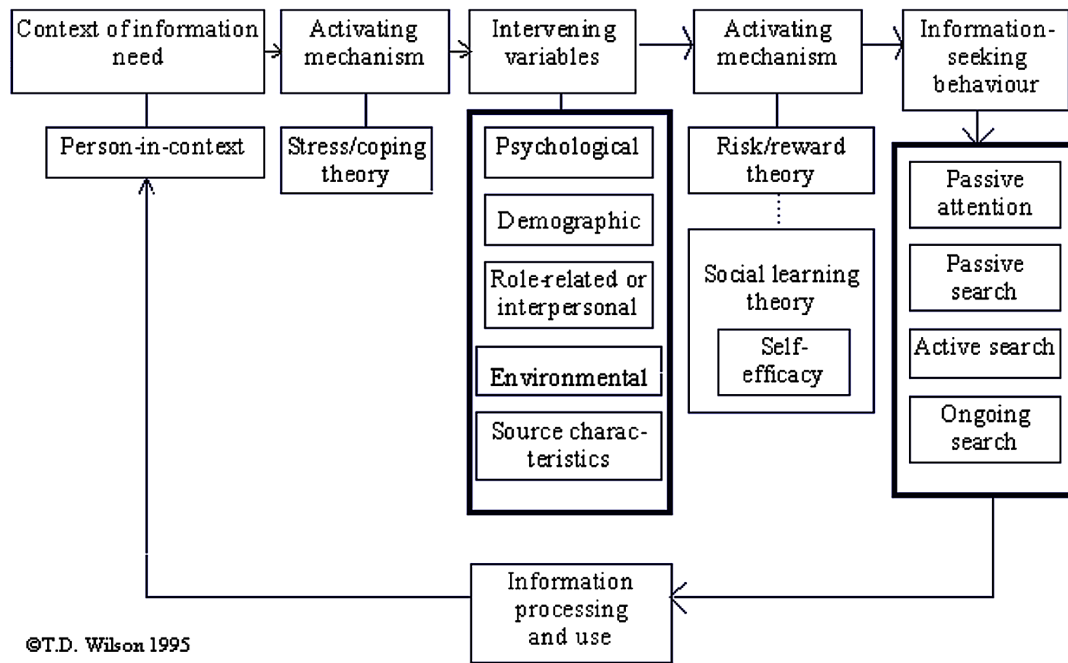
Wilson's 1995 model of information seeking brings to the fore the complexity of information seeking and intervening variables (barriers) which includes cognitive skills (Figure 1).

Information use depends on the individual evaluation of the cognitive and emotional relevance of the information received. Information seeking characteristically places demand on cognitive abilities such as working memory, spatial ability, and reasoning. For information seeking, Sutcliffe and Ennis (1998) proposed theoretical framework which consists of four recurrent cognitive activities: problem identification, need articulation, query formulation and result evaluation.

- **Problem Identification:** Involves identifying the information need from a problem statement.
- **Need Articulation:** The information seeker expresses information need by selecting low-level terms from long-term memory, which may lead to a refinement or restatement of the information need.
- **Query Formulation:** The process of generating queries and depends on the information seeker's skill level and on the capabilities and possibilities of the IR system.
- **Results Evaluation:** A decision-making process whereby the information seeker decides whether to accept the retrieved results or continue searching for more results.

The intellectual processes engaged during search are controlled by the cognitive abilities possessed by the user. When an information user is inhibited in the use of cognitive skills, it constitutes a barrier

Figure 1. Wilson's model of cognitive skills



in the process of information seeking which could lead to frustration or outright abandonment of the search endeavors. Cognitive ability has been recognized to have bearing on individuals' behavior towards information seeking. It refers to human ability to perform mental processing of activities which involves full engagement of the brain to achieve a required task (Carroll 1993). It is quite interesting to see identical twins that are very hard to differentiate in many physical ways but cognitive styles.

Riding and Rayner (1998) defined cognitive styles as person's preferred and habitual approach to organizing information. Xie (2000) asserted that information users such as university undergraduates normally employ their general cognitive skills and knowledge in three ways:

1. To represent their problem task;
2. To establish a set of sub-goals to fulfil the overall goals; and
3. To develop techniques and strategies that help to seek the required information.

Gwizdka (2002) examined the relationships between selected cognitive abilities (memory span, visual memory, flexibility of closure, and speed of closure), information presentation in graphical email user interface, and information scanning tasks. A number of cognitive ability effects on user interaction were found. For example, people with lower ability to extract visual patterns tended to move information from their email inboxes to places outside email and were slower on the textual email interfaces than on the visual email interface (Gwizdka, 2004); people who had lower level of working memory (Mw) took more time to locate information in the email inbox and sorted email messages more often (Gwizdka & Chignell, 2004).



## ***Demographics, Socio-Economic and Cognitive Skills as Barriers to Information Seeking***

Information seeking behavior is greatly influenced by cognitive characteristics. For example, the concept of *cognitive dissonance* as a motivation for behavior proposes that conflicting cognitions make people uncomfortable and that, consequently, they will seek to resolve the conflict in one way or another (Festinger, 1957). One of the ways in which dissonance may be reduced is by seeking information either to support existing knowledge, values or beliefs, or to find sufficient cause to change these factors. Accordingly, Aaker, Batra & Myers (1992) reporting work on advertising and its effects on changes in attitudes towards products, note that where an advertisement matches the belief held by a person, that person is more likely to advance supporting arguments for choosing the product. However, where there are discrepancies between the communication and the previously held belief, the person is likely to bring forward counter-arguments to the claims being made in the advertisement.

On the other hand, Sorrentino and Short (1986) suggested that many people are simply not interested in finding out information about themselves or the world, do not conduct causal searches and do not give a hoot for resolving discrepancies or inconsistencies about the self. This seems to return us to the idea of people having different levels of *cognitive need*, which may be the ultimate driver of information behavior. In the same vein, Rogers (1983) suggested that individuals generally tend to expose themselves to ideas that are in accordance with their interests, needs or existing attitudes. We consciously or unconsciously avoid messages that are in conflict with our predispositions.

Johnson and Macrae (1994) tested the proposition that people are more likely to bias their information search towards information that matches their stereotypical image of a group rather than towards that which does not match their stereotype. They demonstrated that when a group of students, ‘...could control the amount and nature of information they received about a group, they displayed the anticipated preference for stereotype-matching information.’ However, when the students’ information acquisition was controlled by the researcher, ‘...a reduction in their stereotype-based impression of the group’ was observed.

Krishnan and Jones (2005) studied how people differ with respect to their preference of information presentation. They found that some people preferred to access files via folders shown in a spatial representation, while others preferred textual keyword-based search to access their files. Other studies have demonstrated reduction of the performance gap between different population groups through appropriate design modifications. Zhang and Salvendy (2001) investigated the effects of users’ visualization ability and website structure display design on web browsing performance. They found that structure preview reduced the differences in performance between high and low visualization ability users.

Savolainen (2009) based on the conceptual analysis, examined the features of cognitive barriers and their impact on information seeking. The study resulted in a typology specifying six sub-types of cognitive barriers: unwillingness to see one’s needs as information needs, inability to articulate one’s information needs, unawareness of information sources, low self-efficacy, poor search skills and inability to deal with information overload. The sub-types were reviewed at two stages of the information-seeking process: identifying and articulating information needs; and selecting and accessing information sources. According to Savolainen, the impact of cognitive barriers is mainly negative. They block, limit or hamper information seeking, or give rise to negative reactions such as frustration. Cognitive barriers can also impact positively by helping the individual to concentrate on a few, good enough sources of information.

## CONCLUSION

Information has been adjudged to be a factor of production, hence the demand for it. The orbits of complexities that revolve around each information seeker in digital library environment have been discussed as barriers to timely access to information. Information in digital formats allow for remote accessibility which characterizes the 21<sup>st</sup> Century information service provision. The factors examined in this study are germane to information seeking in digital libraries. Demographic factors (age and gender); level of income and education, ICT infrastructure and power supply considered under socio-economic; and cognitive factors which pointed out problem identification, need articulation, query formulation and result evaluation, have the capacity to restrict scope of search, delay or block access and ultimately frustrate the information seeking process. Inability to surmount these barriers by information seekers could also hamper effectiveness and efficiency among digital information seekers.

## RECOMMENDATIONS

Having examined these inhibiting factors, the authors recommend the following ameliorating approaches to information seeking: The dispensational change in access and use of information should be recognized by older persons who are not favorably disposed to digital information and consciously embrace the change by demonstrating willingness to learn and relearn relevant technologies that will aid their access to digital information. There is a need to educate the populace against the cultural believe of superiority of the male gender over the female. The focus should rather be on cognitive capabilities of individuals and how to improve on them. The need for information users to constantly upgrade knowledge in relation to the dynamic nature of the digital library and ICT infrastructure becomes paramount.

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## **KEY TERMS AND DEFINITIONS**

**Cognition:** The set of all mental abilities and processes related to knowledge, attention, memory and working memory, judgment and evaluation, reasoning and computation, problem solving and decision making, comprehension and production of language, etc. Human cognition is conscious and unconscious, concrete or abstract, as well as intuitive (like knowledge of a language) and conceptual (like a model of a language). Cognitive processes use existing knowledge and generate new knowledge.

## ***Demographics, Socio-Economic and Cognitive Skills as Barriers to Information Seeking***

**Demographics:** Investigating a population with focus on factors such as age, race, gender, economic status, level of education, income level, marital status and employment amongst others. Demographics are used by researchers, government agencies and non-governmental organizations for decision making, policy formulation, etc.

**User:** A person or a group of persons who uses the digital library resources. They are not expected to have the technical expertise possessed by librarians. Their main concern is to know if certain information is available and how they will access it. They are not interested in the process of acquisition, processing, storage and preservation of digital resources.

**Virtual Space:** A generic term for the online world of the Internet. It also encompasses radio, television, phone and video calls, texting, e-mail, blogs, forums, chat rooms, instant messaging, social media interactions, as well as access to corporate data.