CHAPTER II
REVIEW OF RELATED LITERATURE

2.0 Introduction

A literature review is an account of what has been published on a topic by accredited scholars and researchers. The purpose of reviewing the literature is to understand what knowledge and ideas have been established on a topic, and what their strengths and weaknesses are. The literature review plays a very important role in the research process. To carry out any research, it is important to know what has already been done on the area of study. It is a source from where research ideas are drawn and developed into concepts and finally theories. It provides the researcher a bird’s eye view the research done in that area so far.

The amount of literature published in the form of research papers, reports, books, guidelines and standards etc. needs to be reviewed to understand the concept better. This activity helps in knowing whether the study is going to yield new knowledge or will supplement the already existing knowledge. The review of the related literature presents the descriptive account of similar studies made by others and forms the basis for the study. Depending on what is observed in the literature review, a researcher will understand where the present research stands. Besides enlarging researcher’s knowledge about the topic, writing a literature review would help to gain and demonstrate skills in two distinct areas:

- **information seeking:** the ability to scan the literature efficiently, using manual or computerized methods, to identify a set of useful articles and books
critical appraisal: the ability to apply principles of analysis to identify unbiased and valid studies

In the present study, a retrospective search of literature was made by using books, library and information Abstract (LISA), Education Resources Information Center (ERIC), Scopus and online databases, viz., Emerald, ProQuest, J- Gate, IEL digital library, etc., Also using Reports, Manuals, Guides, research articles from journals reviewed.

Review of literature on information literacy reveals the significance of information literacy in academic libraries with special reference to engineering college libraries. It is believed that improving users’ information searching skills, knowledge of their library’s collection and awareness about the services can act as a motivating factor for making use of the library more and more and enhance the utilization of library resources. Main emphasis of the search was on the literature that dealt with the information literacy prorammes in the electronic environment in engineering college libraries. Keeping in view the present study, the published literature has been reviewed in the following subheadings:

- Concept of Information Literacy
- Changing Academic Library Environment
- ICT and Information Literacy
- Information Literacy for Engineering Colleges
- Information Literacy Models, Standards, Guidelines
- Information Literacy Assessment

2.1 General Overview

Proliferation of information technology from the mid-1980s to the present brought about a set of complexities forcing the LIS community, and, indeed, society, to focus on
dealing with advances in information technology and the resulting proliferation of information. Research and publications in information literacy have been active among librarians and information professionals since early 1970s in many industrialized and developing countries.

In the preface of the UNESCO’s guide states as follows; “Users of information are an integrated part of and the final link in the information transfer chain. They are the ‘raison detre’ of every investment made for bettering the storage, processing and retrieval of information. In every country, from the least development to the most advanced, certain amount of scientific and technological information locally produced or of international origin – is processed and stored in some fashion for the benefit of the users. Unless these users know how to find relevant information available to them, the information “Machinery’ falls short of its main goal” (Evans et al., 1977).

From the study, it is reported that libraries have been involved in ‘Information literacy programmes’, in various forms, for a very long time. In academic and school libraries in the nineteenth century it usually took the form of ‘library orientation’, making sure that new students and faculty knew how to find the books and other materials for their courses (Clyde, 1981). Ford (1994) notes that in South Africa, Australia, and the Netherlands issues related to information access and use have become an increasing concern and therefore, concepts of user education and information literacy are being incorporated in their school and higher education curriculum.

Reeves (1996) explained that “the overuse of the term information is a telltale sign of the Age of Complexity: the age of multiple choices and endless data” and contend that information overload due to improved telecommunications and exponential growth of the
volume of information were leading to a new understanding of knowledge and learning. The solution to managing the complexity of information was a model of learning based on critical thinking about and selective filtering of information. This refocused the library instruction movement towards information literacy instruction.

The uncertain quality and expanding quantity of information pose bigger challenges for society. The sheer abundance of information will not in itself create a more informed citizenry without a complementary cluster of abilities necessary to use information effectively (ACRL, 2000). This situation demands the need for Information Literacy (IL), which aims at developing learners' critical thinking and ability to discriminate the whole gamut of information resources and formats prior to consumption of information for sustained learning skills.

Aguolu & Aguolu (2002) opined that effective use of library resources and other facilities depend on the skillfulness or competence of the users and the level of assistance given to them. Library instruction is often interchangeably with library literacy, user education, information literacy, and bibliographic instructions. There is a need of effective Information literacy programmes for use of libraries information resources and services. IL is a continuous process, which should teach information skills and make users information literates and lifelong learner to face the challenges created by the present electronic environment. It also contributes to the holistic development of an individual.

According to the Council of Australian University Librarians (2004), information literacy is an understanding and set of abilities enabling individuals to recognize when information is needed and have the capacity to locate, evaluate and use effectively the needed information. Librarians, teachers, technologists and some policy makers have
recently begun to address the need for information literacy training and teaching on all levels of education.

In the US, the national forum on information literacy was established in 1989, followed by the Institute for Information Literacy in 1998. Information literacy was included in the United States education plan at various levels since 2000. Developments in information literacy have also been reported in other parts of the world such as Australia, Canada, New Zealand, China, Japan, South Africa, Singapore and Malaysia. Similarly, in Europe, information literacy initiatives and programmes were evolved from the work of academic librarians since 1970s. The growth of digital information, the focus on lifelong learning and the need for highly skilled workers have highlighted the need for information – related competencies (Ali et al., 2009).

2.2 Concept of Information Literacy

Arp (1990) opines that the concept of information literacy has created some controversy because its nature continues to evolve. The central elements, however, seem clear. Information literacy implies a conscious and systematic attention to developing the capacity to define effectively an information need, use research tools and processes to identify and locate such information, assess it, and communicate an analysis and synthesis of the information in response to that need. McCrank (1991) says that the term information literacy needs more clarification. The author further noted that the paradox of information literacy is that it calls upon librarians to change more than users. Frequently, information literacy is defined in terms of the characteristics that one should possess to be an information literate person.
Doyle (1992) recognized the following set of characteristics of an information literate person,

- recognizes that accurate and complete information is the basis for intelligent decision making
- recognizes the need for information
- formulates questions based on information needs
- identifies potential sources of information
- develops successful search strategies
- accesses sources of information including computer-based and other technologies
- evaluates information
- organizes information for practical application
- integrates new information into an existing body of knowledge
- uses information in critical thinking and problem solving.”

The concept of information literacy was first introduced in 1974 by Paul Zurkowski, president of the US Information Industry Association, in a proposal submitted to the National Commission on Libraries and Information Science (NCLIS). He recommended that a national program be established to achieve universal information literacy within the next decade. According to Zurkowski “people trained in the application of information resources to their work can be called information literates. They have learned techniques and skills for utilizing the wide range of information tools as well as primary sources in moulding information solutions to their problems” In this definition Zurkowski suggested that 1) information resources are applied in a work situation 2) techniques and skills are needed for
using information tools and primary sources; and 3) information is used in problem solving (Behrens, 1994; Bruce, 1997).

The concepts of ‘information literacy’ and ‘digital literacy’ are described, and reviewed, by way of a literature survey and analysis. Related concepts, including computer literacy, library literacy, network literacy, Internet literacy and hyper-literacy are also discussed, and their relationships elucidated (Bawden, 2001). Savolainen (2002) suggests the umbrella term 'information-related competences' that covers information literacy, media competence and library skills and adds: 'Because new labels describing specific kinds of literacies are continually introduced, reflecting the developments of ICTs, the attempts to develop an exact classification of information-related literacies seem to be futile.

In a technological society, the concept of Information literacy is expanding, according to Audunson & Nordlie (2003), there is no one, single term integrating these topics and problems under one umbrella. In the Norwegian educational sector, governmental units responsible for ICT policies as well as the LIS sector have been preoccupied with topics and problems falling under the term 'information literacy. Information literacy as a concept has been formally articulated in the United States since the early 1990s. It appeared as a result of the tremendous progress in information technology and its dramatic impact on information accessibility. With rapid progress in communication technology, the library shifted its mission from that of a repository of human culture to that of a facilitator of human culture. As a result, our mission as professional librarians has moved from preservation of knowledge to that of IL advocates (Ashoor, 2005).

Nayak et al. (2006) provides an overview of E-Information Literacy. The idea of information literacy, emerging with the advent of information technologies in the early
1970s, has grown, taken shape and strengthened to become recognized as the critical literacy for the twenty-first century. Today, E-information literacy is inextricably associated with information practices and critical thinking in the information and communication technology environment.

ALA (2007) defines information literacy as “a set of abilities which enable individuals to recognise when information is needed and possessing the ability to locate, evaluate, and utilize the needed information”. The importance of information literacy in the modern environment of rapid technological change and proliferating information resources cannot be over emphasised. Because of the technological advancement, which has resulted in the proliferation of information, individuals are faced with diverse, abundant information choices whether in their academic studies, in the workplace, and in their personal lives. Increasingly, information comes to individuals in unfiltered formats and raising questions about its authenticity, validity, and reliability. These pose new challenges for individuals in evaluating and understanding it.

2.2.1 **National and International Scenario**

With the appearance of the information age, the education of information literacy, the necessary skills of information age, has aroused widespread concern around the world, and gradually added to the goals of education in all schools and evaluation systems. That is why Information literacy has been considered as a global phenomenon and many information literacy programmes have been initiated, and also documented throughout the world, especially in countries like North America, Australia, South Africa and North Europe.
Rader (2003) explains that academic librarians are building partnerships with teaching faculty to integrate information skills instruction throughout the undergraduate and graduate curricula. The author also highlighted the teaching information skills efforts of the librarians in several African countries particularly at the University of Botswana, where librarians have integrated information skills instruction throughout the curriculum.

As a country starting early in information literacy education, the USA is at the forefront of the world with a wealth of experience and achievements in the information literacy education and research. A more systematic and deeper collation and research on information literacy education in American is of great significance on China's development of information literacy education (Wu, 2010).

Secker (2010) explains that Information literacy widely recognized and embedded in the curriculum in US and IL standards seem to be better established in the US universities. The author also discussed the ‘freshman’ experience, which is often a rather more extensive process in US universities compared with induction at UK universities, as it is designed to build loyalty between the student and their university. The US libraries advocate new technologies in relation to ILE, such as producing podcasts and using Camtasia software to create multimedia etc.

Bradley (2014) advocates the need for twenty-first century information skills in engineering practice, combined with the importance for engineering programmes to meet accreditation requirements, Author explores whether and how information use skills are reflected in engineering programme accreditation standards of four countries: Canada, the USA, the UK, and Australia. The results indicate that there is a significant overlap between the information use skills required of students by engineering accreditation processes and
librarians’ efforts to develop information literacy competencies in students, despite differences in terms used to describe these skills.

2.2.1.1 National scenario: Literature published in India

When you take a look at the literature published in India, it is observed that there is very little output. Very few studies are being carried out in India. The literature review of the related literature published in India shows that only a few Indian authors have published some papers/articles related to Information Literacy.

Ramakrishnagowda and Valmiki (2004) conducted the study in the KUVEMPU University to assess the computer and information literacy of the post graduate students. The study reveals that majority of the students lack awareness regarding the printed reference sources, highest percent of them do not possess the ability to identify the key concepts in the given information environment.

Hadimani & Rajgoli (2010) have made an attempt to know the information literacy competency among the undergraduate students of the College of Agriculture, Raichur, Karnataka. Outcome of the study has been discussed and necessary suggestions have been made on the basis of the results for implementing proper information literacy competency programmes in the college. Singh & Klingenberg (2012) highlight the Information literacy initiatives in India particularly the role of agricultural university libraries in imparting I L programme as part of the course curriculum. Also discusses the information competency programmes of German universities and basic models of teaching information literacy skills by the subject librarians at some German universities and difficulties faced in incorporating information literacy into regular course curriculum.
Another study by Panda & Jena (2013) presents the findings of a survey on the information literacy competency among the writers of Odia literature and also reveals the awareness about the use of information resources, both print and electronic; knowledge about Internet; familiarity with and use of information communication technologies, copyright and fair use of information etc.

The Karnataka Govt. initiated a series of skill development programmes to the librarians of both Degree College and Pre-University College working in Govt. and Aided Colleges in Karnataka to upgrade the skills of librarians emphasizing on ICT and its facets. To know the worth of the training usefulness and to evaluate the efficiency of content for further improvement in the training programme, the author conducted study (Jange, 2011).

2.2.2 Information Literacy Skills

Information literacy is a necessary skill that is utilitarian in every aspect of a person’s life. The importance of imparting information literacy programmes to develop information literacy skills among the students cannot be ignored in the contemporary electronic environment. The information literacy skills would lead to independent and student-centric learning, rather than depend on others for help.

Lock (2003) explains that there are two ways of looking at information skills in institutions of higher learning. The first strand relates to study skills which includes skills such as being able to use a library and its resources for advancing one's studies, being able to perform literature searches to whatever depth and complexity required for a particular curriculum or discipline area, and being able to demonstrate this to the satisfaction of tutors and assessors in whatever form necessary by means of citations and references to reading and information gathering. The second strand includes attributes of awareness and
understanding of the way in which information is produced, some practical ideas of how information is acquired, managed, disseminated and exploited, particularly with knowledge of how appropriate professional groups use information in the workplace, in business, and in the world of culture and the arts. It also includes the critical appraisal of the content and validity of the information.

According to CILIP (2005) Information Literacy is a part of knowledge or learning, which is made up of a series of skills or competencies that must be acquired. Information Literacy will mean slightly different things to different communities - it may also require a greater degree of skill or understanding by some communities than others. Information Literacy is relevant and it is viewed as an important skill to be learned and used in primary and secondary schools, in further and higher education, in business, and in leisure.

Eisenberg (2008) emphasizes practical strategies for development of effective IL skills learning and instruction in a range of situations. The author covers conceptual understandings of IL, the range of IL standards and models, technology within the IL framework and three contexts for successful IL learning and teaching: (i) the information process itself, (ii) technology in context, and (iii) implementation through real needs in real situations.

Case studies by Alfino et al. (2008) report the importance of integrating library skills into course goals to add coherence to the curriculum. In this project, the staff was included in the instructional team and information literacy skills that relate to critical thinking. Allen (2008) provided critical and philosophical arguments for constructivist based approaches to teaching critical thinking skills through online library instruction.
Zhang (2010) investigate the role of information literacy skills in environmental scanning for the Singapore SMEs which is a strategic information system used by organizations to cope up with the environmental changes and is a typical business management process with application of both information literacy skills and information technology. Kenton & Blummer (2010) study reveals that a general view of IL focused on the product rather than on the process, a perception of achieving information skills on their own, a performance for people over their information sources and an emphasis on personal interest as key to successful information seeking. The contemporary research has also focused on digital literacy and its relationship to information literacy.

Sasikala & Dhanraju (2011) conducted an assessment of information literacy skills among science students of Andhra University. Baskaran, Ramesh Babu and Golpakrishnan (2013) conducted a similar kind of study to examine the Information skills of the library and information science (LIS) students of Karnataka State. It was found that major IL skills possessed by the LIS students are not in uniform and a degree of variation is noticed.

In another study Singh & Joshi (2013) seek to assess the information literacy competency (ILC) of post graduate (PG) students at Haryana Agricultural University, Hisar, India, along with the impact of instruction initiatives in this respect. Based on the ACRL standards, an instrument was developed with 79 scoring items in the first part of the questionnaire along with the non-scoring items in the second part. The information literacy competency of PG students has been found satisfactory along with significant difference between the first and second year students. Various instruction initiatives were found to have a positive impact upon the ILC of PG students.
Ilogho & Nkiko (2014) investigated the knowledge of information literacy and search skills of the students in five selected private universities in Ogun state, Nigeria. It also examined students’ ability to distinguish diverse information sources as well as assess the effectiveness of information literacy programmes of the private universities. The study concluded that the sound information literacy skills are a desideratum in knowledge acquisition in the twenty-first century and recommended inter alia; that information literacy skills be integrated into the secondary and tertiary schools’ curricula.

The Rider University librarians heightened their collaboration with classroom faculty to teach the students in core writing classes information literacy (IL) skills during IL instruction (ILI) sessions. The conventional approach, which involves lectures, demonstrations, and hands-on time, was used in both the control and the experimental groups. The three experimental groups involved: (a) assigning students to preview the class Research Guide and take a graded quiz (Preview group), (b) engaging interactively with students during the ILI session (Active Learning group), and (c) providing multiple instruction and follow-up sessions (Multi-session group). The results showed that the student knowledge of concepts included in the training improved significantly in both the control and the experimental groups, but no differences were found among the teaching methods employed. The overall low scores in qualitative analysis suggest that more powerful instruction strategies besides diversified pedagogies are needed to significantly enhance long-term retention. (Hsieh, 2014).

2.2.3 Information Literacy: Delivery Methods and Contents

The Leckie & Fullerton (1999) study done at two Canadian Universities reveals that the science and engineering faculty thought their undergraduate students skills in finding,
retrieving and evaluating information were poor in the lower years, but improved by the upper years. However, the majority of faculty indicated that library research instruction for their students was improved. The results show clearly that the library instructional program will not be successful if it is general. It is emphasized strongly that the instruction must be course related and the librarians involved in the instructional program must know about each disciplines, departments and programs. In order to provide powerful skills and analytical expertise that students will use in all of their post college pursuits.

A national survey of information literacy instruction in Canadian academic libraries conducted by Julien (2000) revealed that trends in teaching objectives, methods, and content have changed little in the past five years. The instructional librarians continue to face numerous challenges, particularly with regard to limited resources and faculty and student attitudes. And also found that the influence of technological change on the content of instruction has remained fairly constant with 2.4 percent of libraries in 2000 that they notice no influence, 13.5 percent noting only a “slight” influence, 44.7 percent noting a “quite a bit” influence and 37 percent noting “a great deal” of influence.

Germain et al. (2000) tried to compare library instruction via a web-based tutorial with a lecture followed by hands-on computer experience. A total of 303 pre tests and 284 post tests were collected from first year undergraduates for evaluation. The instructional content of this study included 'the basics of using the library, its OPAC and entering a search in a database', and the time between testing varied between one and a half to six weeks. The students undertaking the electronic tutorials were supervised by the librarian. The results of the research suggested 'no difference in the effectiveness of the two types of instruction, web
and live, based on the number of correct answers’. However, the authors did not plan to assign students to complete the tutorial independently.

Holman (2000) also conducted similar study on the development of practical library skills by first year students, using either an online tutorial or attending a class, but again posttest times varied and the pre and posttest questions were not identical. Students taking part in the librarian led class followed the demonstration on their own terminal but were not required to complete a follow-on exercise. Participants included 56 students who attended the class, 27 students who completed the tutorial and 42 students in a control group. Although the students engaging in both instruction methods showed significant improvements over the control group, the tutorial group's post test scores were not significantly different from those of the class group.

Devidson (2001) states that, faculty, student, and library Staff attitudes toward credit courses, as well as various other instructional methods, for teaching library and research skills were assessed. A surprising number of faculty and students did not know about the courses offered. Although they indicated more preference for other methods, such as Web tutorials and written guides, two-third would still consider a credit course a viable option. To be successful, credit courses must be well marketed to both the faculty and students, and their importance and content must be clearly understood by faculty advisors.

Rathemacher et al., (2001) say credit-generating courses are at the center of the draft plan prepared for information literacy at the University of Rhodes Island. They envision these courses being supplemented by instructional ‘modules’. They conceive of modules as tutorials, some of which are Web-based, covering general topics such as the library catalogue, periodical databases and research strategies, as well as subject-specific topics
such as company information or drug information. Web-based modules would help to reach more students than through credit courses or the traditional bibliographic instruction alone.

Gutierrez et al. (2001) compared the performance of two groups of Freshman college students assigned print and electronic workbooks respectively following a class lecture by a librarian. The researchers conducted a class lecture for each of two groups of approximately 65 students, eliminating the disadvantage of not having a 'human' instructor. From the study no significant difference was found based on the format of the workbook. The research suggested that frequency of library usage was the significant factor in the improvement of information literacy skills rather than the instructional format.

A study by Churkovich & Oughtred (2002) at the Deakin University Library in Australia compared learning for three methods of instructional delivery to students, with results that run counter to most of the previous studies. The traditional in-class group learned more than either the online tutorial group or the “mediated” group, who completed the tutorial with the librarian assistance available. Despite this result, however, the librarians have decided to continue with the online instruction for the basic classes, addressing design flaws in the tutorial and maintaining face-to-face instruction for the advanced classes. The small number and limited scope of knowledge-based questions in the test may have impacted this study. In her paper Knight (2002) recorded that traditional instruction has been supplemented by online tutorial, MentorWeb. The MentorWeb tutorial was designed to address the research objectives of the course and to be an easily accessible information resource for the students. The Web – based tutorial is an attractive mode of delivery for literacy instruction.
Further research was suggested in a number of areas. A project was conducted at the University of Melbourne during 2002 to evaluate the effectiveness of different methods adopted for teaching the information literacy skills to the students in the Arts Faculty. The three programs that were evaluated used different modes of delivery. The paper discusses the rationale of the project, the methodology and the results of the evaluation (Fiona & Ellis, 2003). The need for the training the library and information professionals in the planning and implementation of IL programmes working in Indian University libraries was emphasized by Nyamboga (2004).

Lipu & Lloyd (2007) tried to provide in their book an overview of approaches to assist the researchers and practitioners to explore ways of undertaking research in the information literacy field. The book covers an introductory overview of research by Dr. Kirsty Williamson, explores the key aspects of a specific method and explains how it may be applied in practice. The methods covered include those representing qualitative, quantitative and mixed methods. And also points the way towards potential new directions for the burgeoning.

Walsh (2011) explains in his book about the practical guidance to the librarians and others delivering information literacy (IL) teaching on how to choose the best method for their purposes. His audience is the US higher education (HE) librarians, and some of the terminology is different to that used elsewhere; fortunately the author makes sure to define terms used and explain any acronyms or jargon. It is clearly structured and deals with: methods of instruction; objectives of instruction and how to measure success; participant populations and learning environments; choosing a method of instruction according to desired purpose; and the future of information literacy instruction (ILI).
Walker & Pearce (2014) research explores the ways in which one-shot library instruction might be bolstered through the promotion of higher levels of student engagement. This research utilizes a pre and post-test analytical model to compare an experimental, learner-centered approach to library instruction, supplemented with clickers, to a more traditional pedagogical approach. Statistical analysis show that while both the experimental and control groups witnessed significant improvement from pre to post-test there was no statistically significant difference between these two approaches.

2.3 Changing Academic Library Environment

ICT has thrown a challenge for the library professionals all over the world. Increased access to technology has altered the way that information literacy, while variety of electronic information resources has widened the potential resource base for all users. These developments have reduced face-to-face teaching in the library and the need to visit the library in search for information. This has led to alterations in planning and delivery of information literacy programmes. There is no doubt that the information environment in academic libraries is changing. In view of this, information literacy programmes need continuous revision abreast with the changing information environment

Duderstadt (1997) documented a challenging vision of the university as a knowledge server for an information-based economy and identified the library as the intellectual focal point of a digital convergence of a wide range of media. He described the role of the library as becoming more of a knowledge navigator and a facilitator of retrieval and dissemination.

Misra & Satyanarayana (2000) emphasized that instruction program should guide and prepare users to face any challenges thrown by technological complexities in the 21st Century. They stressed on self-instructional material, learning package and computer-
assisted instruction. Vasanthi (2001) feels that the challenge before information professionals is to convince and convert traditional users into users of Internet-based resources and services. Further she emphasizes that information literacy can contribute to developing information technology related competencies among end-users which includes basic computer and network literacy.

Owusu-Ansah (2004) notes that the libraries, which had long been in the business of providing instruction in how to use their collections and locate information, were foremost in recognizing the complexity of this new environment. The academic libraries have historically provided services such as bibliographic instruction, reference, and research guides or pathfinders, and in some cases, have taught formal credit bearing or non-credit courses in basic research methods. More recently, these activities have fallen under the umbrella of information literacy instruction, where pedagogies continue to range from the formal full-semester credit courses to the informal introductory sessions of an hour or longer, printed and online research guides, reference interview, etc. The methods employed to assess these efforts have also been quite varied.

2.3.1 Information Literacy Education

Information literacy requires sustained development throughout all levels of education, by leading individuals to think critically and by helping them to construct a framework for learning how to learn and to become lifelong learners. Educational institutions provide the foundation for continued growth throughout the careers of graduates, as well as in their roles as informed citizens and members of communities.

Bruce (1994) explains that as students progress through their undergraduate years and graduate programs, they need to have repeated opportunities for seeking, evaluating,
managing and applying information gathered from multiple sources and obtained from the discipline specific research methods. So, there is a wide and growing recognition that teaching students information literacy (IL) skills is a critical component of the 21st century higher education.

Breivik (1998) captured the essence of the changes required for the educational systems in order to realize the potential of information literacy education for lifelong learning. Such learning processes, she concludes, would necessarily involve the information processes, practices and experiences described as information literacy. Education needs a new model of learning – learning that is based on the information resources of the real world and learning that is active and integrated, not passive and fragmented. Textbooks, workbooks and lectures must yield to a learning process based on the information resources available for learning and problem solving throughout people’s lifetimes.

The significance of information literacy education lies in its potential to encourage deep, rather than surface learning, and in its potential to transform dependent learners into independent, self directed, lifelong learners. Without information, literacy people are condemned to a lack of information, dependence upon others for access to knowledge and information, and even to acute levels of information anxiety (Wurman et al., 2001).

Bruce (2004) further describes that information literacy is a natural extension of the concept of literacy in our information society, and information literacy education is the catalyst required to transform the information society of today into the learning society of tomorrow. Across the world, educators have been developing strategies and policies for designing learning opportunities that will enable learners to take advantage of the ICT
infrastructures available to them and also help students to recognize the transferability of the processes involved to everyday life, community and workplace contexts.

Li & Tam (2007) emphasize on the Chinese University of Hong Kong Library’s development of its web-based Information Literacy Tutorial and how it was incorporated into the mandatory student IT Proficiency Test. The inclusion of web-based e-learning tutorials on information literacy skills will support diverse ways of learning and also useful for Hong Kong academic libraries to plan and develop an interactive e-learning platform on information literacy. Ramesha (2008) made an attempt to highlight the need of taking initiatives and carrying out training programmes and projects for developing, promoting and implementing information literacy (IL) education. The author proposes strategy for addressing the IL issues in India which would help individual institutions to intensify and broaden their existing activities in the field of IL promotion and implementation.

In an effort to determine the extent to which teacher education programs incorporate information literacy instruction, Kovalik, et al. (2010) at a large Midwestern university conducted a survey of teacher education faculty in selected states. The survey sought to gather data related to faculty knowledge, inclusion, and assessment of information literacy in teacher education programs, and the degree to which there was collaboration between librarians and faculty in the teaching of information literacy skills.

2.4 ICT and Information Literacy

Information literacy is related to information technology skills, but has broader implications for the individual, the educational system, and for society. Increasingly, information technology skills are interwoven with, and support, information literacy. Information literacy’s focus on content, communication, analysis, information searching,
and evaluation; whereas information technology “fluency” focuses on a deep understanding of technology and graduated increasingly skilled use of it. (UNESCO, 2007). From the literature it is found that there are many studies which attempted to provide use of ICT to deliver effective information literacy programmes at different academic institutes. Only some of the studies have been mentioned below.

There are several examples of good information literacy practices. For example, at the Aalborg University Library a project titled MILE (Model for Information Literacy Education) was initiated, aiming to create and test a model for user instruction in information literacy, based on innovative pedagogy and ICT. The product consists of a combination of multimedia or Web-based just-in-time tutorials, as well as live instruction integrated in the teaching/learning process (MILE, 2001).

Nichols et al. (2003) developed an online format for delivering basic information literacy instruction for the purpose of allowing librarians to focus on more specialized instruction at State University of New York (SUNY) at Oswego. The authors conducted study to test the efficacy of the new format and to determine whether the student learning would be comparable using the online tutorial versus more traditional pedagogies. Finally, observations of behaviors and comments made by students using the tutorial indicated that neither mode of instruction fits all learning styles, that the students were more interested in active participation than in reading text or hearing detailed lectures, and that the timing of library instruction is important.

Rockman & Smith (2005) highlight four information and technology literacy assessment projects including the ICT Literacy Assessment from ETS, Project SAILS from Kent State/ACRL, the Bay Area Community Colleges Information Competency Assessment
Project, and the International Computer Driver’s License. Mackey (2005) explains how the individual and group webpage/site design assignments in a 300-level information environment class at the University of Albany teach IL/IT skills. The assignment requires students to find and evaluate 15 websites on an information science topic and then link them to a page they design using HTML, XML, CSS, UNIX, etc. and results of a student survey indicated the project improved both skill sets. Merrill et al. (2005) in their article emphasize that the Virginia Tech University librarians and instructional designers have developed an online IL textbook. And also discusses design, construction and structure of the textbook; information on its use and assessment of it.

Crawford (2006) investigates the impact of electronic information services (EIS) on the Glasgow Caledonian University students. It was found that the respondents broadly understood the concept of information literacy although this was much more marked among alumni as a result of the experience of work. The relationship of work activity to information literacy was found to be central and alumni felt that an understanding of information literacy gave them a distinct advantage in job finding and seeking promotion. It was also found that, although the library does have an impact on users, other factors such as progression and retention, and an innovative learning and teaching agenda are also important.

Koneru (2006) explains the strategic and collaborative approaches and desirable for fostering information literacy in academic setting via an information portal. Nurturing IL aims at developing learners' critical thinking and discernment about the whole gamut of e-information and its varying formats, prior to its consumption. Fox (2005) discusses the delivering the Information literacy in distance mode used question point to provide
instruction through an online meeting. The considerations include contents of the welcome e-mail, benefits of the software, equipment testing, a technical support librarian, slower pacing than face-to-face sessions, scripted text to reduce typing, and feedback questions.

Roberts (2007) advocates that podcasting is an alternate form of disseminating information literacy techniques that caters to the library user and useful for the auditory learner as well as distance education learner. Also covers the creating, planning and publishing of a podcast program that can be utilized by librarians involved in teaching information literacy skills.

Koneru (2010) describes how to impart IL instructions using the potential technologies. Among all the available options for imparting IL instructions, the web is preferred owing to its flexible nature to reach out to the target groups wherever they are and whenever they want to access the IL modules. A diligent effort is made to integrate ADDIE, the widely-used instructional design model for designing and developing IL modules. INFOSEEK, the five-faceted model presented under Design Phase provides a content framework for developing IL instructional programmes. Helvoort (2010)64 discusses on the validity of the construct Information Literacy in the perspective of changing information and communication technologies. The author also tries to explore, the impact of technological developments on the relevance of the Information Literacy concept. The technological developments that were discussed content integration (federated search engines), amateur publishing (user generated content), use of social networks to find information personalization and push technology and loss of context / fragmentation of information.

Špiranec & Zorica (2010) found that the new meaning and understanding of the central conceptions in information literacy are shifting the focus of classical information
literacy towards Information literacy 2.0. Many of the aspects of current information literacy practices originate from a print-based culture, which is incongruent with the transient and hybrid nature of digital environments. These radically changing environments are causing the appearance of anomalies in the information literacy paradigm, which could effectively be resolved through the introduction of a sub-concept of information literacy.

Nazari & Webber (2011) conducted case study. The study highlights several characteristics of GI and discusses their implications for IL. In particular, it compares the emergent IL competencies in the GIS discipline with those in the SCONUL model. Unlike exploratory studies of IL which focus on the IL and IL competencies to explore this phenomenon, the methodological approach taken in their study provides IL researchers with a new approach whose primary focus is on the concept of information as a key contextual element of IL. This helps one to gain a deeper insight into IL in disciplinary areas.

Yang & Chou (2014) conducted a survey to determine how the academic libraries in the United States and Canada marketed and delivered information literacy on the Web. Only 65 percent of the libraries in the sample advertised library instruction as a service on the Web, while 64 percent of the libraries boasted research guides and tutorials. Sixteen percent of the libraries provided direct links to ACRL's Information Literacy Competency Standards for Higher Education. The authors hope the findings can help determine how academic libraries are currently using the Internet to increase information literacy on the Web and set a new platform for better strategies for advocating information literacy.

Mandalios introduced the RADAR tool, which she designed to assist students evaluate online information. She pointed out that the tool, although supported by preliminary qualitative research conducted at her own institution, required further empirical
investigation. This brief communication aims to contribute empirical evidence which supports the efficacy of RADAR as a tool for evaluating online information resources by discussing student feedback on the application of the tool in an introductory session to a taught postgraduate business class (Cullen, 2014).

Johnston & Marsh (2014) study focuses on the approach taken to embed information literacy through iPads and iBooks through the development of an information literacy matrix and iPad activities created in collaboration with faculty in a foundations bridging course in an EFL environment. The feedback was sought from faculty on the content of the iBooks and the outcome of using them in the classroom. The findings of the study created new opportunities for the library staff to collaborate with faculty and professional development opportunities for library staff.

2.5 Information Literacy for Engineering Colleges

With the rapid growth of information, the ability of science and engineering graduates to be information literate has become critically important. There is a need to determine what information is needed, where to locate it, how to select, evaluate it and utilize it, purposefully for the collective progress is of critical importance. Information literacy initiates, sustains, and extends lifelong learning through abilities which may use technologies but are ultimately independent of them (ACRL, 2000).

Waldman (2013) briefly summarizes that history and discusses the impact the information age has had in altering the ways in which that instruction is offered. It will then address the ways in which community and technical colleges can effectively continue the tradition of providing the necessary tools that enable the students and graduates to become information-literate citizens. Information literacy has become an important skill for
undergraduate students due to societal changes that have seen information becoming a valuable commodity, the need for graduates to become lifelong learners, and the recognition that information literacy is an underpinning generic skill for effective learning in higher education. The author describes a sequence of purposefully designed activities to help students learn and practice information literacy skills that were integrated into a first-year engineering and technology study unit as a core element of the unit syllabus (Tucker & Palmer, 2004).

Callison et al. (2005) describe the collaboration at the University of Pittsburgh between the Freshman Engineering Program and the Engineering Library “has resulted in a library research project that is integrated into the freshman curriculum. Mohler (2005) reviews the outcome of a citation analysis of bibliographies of first-year engineering students at Wichita State University. The engineering librarian used the results to evaluate the library instruction for this group of students.

Information literacy is a way of learning through engaging with information...it is not just about finding and presenting information, it is about higher order analysis, synthesis, critical thinking and problem solving. Ngatai (2004) writes that the study of Information Literacy for Postgraduate Engineering involves seeking and using information for independent learning, lifelong learning, participative citizenship and social responsibility. In another study Dumont & Foucault (2005) write about the innovative approaches, which contain five library initiatives including a capstone research portfolio for PhD students, graded in part by a librarian. Others were dedicated information services for Research chairs, a database of faculty publications; a journal needs analysis, and comparative analysis of Canadian engineering programs publication data.
In 2002, the Science and Technology Section (STS) of the Association of College and Research Libraries (ACRL) Division of the American Libraries Association charged the STS Task Force on Information Literacy for Science and Technology with developing standards, performance indicators and outcomes for library instruction in science and technology, based on the ACRL Information Literacy Competency (ILC) Standards for Higher Education. The STS Task force identified five standards, with the fifth standard as lifelong learning being entirely new and different from the ACRL ILC Standards for Higher Education (Baldwin, 2005).

Pilerot & Hiort af Ornäs (2006) explores the preliminary process of including Information Literacy implicitly, into assessment items in an undergraduate engineering technical course; Control Systems Analysis and Design. Williamson et al., (2007) tried to examine the ways in which access to electronic information seeking affects the IL needs of research students in the Faculty of Information Technology at Monash University. The result points to enhanced roles for both supervisors and academic librarians, with the need for the latter to become perceived as educators within their university communities.

Universities and professional bodies require graduates to be skilled practitioners educated to a high standard of competency with proficiency in a diversity of graduate attributes. Some attributes are discipline based while others are of a more generic nature. Technical courses, generally, rely more heavily on mathematical computations and technical descriptions and drawings to demonstrate knowledge and information and are proving to be more challenging to effectively embed Information Literacy as a learning outcome (Keleher et al., 2011).
Fosmire (2011) attempts to create just such a bridge, focusing on the information resources and processes needed by engineers engaged in the design process and bringing together the literature of both the engineering education and library science communities. Peterson & Jeffryes (2012) emphasise the outcome of seminar at the College of Science and Engineering. The seminar provided a strong model for re-framing information literacy in the context of teaching and learning in science and engineering, giving librarians an opportunity to strengthen relationships and increase liaison effectiveness.

In 2011, the ACRL Science & Technology Section (STS) completed its five-year review of the Information Literacy Standards for Science and Engineering/Technology. The author considers the broad recommendations of the task force, using the framework of e-Science - team-based, data-driven science - to address areas of necessary transformation in information literacy: an advanced team-based model that crosses disciplinary boundaries; a recognition that individuals and groups not only consume information, but also produce it; and stronger interplay between information literacy and complementary literacies. And also extrapolates beyond the sciences, referencing broader trends within higher education (Berman, 2013).

2.5.1 Design & Development of Information Literacy Programmes

In modern information intensive society, training students with higher information literacy skills is one of the important goals of higher education in the world.

Peacock & Judith (2001) describe the QUT Library’s Information Literacy Program as a comprehensive generic curriculum and a diverse range of discipline-specific information literacy classes and integrated courses to undergraduate and post-graduate students, staff and external client groups. Frantz (2002) explains that integration with a core
curriculum, specific discipline or course, or general information skills courses have gained popularity because they offer opportunities for in-depth instruction and reinforcement of research skills through course activities.

Ruth (2003) conducted the study to examine the effectiveness of information literacy programs depending on the teaching partners having a shared understanding of how information literacy is developed, and the provision of appropriate staffing resources to develop and deliver the programs at the University of Waikato, Hamilton, New Zealand. Effective communication and positive working relationships are some conditions that were found to be essential to the success of collaborative teaching partnerships, and strategies were identified for initiating, developing and sustaining those partnerships.

Hunn & Rossiter (2006) study reports the findings of a project to develop an online information literacy tutorial at the DCMT Library, Cranfield University. This case study highlights some of the issues raised in designing and developing a tutorial for a specific target audience and to describe the actual tutorial package. Discussion on the tutorial design includes commentary on the navigation, themes associated with specific tutorials and the tools used to engage the user, including a generic search engine.

Tingyan & Li (2011) analyze the content of information literacy education and development status and finds the relevant constraints. And also proposes some suggestions on the system construction of information literacy curriculums in Chinese colleges. Namely, by rational design of curriculum system and training path, to enhance the students' information, knowledge, ability, awareness and moral construction, and promote the comprehensive improvement of information literacy of college students.
Daugman et al., (2012) describe how a diverse set of professional backgrounds was leveraged to develop a credit-bearing arts and humanities information literacy course, LIB250: Humanities Research Sources and Strategies; the experience of teaching the course and ideas for improving the course. LIB250 has been taught once per academic year, unlike the other advanced information literacy courses, which have been taught each semester. Web2.0 technologies incorporated throughout course design and delivery in order to streamline planning and to facilitate student engagement.

A case study by Loo (2013) recounts a process of course design, conduct, and evaluation for a single-session chemical information literacy class using guided and team-based learning. This approach incorporates active learning, worked examples, process worksheets, and POGIL elements. The instruction followed an iterative cycle of learning exercises whereby (1) the instructor introduces an information problem (2) student teams collaboratively work through process worksheets that guide them through the technical and analytical tasks of resolving the information problem or task, (3) the instructor serves as a facilitator to address learning needs that arise during the exercise, while the student teams analyze and reflect upon the learning activity and concepts, and afterwards, (4) the class engages in a discussion as an opportunity for evaluation, and further exploration. Overall, the guided and team-based learning approach offers opportunities to observe student progress closely and forges a collaborative spirit between students and the instructor for an engaging and rewarding experience.

The demand for instructional design librarianship is increasing. The trend is due to the higher education's focus on integrating information literacy content in academic disciplines. The generic ADDIE (analysis, design, development, implementation, and
evaluation) design model is traditionally used to develop information literacy instruction and content. The IDEA (interview, design, embed, assess) model is a library-specific systematic approach to integrating information literacy instruction and resources within academic courses. A close collaboration between library and academic faculty is evident throughout. Flowcharts, forms, and rubrics guide the librarians not formally trained in instructional design through the process (Mullins, 2014).

Derakhshan et al. (2014) examined the challenges in the development of IL competencies and approaches to overcome the challenges in Iran. A total of 15 academics teaching 18 different LIS courses from six universities were interviewed. The main challenges facing educators were a lack of clear understanding of LIS as a discipline, the gap between the way students learn in schools and the expectations in a university, shortcomings in teaching styles, and the fixed nature of the LIS education system. The aim of Kingori, et al. (2014) conducted study to investigate the prospects of re-engineering information literacy programmes (ILPs) in selected Nairobi-based public and private universities and develop a model that could be used to address the issue. This study was based on a mix of Jerome Seymour Bruner's (1971) theory of discovery learning and the Seven Ways or Faces model.

2.5.2 Role of Librarian in Information Literacy

The librarians have access to the wealth of information adaptable to their own libraries. An important role of librarian is in assisting others to find the information they need. Many libraries have successfully overcome the institutional hurdles; have planned and implemented one or many IL programs and have excellent content, appropriate strategies and useful tools to aid the students to become information literate.
ACRL (2000) also states that the librarians coordinate in the assessment and selection of information resources for supporting the teaching and learning, in arranging systems and facilitating the accessibility to information, and in teaching students as well as educators in their search for information. Rockman (2004) explains that an academic library has major role to assist educators in information literacy instruction. The librarians will work with the educators to integrate information literacy through activities such as using e-learning platforms in the course, evaluating students’ information literacy skills, using online teaching for selected contents, recommending the integration of electronic resources in the courses, preparing efficient teaching tools, and introducing plagiarism prevention software.

The College of Integrated Science and Technology created an undergraduate health informative class in which a librarian was involved in curriculum design. The librarian became a central coordinator for the course, team-taught by faculty from five disciplines’ and the benefits of the arrangement included stronger relationships with each department and highlighting services and resources for faculty and students (McCabe, 2005). Bridgland & Whitehead (2005) opined that sustaining forward movement in information literacy is being examined as programmes move toward maturity. Moving librarians out of the library and into teaching and learning centers as a means of integration has been attempted but online tutorials continue to be the primary means of supporting large numbers of students. The course management systems such as Blackboard and WebCT are also showing promise and not just in universities, but the librarians need to find ways of going beyond just adding links into existing programmes (Dando, 2005).
Li (2006) sees that the librarians are the major part in promoting information literacy among students and the educators. In another study Dold (2014) explains that the librarians are instrumental in advancing the education of students and orienting tomorrow's professions toward the world in which they will practice: rich in information, diverse in perspective, and latent with the opportunities for trans-disciplinary research. The author examines how different disciplines may be included in a shared problem, using psychopathy as an example. The role of the librarian is discussed in terms of critical information literacy, as a means to conducting trans-disciplinary research.

Moselen & Wang (2014) explore the development of a programme for subject librarians which focuses on the practical aspects of how to integrate information literacy into an academic curriculum. The theoretical basis of the programme is largely based on the doctoral research of Dr. Li Wang who developed a systematic model for integrating IL into an undergraduate programme at the University of Auckland. Elements of the programme are explained and outcomes, after two years of running the programme, are explored.

Walker & Pearce (2014) opine that many librarians still struggle to solidify their place, and their value, in the instructional landscape of their parent institution. This struggle persists while library instruction for the students remains limited to one 50-75 min session (one-shot instruction). Indeed, the notion that information literacy can be taught in one session is preposterous for most librarians. Nevertheless, as this constraint persists, the librarians must work to improve the results students achieve within the one-shot model.

Monge & Frisicaro-Pawlowski (2014) present an argument for faculty and librarians to collaborate and redefine information literacy guidelines using specific disciplinary requirements while incorporating non-formal and informal workplace learning practices.
This approach would better prepare students for the social and collaborative learning required in a 21st century workforce environment. An exploratory study was conducted by Fong (2014) in an effort to determine what librarians in the US are doing to teach research skills to chemistry graduate students. The Chemistry librarians at ARL (Association of Research Libraries) institutions were surveyed about the content they teach; when, where, and how they present it; and what assessment they perform. The results reveal the most popular resources and information literacy skills taught coverage gaps, and preferences for teaching and assessment techniques.

Ojedokun (2014) conducted study at universities in Nigeria, to determine librarians' information literacy skills. The research suggests that librarians are clearly deficient in the essential skills required for successful information research process. To remedy the deficiencies, the study recommends regular training and retraining through professional development workshops, librarians' access to regular use of the Internet, and the review of the curriculum of the library schools.

2.6 Information Literacy Models, Standards, Guidelines

A. Information Literacy Models

There are a number of Information Literacy or information problem solving models available. Some of the important IL Models developed by experts, academicians and organizations are as follow

a. Big6 Model

The Big6 model is one of the most well known models in the field developed by Mike Eisenberg and Berkowitz and is being taught to students as a guide for their research. It is a process model of how people of all ages solve an information problem. It has six
stages of the Information problem-solving that the students apply in their Information problem solving process, namely task definition, Information seeking strategies, location and access, use of Information synthesis and evaluation (Eisenberg & Berkowitz, 1990).

b. Seven Pillars of information Literacy (SCONUL) Model

The Seven Pillars of Information Literacy model was developed by the SCONUL advisory committee on Information Literacy in 1999. In 2012 the model was updated and expanded to reflect more clearly the range of different terminologies and concepts which we now understand as “Information Literacy”. The model has seven competence levels which include the ability to recognise a need for Information, the ability to distinguish way in which the Information gap may be addressed, the ability to construct strategies for locating Information, the ability to locate and access Information, the ability to compare and evaluate Information obtained from different sources, the ability to organise, apply and communicate Information to others in ways appropriate to the situation and the ability to synthesise and build upon existing Information, contributing to the creation of new knowledge (SCONUL, 1999).

c. Kuhlthau's Model

Another well-known model is the Information search process by Kuhlthau. This model shows users’ approach to the research process and how users’ confidence increases at each stage. The model has seven stages, which include initiation, selection, exploration, formulation, collection, presentation and assessment (Kuhlthau, 1993).

d. 8Ws Model

This model was developed by Annette Lamb in the early 1990 (updated in 1997, 2001. The model is similar to the work of Eisenberg, McKenzie, Kuhlthau, Pappas and
Tepe. However, a fun alliteration was used to stimulate student interest and focus on the student’s perspective. The model has used “8Ws” approach focusing on the process of the project development; Watching (Exploring), Wondering (Questioning), Webbing (Searching), Wiggling (Evaluating), Weaving (Synthesizing), Wrapping (Creating), Waving (Communicating) and Wishing (Assessing) (Lamb et al., 1997).

e. **Pathways to Knowledge Model**

The Information Inquiry model by Pappas and Tepe includes pathways to knowledge and is meant to encourage students to continuously explore and reassess as they go about their information process. The model has six steps namely appreciation and enjoyment, pre-search, search, interpretation, communication and evaluation (Pappas & Tepe, 2002).

f. **Research Process Model**

Stripling and Pitts’ Research Process model (1988) guides students through the stages of creating a research paper. It has ten steps starting from choosing a research topic and ending with the presentation of the final topic (Stripling and Pitts, 1988).

g. **The Research Cycle Model**

The Research Cycle model is created by Jamie McKenzie. The model has seven stages, which include initiation Questioning, Planning, Gathering, Sorting & Sifting, Synthesizing, Evaluating and Reporting* (*Reporting comes after several repetitions of the cycle create sufficient INSIGHT) (McKenzie, 2000).

h. **Empowering-8 Model**

Empowering Eight (E8), an Information Literacy Model was developed at this workshop organized jointly by IFLA -ALP and the National Institute of Library & Information Sciences (NILIS) of Sri Lanka in 2004. Developing another model (E8) was
essential because of the composite culture and local conditions in these countries. The model has eight stages, which includes Identify, explore, Select, Organize, Create, Present, Assess, and Apply with several sub-stages under each component (Wijetunge & Alahakoon, 2005).

B. Information Literacy Standards and Guidelines

The Australian Information Literacy Standards are based on the United States standards. The United States standards were reviewed at a workshop by the University of South Australia for the Council of Australian University Librarians (CAUL). The scope of Australian standard is obviously wider covering not only to the students but also the faculty member and the non-academic setting (AARL, 2001).

In 2003, the standards were further revised based on the recommendations and experiences of the academics and librarians who used the CAUL original set of benchmarks. The second edition was renamed the Australian and New Zealand Information Literacy Framework (ANZIIL) and essentially provided four guiding principles and more comprehensive details for each of the six core standards (ANZIIL, 2004).

The information literacy standards, for becoming effective learners, include three basic components: access, evaluation and use of information. Lau (2004) notes that these core goals are found in most of the standards created by individual educators and library associations such as AASL, ACRL, SCONUL and the Australian and New Zealand Institute for Information Literacy. The IFLA information literacy standards are based on these international experiences and contributions. The IFLA standards are grouped under the three basic information literacy components. 1) Access: Definition and Articulation of the Information Need and Location of Information. 2) Evaluation: Assessment of Information
and organization of Information 3) Use: Use of information and Communication and ethical use of information.

The schools and institutions of higher education worldwide have implemented different IL standards and guidelines. These documents not only list the information-related competencies that students ought to possess and exhibit, but also make recommendations as to how these competencies can be integrated within school curricula and also the various strategies that can be implemented in order to effectively impart these competencies to students. These information-related competencies range from specific IL skills to more procedural ICT skills (Mokhtar & Majid, 2008).

In United States, the American Library Association (ALA, 1998) and Association for Educational Communications and Technology’s landmark publication ‘Information Power’ and the Association of College and Research Libraries (ACRL, 2000) is the source that the higher education community looks to for standards and guidelines on academic libraries. ACRL promulgates standards and guidelines to help libraries, academic institutions, and accrediting agencies understand the components of an excellent library. These standards, guidelines, and model statements, reviewed and updated by the membership on a regular basis, have both become de facto standards for IL competencies from kindergarten to college, both across the US and in many other nations throughout the world.

The UK Standing Committee for National and University Libraries (SCONUL, 1999) first convened and proposed the Seven Pillars of Information Skills in their position paper in 1998. The basis of the paper was the relationship between information technology skills and information handling skills.
a. Information Literacy Standards in Science, Engineering and Technology

In January of 2002 JoAnn DeVries, Chair of the Science and Technology Section, charged the STS Task Force on Information Literacy for Science and Technology with developing standards, performance indicators and outcomes for library instruction in science and technology. The STS Council approved the resulting product in June of 2004 at the American Library Association Annual Conference in Orlando, Florida. Based on the ACRL Information Literacy Competency Standards for Higher Education, five standards and twenty-five performance indicators were developed. Each performance indicator is accompanied by one or more outcomes for assessing the progress toward information literacy of students of science and engineering or technology at all levels of higher education (ACRL, STS, 2006).

2.7 Assessments of Information Literacy Programmes

Assessment of information literacy programmes by its very nature demands the knowledge to understand the educational environment, including the collaboration between the library, campus, department, and students. Many libraries have already done what we set out to do, and libraries around the country are keenly aware of the complex and multilayered environment this assessment exits within.

Assessing student learning outcomes and competencies are essential activities in evaluating the library instructional programs. With library positions continually being re-evaluated and re-constructed with added responsibilities, it becomes paramount to incorporate assessment measures for instructional programs to validate that students are developing the necessary information literacy skills that support the broader educational outcomes. Owusu-Ansah (2004) proposes that the library be the focal point for information
literacy instruction because information literacy extends beyond any discipline-specific boundary. He asserts that the librarians should be the key personnel ‘to define and achieve campus-wide information literacy. O’ Hanlon (2007) says that the importance of linking “outcomes assessment in academic libraries to the institutional mission of the parent organization.

Emmett & Emde (2007) describe the progression in designing the assessment tool through the three year period and the results. Specifically, the current authors’ research revolves around a semester long, librarian taught, graduate course whose objective is to increase the student participants’ information literacy skills, and to assess the degree of measured improvement using a pre- and posttest methodology.

Katz (2007) describes the development and early administrations of the ETS iSkills™ assessment, an Internet-based assessment of information literacy skills that arise in the context of technology. From the earliest stages to the present, the library community has been directly involved in the design, development, review, field trials, and administrations to assure the assessment and scores are valid, reliable, authentic, and useful. Streatfield & Markless (2008) write the progress to date in evaluating the impact of information literacy work in Higher Education in the UK. It also describes a collaborative UK national initiative in which various university library teams engaged in evaluating information literacy. Finally it proposes a research design for further evaluation work in higher education, combining a new student-focused framework for information literacy development (already field-tested) and application of concept mapping as a diagnostic tool.

To provide systematic assessment of a 3-credit, full-semester information literacy course at the University of Rhode Island, the library instruction faculty adapted the Bay
Area Community College Information Competency Proficiency Exam to determine how well the students learned the material taught in the course and how well that material reflected the ACRL Information Literacy Competency Standards for Higher Education (Larsen et al., 2010). Wertz, et al., (2013) advocate that practicing engineers must continuously renew their knowledge and skills in order to remain competitive in the field. Yet, recent studies have found very little improvement in engineering graduates' lifelong learning skills. The study sought to evaluate the information skills of first-year engineering students. Specifically, it investigated the extent to which students gather information from a variety of sources and from high-quality sources, use gathered information to support an argument, and document information sources. From the study found that student teams mostly relied on Web resources, but their documentation skills were weak. When the students did successfully document the information, it was generally done appropriately.

Leichner et al., (2014) present how a task taxonomy and scoring rubrics were developed as a basis for the construction of standardized search tasks for the assessment of scholarly information literacy (IL). The tasks were applied alongside with a standardized IL test to determine their convergent validity. The results show that IL can be assessed using information search tasks in a reliable and conceptually as well as ecologically valid way. As per the authors, this is the first publication using information search tasks for the assessment of IL with this degree of standardization.

Recent research conducted by Pickard, et al. (2014) in an English high school has explored the importance that teenagers attach to 10 particular evaluative criteria. Participants felt that information on the Web should be current/topical, free from spelling and grammatical errors and easily verifiable elsewhere but authorship was much less of a
priority to them. The findings may be of special relevance to information literacy teachers who are defining priorities for their own programmes. Although many information literacy models stress the need to take a critical approach, the reality of behaviour is often very different.

2.8 Summing Up

Today’s engineering educated workforce needs skills beyond the technical knowledge traditionally taught in the post secondary curriculum. In today’s information rich environment, lifelong learning skills have also become extremely important. Students must be able to identify problems, decide what information they need in order to solve the problem, locate the information they need, analyze it, synthesize it and communicate their solution to others.

While glancing the literature published in India, it is observed that there is very little output in this field. Very few studies are being carried out in India. The literature review of the related literature published in India shows that a few Indian authors have published some papers/articles related to Information Literacy.

From the above literature review, it can be deduced that information literacy is a very important component of higher education in particularly technical and engineering education. Information literacy facilitates individuals in planning for the information tasks such as searching for information, retrieving information, locating information and selecting the information. Information skilled student can explore vast amount of information that is available on the arena. It is for this reason therefore, that engineering students should be equipped with information skills in order for them to interact with the information resources independently and competently without unnecessarily depending on information
intermediaries. Hence the justification for engineering colleges to incorporate information literacy programmes in their courses so as to make it mandatory to teach students such a course.
References


82


33. Daugman, E. et al. (2012). Designing and implementing an Information Literacy course in the humanities. *Communications in Information Literacy*, 5 (2), 127-143.


130. UNESCO. Information for All Programme (2007). *Understanding Information literacy: a primer*. Edited by the Information Society Division, Communication and Information


(Eds.), Technological Convergence and Social Networks in Information Management (pp.95-109). IMCW: CCIS 96.