Information Literacy in the Electronic Publishing Age

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Abstract. The global economy is currently being transformed from an industrial economy into a knowledge economy where knowledge is the major driving force for wealth generation. The growth of this knowledge-based society is bringing fundamental changes in the production, distribution and exchange of information; almost every socio-economic and cultural institution will feel the effects.

Information and communication technologies, especially Electronic Publishing, play a major role in the way information content is being created, distributed and used in today's society.

In parallel, a key challenge in the context of this emerging global information society is the need to provide individuals with skills that will enable them to locate, access, retrieve, evaluate, interpret and act on information, in their professional or personal lives and to become active and responsible citizens, in other words to become information literate. Today, Information Literacy is recognised as making an important contribution to decision making, problem-solving, independent learning, continuing professional development (life long learning) and research.

One of the most efficient ways to achieve this is through the educational system. Information skills acquisition should start at the very early stages of the educational process, at primary and secondary level and then extend up to the tertiary level – further education and higher education.

This paper will review some of the concepts of Information Literacy. A brief overview is made of some standards and approaches to acquisition of the necessary competences, as they apply to Information Literacy; these have been produced mainly for the higher education sector.
In a time when politicians are concerned with attracting young people into science and technology, to become future engineers and scientists, the roles of Electronic Publishing and visual learning and their significance for Information Literacy in the workplace, will be addressed.

1 Introduction

The global economy is currently being transformed from an industrial economy into a knowledge economy, where the capacity to create new knowledge from information is the major driving force for wealth generation and competitiveness [1]. The growth of this knowledge-based society is causing fundamental changes in the production, distribution and exchange of information; almost every socio-economic and cultural institution will be affected.

The constraints are no longer those of availability of scarce natural resources, machinery, or even financial capital but of intangible assets such as, brand, customer relationships, knowledge assets, intellectual capital and intellectual property [2]. With the growth of the Internet has come a shift of power from institutions to individuals. Increasingly, it is not the possession of information that provides the competitive advantage, but the ability to continuously acquire, integrate and apply the information existing in a variety of sources, along with the capacity to create the new knowledge that ultimately leads to success in an information and knowledge driven economy.

Meanwhile, changes are occurring in markets and industries; new forms of competition and new competitors are emerging, markets are now global along with their supply chains; changes in technologies have resulted in product and process innovation [3]. With the accelerating pace of technological change and globalisation, business cycles are getting shorter all the time. In this context, it is the intangible assets and in particular, knowledge, that add value [4].

Organizations, public or private, need to change and adapt quickly enough to be effective in such an environment. Those that are driven by knowledge and are able to acquire and apply information from a wider range of sources, both internal and external, to create new knowledge are those that will succeed. Such organizations will continuously reinvent themselves, through organizational learning and the development of practice and culture to support innovation.

Therefore, individuals must update their knowledge and skills regularly, if they are to participate fully in the evolving society and economy. Education is no longer a series of separate experiences – school, higher education, on-job training; it becomes a lifelong continuous process. To achieve this, individuals must be equipped with those skills that enable personal learning to take place, through the definition
of information needs, access, selection, acquisition, interpretation, evaluation and organization of the information in its many sources and formats.

Competitive advantage, at individual, organizational and national levels requires an expansion of the concept of literacy, from the basic ability to read, write and do mathematics and science, to a much broader skill set, which includes dexterity in the use and application of information to make best use of its increasing availability. This skill set is generally known as Information Literacy or Infoliteracy.

The scientific and technological changes that enable information to be communicated, packaged and analysed in new ways and the development of networks which facilitate new processes for producing and using it – Electronic Publishing – play major roles in the way information content is being created, distributed, used and applied in today’s society.

2 Information Literacy

Literacy (derived from Latin litteratus) is a concept that has had a variety of meanings and has been evolving over time, to include the skills needed for one to perform well in one’s society. The simplest form of literacy involves the ability to use the language in its written form: a literate person is able to read, write and understand his or her native language [5]. Reading, writing and arithmetic (the 3R’s) are still the basics of Literacy but recent developments in ICT’s have made it easier for individuals to access information; the impact of the Internet and other electronic and digital resources, enable people to use more methods and sources than ever before, to satisfy their information needs. However, this all implies a new set of skills for using and applying information; these skills have been encapsulated in the term, “Information Literacy”.

The literature offers several definitions, explanations and clarifications of what “Information Literacy” is. The term “information literate” was first introduced, in 1974, by Zurkowski (the then President of the US Information Industry Association), in a submission to the US National Commission on Libraries and Information Science, to identify people “trained in the application of information resources to their work” [quoted by 6]. He put forward recommendations to the US government that it should establish a national programme, aimed at achieving widespread, work-related Information Literacy [7]. Zurkowski used the term “Information Literacy” to address a goal within an information policy, to accommodate the transformation of traditional library services into innovative private sector information provision, for the new information industry that was emerging. In his perspective, Information Literacy was associated with the effective use of information within a working environment, specifically for problem solving [8].
Bawden [9], in his review on “information literacy” and “digital literacy”, attempts to clarify related “concepts” and a “multiplicity of terms”, which are often used synonymously. Some of these are:

- information literacy;
- library literacy;
- media literacy;
- computer literacy (synonyms – IT/information technology/electronic/electronic information literacy);
- network literacy (synonyms – Internet literacy, hyper-literacy);
- digital literacy (synonym – digital information literacy).

This author [10] argues that “library literacy”, “media literacy” and “computer literacy” are skills-based literacies that emerged to meet the needs of an evolving and increasingly complex landscape of information resources, with new technologies and a wider variety of media and services. In this context,

- **Library literacy** refers to competences in the use of libraries (collection and its services), the ability to follow a systematic search strategy to locate and evaluate the most relevant information on a given topic [11];

- **Media literacy** refers to critical thinking in assessing information made available through television, radio, newspapers, magazines and increasingly the Internet [12];

- **Computer literacy** is usually associated with technological know-how to manipulate computer hardware and software [13, 14].

Humes [15] points out that all these literacies require some level of critical thinking. However, “information literacy” compared to “computer literacy” goes beyond knowing how to use the technology. Compared to “library literacy”, “information literacy” is more than searching through a catalogue or reference materials, because it is not just a technique but a goal for those who want to be able to learn for life.

Although some consider “information technology literacy” to be synonymous with “computer literacy” [16], ACRL – Association of College and Research Libraries – points out that

“information literacy may be related to information technology skills, but has broader implications for the individual, the education system, and for society. Information technology skills enable an individual to use computers, software applications, databases, and other technologies to achieve a wide variety of academic, work-related and personal goals. Information literate individuals necessarily develop some technological skills. Information literacy, while showing significant overlap with information technology skills, is a distinct and broader area of competence. Increasingly, information technology skills are interwoven with and support, information literacy” [17].
The American Library Association was the first organization to formulate a widely accepted criteria for what characterizes an information literate person:

“To be information literate, a person must be able to recognize when information is needed and have the ability to locate, evaluate and use effectively the needed information”

and

“Information literacy is the ability to access, evaluate and use information from a variety of sources” [18].

Other definitions of the information literate person tend to cover the same elements, but expand them in one way or another [19]. Meanwhile, Webber and Johnston [20] point out that the majority of definitions of Information Literacy put forward, tend to include the following elements:

- competency in selecting and interacting with the most appropriate source of information, whether that be in print, electronic or another person;
- feeling comfortable with the tools needed for that interaction;
- communicating information effectively and appropriately;
- taking an intelligently critical approach to information in whatever form (e.g. paper, electronic other people) and appreciating the changes in information economy that affect what is presented;
- using and managing information effectively in a personal and work context;
- developing a sense of oneself as an information literate person.

In this context, the same authors propose a broad definition for Information Literacy as:

“Information literacy is the adoption of appropriate information behaviour to obtain, through whatever channel or medium, information well-fitted to information needs, together with critical awareness of the importance of wise and ethical use of information in society” [21].

To this, the authors would add Cheuk’s words [22] concerning, “the abilities to create, package and present” value added information to others, which provides the important link between the generally accepted definitions of Information Literacy and Electronic Publishing.

One of the most basic human rights is for individuals to have access to information that will enhance their lives, from either social, health, cultural or economic perspectives and individuals must be able to use this information to the best of their abilities. In the workplace, timely information is increasingly the key to wealth
creation. However, the amount of information being produced is much more than ever before [23]. This explains why Information Literacy has recently become so important; it is in large measure due to developments in Electronic Publishing, proliferation of information stored in computers and the ease of access to digital information on the World Wide Web. Even so, as said above, computer literacy and information literacy are not the same thing. We will return to this point later.

The importance of Information Literacy can be gauged by the attention given to the topic in recent conferences [24, 25], where the Information Literacy role was highlighted as being fundamental to improved education, a more effective workplace, better access to health and consumer information and improved citizenship/governance.

Just to conclude this section, the authors found it instructive to look at definitions of literacy in the age before computers. This one is taken from *Webster’s International Dictionary* of 1903

- Literacy – State of being literate
- Literate – Instructed in learning, science or literature; learned; lettered.

So, the basic need of our society and culture – to share knowledge – has not changed. Information, as the medium of knowledge sharing, is still the same, although the methods of transfer, storage, retrieval and presentation have been vastly improved by modern digital methods, including Electronic Publishing.

### 3 Educating for Information Literacy

In this digital age, students need to be more information literate than ever before. While the WWW can contain valid and accurate information, its very nature encourages quick and easy self-publication, without editorial or academic review [26]; content is often of low quality and there is a need for students to be able to recognize and access authentic and useful resources. Furthermore, students need to be able to identify and communicate their information needs, to clearly define a subject or area under investigation, to select and employ the most appropriate search strategies and search tools to gain access to the needed information and formulate a search strategy that takes into consideration different sources of information and the many ways in which it is organized. They need to be able to analyse and evaluate information sources retrieved, for value, relevance, quality and suitability and interpret and apply their findings, by turning the information discovered into new knowledge. Furthermore, ethical questions also need to be considered in respect of copyright, intellectual property and plagiarism.

Standard-based education has become popular since it facilitates assessment, including cross-institutional comparisons [27]. Recognized international standards will assist in assessing student progress toward Information Literacy, as they serve
as guidelines for faculty, librarians and others in developing measures for student learning in this domain.

Several Libraries and Information professional bodies, in USA and Australia, have produced standards and statements for Information Literacy; the Standing Conference of National and University Libraries, UK, have produced a model for the development of the information literate person [Weber and Johnston – Information Literacy: Standards and statements]. The standards address mainly higher education and schools [28] and have been published by several entities, namely ACRL – Association of College and Research Libraries, USA [29], CAUL – Council of Australian University Librarians, Australia [30], SCONUL – Standing Conference of National and University, UK [31]. These standards are derived from the work done for the American Library Association on Information Literacy, although the Australian standards [CAUL], are more inclusive as they talk about an information literate person, instead of limiting comments to an information literate student [32], by including the following clause,

“The information literate person recognizes that life-long learning and participative citizenship requires information literacy”.

3.1 The Role of European and International Computer Driving Licenses

The tools we have used to effect knowledge transfer have changed over time. Production of the written word has progressed from stylus and quill, through pen and typewriter, to the computer keyboard input, speech recognition and “intelligent” word processing of Electronic Publishing. At each stage, additional skills have been required to make use of the newest technology. Do these skills deserve to be graced with the title of literacy? These authors think not. Just as we managed without pen or typewriter literacies, it is argued that there is no need for the term “computer literacy” to describe the set of skills required to operate a computer as a tool in the knowledge transfer process. The European Computer Driving Licence Foundation [33] provides European and International Computer Driving Licences (ECDL and ICDL) to certify competence in a set of IT skills but these are not enough, on their own, to guarantee Information Literacy.

4 New Formats in Education and Scholarly Materials: New Skills Required

Educational and scholarly materials are increasingly made available in digital/electronic format, via Electronic Publishing. This is particularly true for scientific research publications, as more and more authors place their papers directly on the
WWW. Traditional publishers are moving into the Electronic Publishing business and companies, new to the sector, are also moving into Electronic Publishing [34].

Kling et al. [35] outlined the new publishing models that are being tested in different disciplines and which include:

- **electronic journals** – an edited package of articles that is distributed to most of its subscribers in electronic form. Articles from an e-journal may and probably will be printed for careful reading; they might be stored in libraries in a printed form, for archival purposes. However, e-journals are accessed primarily in electronic form;

- **hybrid paper-electronic** (or the p-e) journal – this is usually the electronic version of a paper journal; it is a package of peer-reviewed articles available through electronic channels, but whose primary distribution channels are paper based;

- **author’s self posting** – author’s posting their articles on their Web-sites;

- **e-print repositories** – field wide and institutional.

Some of these new Electronic Publishing models, based on self/open-archiving (e.g. deposit of digital documents in a publicly accessible website), have been tested by scholars in several disciplines and are sponsored by academic departments or research institutions, in response to the rising costs of materials, produced by the traditional publishing industry. There is a strong international movement that, at least in some scientific areas, seeks to make research papers available by this method. Academics and researchers, worldwide, visit them, as the first place to look, before deciding to obtain the original document. This is especially useful for countries and/or organizations where financial restrictions prevent access to a wide range of commercially published journals [36].

Other electronic information products made available through Electronic Publishing include electronic periodical indexes, full text, numerical, audio and mixed databases, reference and document delivery services. These are gradually being integrated and made available through automated library systems to users in a seamless way.

Although the same set of skills are needed in the use of both print and electronic sources – defining a topic, determining information requirements, locating, accessing and evaluating the information retrieved – the Information Literacy skills in the electronic environment, with broader access to networked information sources have to be extended to accommodate the comfortable use of computers and electronic communications tools, enabling easy navigation in this contemporary information environment, which is becoming increasingly dominated by ICT. This is particularly relevant to the Distance Learning situation in an online environment [37].

Theses and dissertations are a major source of new knowledge and contain valuable research results which, when published, are extremely useful to others
working in the field [38]. Improving the availability of this resource has created an
interest in the development of digital libraries of theses and dissertations [39] and
is the driving force behind the ongoing project Networked Digital Library of Theses
and Dissertations – NDLTD [40].

The creation of digital libraries of theses and dissertations makes an important
contribution to the generally availability of educational material. They encourage
an environment, which significantly increases the availability of students’ research
for scholars and empowers universities to unlock their information resources. Higher
Education institutions that have adopted the Electronic Publishing of theses and
dissertations benefit in a number of ways [41, 42], such as:

- empowering students to convey a richer message through the use of multimedia
  and hypermedia tools, animation and interactive features
- endowing graduates with new capabilities, ensuring that the next generation
  emerge as effective knowledge workers, by providing them with opportunities
to produce electronic documents and training them in the developing forms of
Electronic Publishing and information access.

This is the duality of education for Information Literacy and Electronic Publishing.

5 Visual Learning

It is well-documented that we are better able to grasp concepts through visual
representations. Our greatest thinkers regularly employ imagery and visual percep-
tion mechanisms to make important advances in their research. The process of
visual perception is complex; it requires multi-disciplinary research into our senses,
memory and the way in which information is processed.

There are other, more conscious, applications of visualization as a mode of
thought. These include associative logic, the use of transforms to change one im-
age into another (so that other relationships can be ‘seen’), decomposition (visual
analysis), and bringing pieces together to create a new picture (synthesis). These
visual skills can be learned and improved if one makes time for conscious practice
and the right tools are provided.

There is a great deal of evidence to show that human beings are most comfort-
able when thinking in terms of visual imagery. For scientists and students, visual
thinking brings significant benefits both in knowledge acquisition and in commu-
nication.

Personal computers only became popular when graphical user interfaces were
introduced and Internet expansion increased dramatically with the introduction
of graphical browsers. The use of computers, to create and present high quality
images, animations and simulations has increased the potential of visual thinking
and communication.
To realise the potential of visual imagery, it is necessary to learn how to use the relevant techniques and skills correctly. Visual communication is a branch of knowledge that can and should be developed, creating additional skills for the production and consumption of visual messages, improving spatial intelligence (being able to form mental representations of three-dimensional reality) and skills of intelligent thinking based on visual representations.

Success in the effective use of visual and mental imagery lies in a continuous learning process. The ideas and messages to be communicated should be encoded correctly, using a multimedia language; this encoded information must then be understood by the receiver. If one takes a look at the long history of our civilization, it will be seen that our visual imagery has developed from cave paintings, through artistic perspective, to the precise graphical language used to establish communication between scientists, engineers and architects. Our history also reveals the importance of visual imagery in the learning process [43].

Today, with the most recent advances in Computer Graphics and Visualization, this learning process is continuous and for life. One needs to develop skills to recognize, understand, retain and use appropriate cognitive models, especially when they are embedded in interactive applications. This is, again, a use of abstract thinking skills and is, therefore, another element of Information Literacy.

Visual learning, in the area of scientific education, has been identified and recognized as being particularly important in collaborative, distance learning and virtual learning environments. Applications to Science and Engineering education will probably be the forerunners because of experience of mental modelling in this field. [44]

Electronic Publishing has the potential to play a significant role in education for Information Literacy and can also contribute to the development of better ways to teach information technology, using visual learning to enhance the teaching process. Electronic Publishing can improve its immediate impact on attracting students to Science and Technology subjects by incorporating the potential of visual communication. This is completely in accordance with the Science and Society Action Plan of the VI Framework Programme of the European Commission [45].

6 Information Literacy in the Workplace – A Core Competence Essential for Knowledge-based and Learning Organizations

As the corporate sector comes to terms with the wider implications of the global business environment and the fast moving knowledge economy, employees are increasingly expected to be able to access, organise and use information to meet new, ill defined situations.
Traditional supply chains are changing as outsourcing becomes more common. As the interests of enterprises and institutions broaden, there is a need for more immediate and comprehensive information flows to take account of changes in procurement practices, different languages and cultural requirements and a diversity of regulations, laws and standards. [46] Hall points out that,

“with straightforward access to common resources, employees can:
- execute routine tasks quickly;
- aggregate previously disconnected places of information to facilitate innovation in working practices, product design or service delivery, and
- be liberated from fear of losing important intellectual assets if valuable colleagues leave the firm” [47].

Employers are, therefore, demanding from the educational sector people who are able to work in teams with colleagues, sharing information and creating new knowledge for problem solving and effective decision-making in the turbulent, fast-moving global economy. In practice, this means that they

“have to access, manage and use the vast amount of information delivered to them through multiple channels (e.g. phone, Internet, e-mail, printed documents, Web casts) and in a wide variety of formats (e.g. video, printed, electronic text)”. [48]

Computer hardware and software vendors promote a wide variety of products as tools for Knowledge Management. These include browsers, data warehouses, filters, intranets and extranets, software agents.

Intranets and extranets are widely regarded as “key platforms for knowledge sharing and as tools for formal distributed cognition” [49]. It is here that Electronic Publishing methodologies and techniques play an important part in improving information flows by providing better user-interfaces, search and retrieval facilities, use of meaningful metadata and quality control of content. They can also reduce the risk of information overload by offering improved filtering and prioritizing facilities.

Despite all these technological advances, companies can only reap the benefits of company-wide knowledge creation, sharing and usage, if all its employees achieve an adequate level of Information Literacy. The monograph Competing with Knowledge [50], based on a study of the state of Knowledge Management in Europe and US, devotes a whole chapter to Information Literacy in the workplace and reinforces the message that the knowledge economy requires a continuous supply of knowledge workers, reinventing themselves to keep pace with technological advances and the need to innovate for competitive advantage.

These elements of Information Literacy and Electronic Publishing together with a context which encourages and motivates people to share their knowledge [51, 52], will define the learning organization of the future [53].
7 Conclusion

This paper set out to show that the move to a knowledge-based economy, the investment in lifelong learning facilities and the improved availability of educational and scholarly materials, as products of Electronic Publishing, are all emphasizing the need for an internationally recognized set of skills and associated standards for Information Literacy.

A successful knowledge economy requires knowledge to be on the move, generating new knowledge, added value and opportunities for innovation and creativity. This means that a complete definition of Information Literacy must always contain an element of Electronic Publishing, in the words of Cheuk "the abilities to create, package and present information effectively to an audience". This is no more than our forebears achieved when they communicated their research results, first by letters and later by learned journals [Correia and Teixeira 2002]

Employers are now expecting their employees to possess these "knowledge economy skills" and employees should prepare themselves to meet the cultural challenges of knowledge sharing in the workplace.

References

10. Ibid, p. 223.


