



United Nations  
Educational, Scientific and  
Cultural Organization

# Towards Information Literacy Indicators

Conceptual framework paper prepared by  
Ralph Catts and Jesus Lau



With a list of potential international indicators  
for information supply, access and supporting skills by  
UNESCO Institute for Statistics

UNESCO: Paris, 2008

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**Recommended catalogue entry:**

UNESCO. Information for All Programme (IFAP). Towards Information Literacy Indicators.

Edited by the Information Society Division,  
Communication and Information Sector,  
UNESCO: Paris, 2008. – 44 p; 21 cm.

I - Towards Information Literacy Indicators

II – R. Catts and J. Lau

III – UNESCO

IV – Information for All Programme

Published in 2008 by UNESCO:

7, place de Fontenoy

75352 Paris 07 SP

France

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CI-2008/WS/1

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## Acknowledgements

The authors acknowledge the advice and comments provided by the following people in relation to this study:

Mr Claude Akpabie, Programme Specialist, Culture and Communication Statistics, UNESCO Institute for Statistics;

Dr Joan Bartlett, School of Information Studies, McGill University, Montreal, Canada;

Mr Simon Ellis, Head of Section, Science, Culture and Communication Statistics, UNESCO Institute for Statistics;

Ms Misako Ito, Assistant Programme Specialist, Information Society Division, Communication and Information Sector, UNESCO;

Prof. Diane Mittermeyer, School of Information Studies, McGill University, Montreal, Canada; and

Dr Cristobal Pasadas Ureña, Past convenor of the Presidential Committee for the International Agenda on Lifelong Literacy, International Federation of Library Associations and Institutions.

## Foreword

UNESCO's Information for All Programme (IFAP) recognizes the considerable effort being invested by many international organizations in "measuring the information society". Our goal is not to replicate their work but to identify additional indicators to measure the development of knowledge societies and then to collaborate with organizations currently engaged in measurement activities in order to develop a coherent set of indicators.

The Intergovernmental Council for the Information for All Programme at its Fourth Session in March 2006 established a Working Group on "Measurement for Knowledge Societies", with a special focus on IFAP's three priority areas, namely information literacy, information preservation, and information ethics, all three of them with critical importance to the development of knowledge societies.

Measurements in these areas focus more on people and government priorities than on the information itself or the information technologies. They focus more on the impact of information on societies than on access to information, for example.

One of these priority areas involves raising awareness of the importance of information literacy. The Alexandria Proclamation of 2005<sup>1</sup> recognizes information literacy as "a basic human right in the digital world" as it empowers individuals "in all walks of life to seek, evaluate, use and create information effectively to achieve their personal, social, occupational and educational goals". In a digital world, people require new skills and training in order to participate. The digital divide is much more than a 'technology access' divide; without the skills to use the technologies an even greater divide emerges – the information literacy divide. Interestingly this is not a "north-south, developed-developing" issue; it applies to all countries and is more a reflection on the extent to which education systems are – or are not – keeping up with the new information societies.

<sup>1</sup> "Beacons of the Information Society", High Level Colloquium on Information Literacy and Lifelong Learning, Bibliotheca Alexandria, Egypt, November 2005.

The need to focus on information literacy brings new imperatives to the Literacy Decade and the Decade of Education for Sustainable Development. The IFAP Council recommended that special attention be given to supporting information mediators, or infomediaries, such as teachers, librarians, archivists, as these information professionals have a multiplying effect in achieving information literate societies.

UNESCO is promoting the concept of knowledge societies, in particular universal access to information and knowledge, including providing guidance to Member States about how they could measure their own progress towards knowledge societies. In line with the Geneva Plan of Action adopted by the World Summit on the Information Society, international comparisons are helpful to understand what is possible and what policies and investments are needed in the establishment of knowledge societies. An initial investigation revealed numerous existing measures of information infrastructure but no measure of information literacy.

UNESCO is a significant global player in terms of “measurement” with its own Institute for Statistics (UIS) that was established in 1999. The Institute meets the growing needs of Member States and the international community for a wider range of policy-relevant, timely, and reliable statistics in the fields of education, science, culture, and communication and information.

This is why UNESCO through IFAP decided to engage in the development of an international framework for measuring information literacy through which achievements at both international and national levels can be demonstrated and future efforts can be better focused.

This paper provides a basic conceptual framework for measuring information literacy and is designed to serve as a reference to facilitate the elaboration of information literacy indicators.

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## Executive Summary

This paper provides a conceptual framework for the identification of indicators of information literacy (IL) and proposes a pathway for cost effective and timely development. The paper includes a definition of IL; a model that links information literacy with other adult competencies including Information and Communication Technology (ICT) skills; and a description of IL standards in education. Issues of IL equality and the implications of cultural diversity are identified.

**Defining Information Literacy.** As derived from the Alexandria Proclamation of 2005, adopted by UNESCO's Information for All Programme (IFAP), Information Literacy is the capacity of people to:

- ▷ Recognise their information needs;
- ▷ Locate and evaluate the quality of information;
- ▷ Store and retrieve information;
- ▷ Make effective and ethical use of information, and
- ▷ Apply information to create and communicate knowledge.

People use IL in conjunction with problem solving and communication skills as part of an integrated set of skills which adults need to be effective in all aspects of their lives. The benefit of considering IL as separate and distinct from other adult competencies is that it clarifies one dimension of these complex capacities, and enables a distinction to be made between the effective use of information, and the supply of, and access to information. As described in the Organization for Economic Cooperation and Development (OECD)'s Global Project on Measuring the Progress of Societies, IL enables people to move from dependence on 'knowledge brokers' to become 'knowledge builders' (OECD, 2007).

**Distinguishing IL and ICT.** People can be information literate in the absence of ICT, but the volume and variable quality of digital information, and its role in knowledge societies, has highlighted the need for all people to achieve IL skills. For people to use IL within a knowledge society, both access to information and the capacity to use ICT are prerequisites. IL is however, a distinct capacity and an integral aspect of adult competencies.

**Need for Indicators of IL.** The development of indicators of information literacy is a priority at both national and international levels. Apart from initiatives outlined in this report in the education sector, information literacy has been a neglected aspect of knowledge societies and therefore the development of indicators is an important initiative. Information literacy underpins many of the Millennium Development Goals (MDGs, 2003). For instance, combating diseases (goal 6) and enhancing employment opportunities (target 16) require that people have the ability to apply information to practice. Indicators of IL can help countries to identify the effect of policies to foster or enhance IL development, and to know the extent to which their citizens are able to participate in a knowledge society.



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Like other aspects of literacy, the level of IL skills required is dependent upon both the domain of practice and on the level of performance required of an individual. For instance, the level of IL needed for effective performance in elementary education differs from that required in adult and higher education. Different levels of skill are likewise required of a journalist and of a citizen in areas of civic involvement, and for health and well-being.

**Proposed IL Indicators.** It is recommended that UNESCO identify indicators of IL by the secondary analysis of existing international surveys to select data elements that are valid indicators of IL. This approach will avoid the need to construct a discrete survey. The primary source of such indicators could be the UNESCO Institute for Statistics (UIS)'s Literacy Assessment and Monitoring Programme (LAMP) survey. A list of recommended indicators of IL is presented in Appendix 2.

**Measurement Models** The context in which information is to be used determines the level of IL skills required. Therefore it is recommended that the latent trait measurement model be applied to IL indicators so that IL can be considered as a continuum of capacity. This measurement model will allow nations to determine their employment, education and social goals for IL skills and to adjust these over time as need arises. It avoids imposing a common set of criteria for IL attainment across vastly different contexts.

**Proposed Development Process.** Elements from the LAMP pilot survey have been identified that illustrate all five elements of IL skills and are presented as an appendix to this report, along with examples from two other surveys. To ensure the validity of these indicators, it is essential that these data elements be subjected to a validation procedure to confirm that the items are recognised by experts as representative of the dimensions of IL. Therefore it is proposed that the content validity of the selected items be confirmed using specialists in information science, together with experts in health and in lifelong learning.

**Teacher IL Competencies.** The current reform of schooling in many countries includes the identification of the skills required of teachers in an information society. In the medium term these developments may make it feasible for UNESCO to identify IL indicators for teachers to be applied at the conclusion of their initial teacher education. This opportunity should be taken at the appropriate time because the IL skills of teachers are crucial for the generational changes needed to make schooling fit for building knowledge societies of the 21<sup>st</sup> Century.

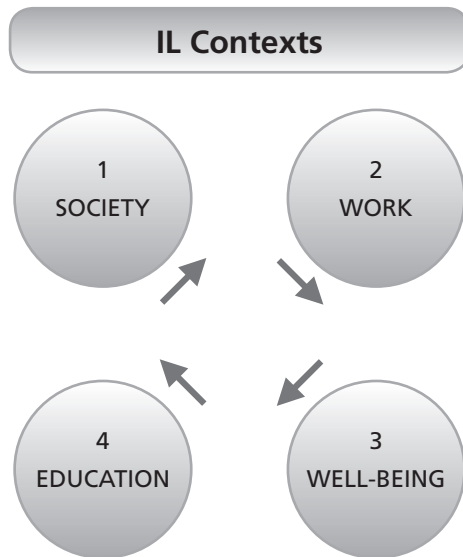
**IL Supply and Access.** The supply of information and access are prerequisites for people to practice IL. Existing surveys including broadcast and library surveys, and national data about internet connections, provide information at national level about the supply of information. Access to information involves issues of equity that require information from individuals and this therefore must be gathered from household surveys to obtain data from individuals. Indicators of Information supply, access and underpinning skills to support information literacy have been identified by the UNESCO Institute of Statistics and are reported in Appendix 3.

## Information Literacy – A Definition

Information literacy (IL) is described in the Alexandria Proclamation of 2005, as essential for individuals to achieve personal, social, occupational and educational goals. IL skills are necessary for people to be effective lifelong learners and to contribute in knowledge societies. This is why IL was endorsed by UNESCO's Information for All Programme (IFAP) as a basic human right.

**IL and national development.** The implications of IL for economic and social development have been recognised by policy makers at both international and national levels. The Alexandria Proclamation makes it evident that IL needs to be considered not only in relation to education, but also in the broader context of work, civil society, and health and well being (Garner 2006). This range of contexts, as illustrated in Figure 1, represents a challenge both for policy makers, and for the development of indicators of information literacy.

Figure 1



**IL for health and well being.** Information literacy is a crucial tool in developing health and well being for all people. There are two distinct areas where the use of information in health provision is of importance. The first is among health professionals where access to current research and best practice is of importance to the delivery of quality services. The development of the Cochrane Library (Cochrane Collaboration, 2007), which is a global independent source of evidenced-based health information, is an example of this provision for health professionals. There is also an academic

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publishing tradition that aims to ensure the quality of information shared among health professionals and researchers. At the level of professional practice the use of on-line access to patient records in much of the developed world enables the development of informed team work.

The other crucial area of health and welfare information use is the right of individuals to information about health and well-being. This is a concern especially in poorer nations where basic literacy remains a challenge, and where access to information may be restricted in rural communities and especially among women. Grant (2002) has defined health information literacy in this context as 'the capacity of an individual to obtain, interpret, and understand basic health information and services and the competence to use such information and services in ways which are health-enhancing'. This capacity includes the ability to distinguish between information from credible sources such as World Health Organization (WHO), and information from those who manufacture and market claims for products and medical supplies.

**IL and civic society.** Information literacy is essential for the operation of a civic society in which all people may participate. In Europe, active information seeking is identified as an essential component of democratic participation. Ogris and Westphal (2006, 12) 'distinguish between active participation (self-directed) and passive participation' and argue that the former is an essential component of political activity. In this vein, Carneiro (2005) has presented a vision for Europe to play a key role in the world by creating government as enabling rather than directive, thus allowing spaces where people can flourish. This model proposes an informed society in which people act creatively and take initiatives to make new meanings and new ways of governance. However this creates a necessary tension between pressures to control behaviours that often drive central government, and the forces that enable innovation and creativity. As Field (2001) has pointed out, while both business and governments want an innovative workforce to provide economic advantage, they insist that this creativity be disciplined and focused on economic benefits. Not only can autonomous learners provide economic benefits, they can also challenge the power of corporations and government to control their lives. At the most extreme level, terrorists and security forces are engaged in a complex struggle to control and manage information, and this struggle creates risks both for the well-being of citizens and for democratic values of liberty and freedom of speech. Our conclusion is that the goal of information literacy for all involves complexity and challenges for policy makers. Hence establishing indicators of IL requires careful planning, clarification of goals, and cooperation among nations.

**IL standards in the education sector.** Standards have been created as means to guide information literacy work in the education sector and have been shown to have utility in this context (Emmett, and Emde, 2007). All published standards have a similar foundation. As generic constructs these standards have application to both the economic sector and to lifelong learning capacities, which is to be expected given the purposes of education to prepare people for civic life and to develop or maintain people's employment capacities. However, as will be outlined below, the situated

nature of the application of IL skills requires these standards to be translated into operational variables in various contexts.

Early formulations of IL standards were developed in the late eighties for use in school library systems in the United States. The first model was created by the American Association of School Libraries, followed in the next years by several standards at state level, including Colorado California, and Washington. Other widely cited initiatives include Big6, Pathways to Knowledge, and Follett (Byerly and Brodie, 1999). An analysis of each country's set of skills for elementary school pupils reveals substantial similarities as confirmed by the analysis of Byerly and Brodie (1999). In the higher education sector the Association of College and Research Libraries (ACRL) drafted IL standards which informed similar action in other nations including Australia, the United Kingdom and Mexico, all of which adopted similar norms for university level students, as confirmed by the Big Blue (2001) project. All standards recognize, with different emphasis, the ability to recognize an information need and the capability to locate, evaluate, store, retrieve, and apply information and to communicate new knowledge.

**IL for work and economic activity.** IL is central to both the notion of a learning organisation and to the development of a competitive advantage for firms and for nations within the global knowledge economy. Too often the concept of knowledge management in firms and governments has not been connected with IL (Cheuk, 2002) with results that have limited the competitiveness of firms. To understand the importance of information literacy to economic growth it is necessary to distinguish between the routine distribution of information, and the use of information to create knowledge. The distribution of information to people depends upon infrastructure, and once that is in place information can often be distributed at marginal additional cost. However, when information is used to innovate and create new products or processes that are privately owned and protected by patents, then new knowledge can be costly to replicate by competitors.

The distribution of information has been a source of human development and well-being from time immemorial. However, the quantity of information now available has transformed the challenges in using information. For instance, rich countries can access satellite images to monitor actions across the global, but the vast quantity of information available makes the task of distinguishing critical information far more complex. Furthermore information can be used as a commodity by rich nations to trade with poorer nations.

## The Elements of Information Literacy

The following IL elements are consistent with the definitions of IL developed for use in higher education and, as argued by Campbell (2004), are applicable across all domains of human development.

- a. Recognise information needs
- b. Locate and evaluate the quality of information
- c. Store and Retrieve information
- d. Make effective and ethical use of information, and
- e. Apply information to create and communicate knowledge.

The nature of these IL elements is outlined below and the implications for the development of IL indicators are identified.

**Recognise Information needs.** The awareness that information is required to solve problems in the workplace, to understand civic needs, and to provide for the health and well being of family and community is the first component of IL. This is the first step also in differentiating IL from the passive reception of given information. This awareness of need is not a static capacity but one that needs to be applied to each and every situation as it arises. Of necessity people choose to accept some information as given, while recognising that other claims need to be questioned and tested by seeking additional information or confirming the accuracy of that information supplied.

**Locate and evaluate the quality of information.** The skills required to locate information depend on the context in which a person is applying their IL skills. In the workplace, the information may be located in manuals, in published codes of practice, or in dedicated databases. In these circumstances, there is usually some assurance of the quality of the information source. However, increasingly people seek information using internet search engines where there is often no filter on the quality of the information located. This is of particular concern in relation to information on health and well being, and also in terms of information relevant to social and environmental concerns. For instance, holocaust denial has spawned internet sites that look credible to the unskilled eye, but when the information is evaluated it can be established to lack accuracy and credibility. Education and training are needed to help people acquire the skills to not just locate, but also to evaluate information sources, and therefore IL indicators must include this skill.

**Store and retrieve information.** People have always appreciated the importance of storage of information and its retrieval for later use. Indigenous people often have sacred places where such information is stored and accessed to be transmitted to each generation. Firms maintain their accounts, stock, orders and, with the digital age, their customer profiles. People maintain not only their own libraries, but also in the digital age store knowledge that they have created as well as phone numbers and music. The capacity to store and retrieve information is therefore an indicator of IL.

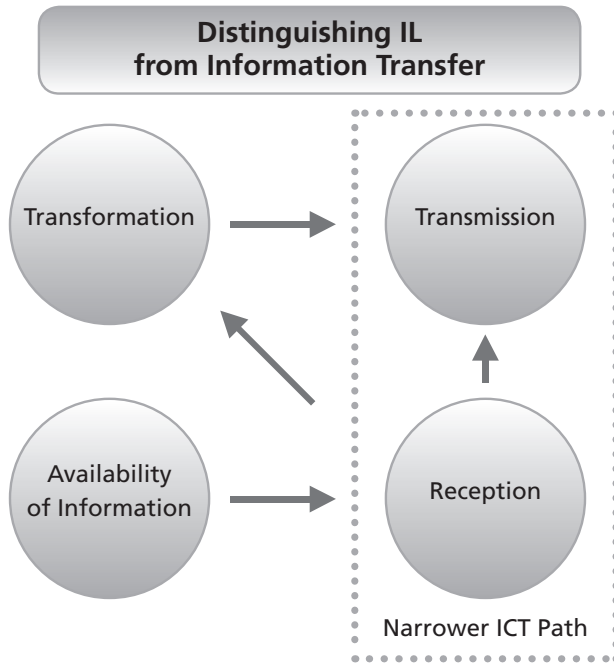
**Make effective and ethical use of information.** Effectiveness of information use is likely to be encompassed in surveys of problem solving and critical thinking, as well as in aspects of literacy. Awareness of the ethical dimension of information use may not be well documented in existing surveys. If this is confirmed it will indicate a gap to be addressed in future development.

**Communicate knowledge.** The purpose of IL is to enable people to create and use new knowledge and hence this component represents the product of IL practice. In surveys of problem solving and of adult literacy there may be items that address this component.

## Information Literacy Research

Information literacy research supports the use of the five elements described above to define the scope of IL. Research and development activities in IL have been focused on education both in schools (Byerly and Brodie 1999) and in higher education (Webber, 2006). Especially in the last twenty years library scientists have advocated the importance of information literacy (Kuhlthau, 1987, Bruce, 1997) and have developed standards, especially for application in higher education (ALA, 2005, Bundy, 2004). This focus has included both schools and higher education in English-speaking and European nations (Virkus, 2003) while, in non-English speaking countries, the focus of IL research has often been primarily on universities. There is evidence of engagement by teachers and academics with the implications for pedagogy of the changing nature of information resources and information use (Nvegi, 2007), but equally there is a recognition that more needs to be done to transform education into a form suitable for the preparation and continuing education of peoples in the information age (Catts, 2007). This is particularly so as some policy makers have focused only on the pre-requisite task of acquiring the skills to use new information communication technologies (ICT). Information literacy includes wider issues about the ways in which these technologies frame access to information, and the skills needed to interpret and use information safely and effectively. The wider compass of IL needs to be understood and promulgated in order that the advantages of the information society can be realised (Balanskat et al 2006). The essential difference between ICT skills and IL is illustrated by the distinction that can be made between receiving and transmitting information using ICT and the process of transforming information to create new knowledge (IL) before transmitting the new information. This distinction is illustrated in Figure 2, where the ICT path is shown as the direct route from reception to transmission, whereas IL involves all four of the elements, and crucially, the steps between reception and transformation, and transformation to transmission (dissemination).

Figure 2



IL is the crucial set of skills that enable individuals to benefit from the wealth of knowledge available in oral, paper and electronic format (Lau, 2006). The essential point is that transforming information into knowledge requires information literacy skills. As stated in the UNESCO’s World Report “Towards Knowledge Societies” (UNESCO, 2005), information without transformation is only raw data. The use of information requires a mastery of cognitive skills, including critical thinking, and this in turn depends upon the capacity to locate, evaluate and then use information.

## Economics and Information Literacy

Peters and Besley (2006, 52) have summarised the characteristics of what they term the knowledge economy and have highlighted differences between this post-industrial economic order and the economics of industrial societies. A modified version of this model is presented in Table 1. This model assumes what they term ‘knowledge capitalism’ but they acknowledge a competing economic model of free and open access to knowledge. This tension raises an issue of values that should inform the development of information literacy indicators. In practice both proprietorial knowledge and public knowledge exist and there is an economic ambiguity inherent in this situation.

Table 1

### Comparison of Industrial and Knowledge Economies<sup>2</sup>

Characteristic	Industrial Economy	Knowledge Economy
Resources	Materials are Scarce and Expensive to access	Information is often widely available at marginal cost
Usage	Materials are depleted when used and recycling is expensive	Information can be shared and may grow through use.
Durability	Materials are usually stable and do not deteriorate over time	Information needs to be updated continuously and quality can deteriorate rapidly
Distribution	Materials and Products need to be transported and costs can determine both sites of production and access to products.	Provided ICT infrastructure exists, both information (materials) and knowledge (products) can be distributed widely.
Ownership and Law	Products can be patented, access controlled and taxes applied.	Knowledge can be difficult to regulate and tax.
Pricing	Value is usually fixed by inputs, labour and transport costs	Value is primarily determined by IP and can vary depending on context.

## The Information / Knowledge Chain

The information knowledge chain involves the creation, packaging, distribution, and use of information. The first three of these phases are precursors for the efficient use of information, and these phases can be reported at the national level. Essential IL encompasses the skills needed to use information and this requires indicators of the practices of individuals.

Information Literacy is an integral component of the creation of knowledge in a production cycle that includes authors, inventors, researchers and other people who generate new knowledge in the form of articles, books, texts, patents or to share with

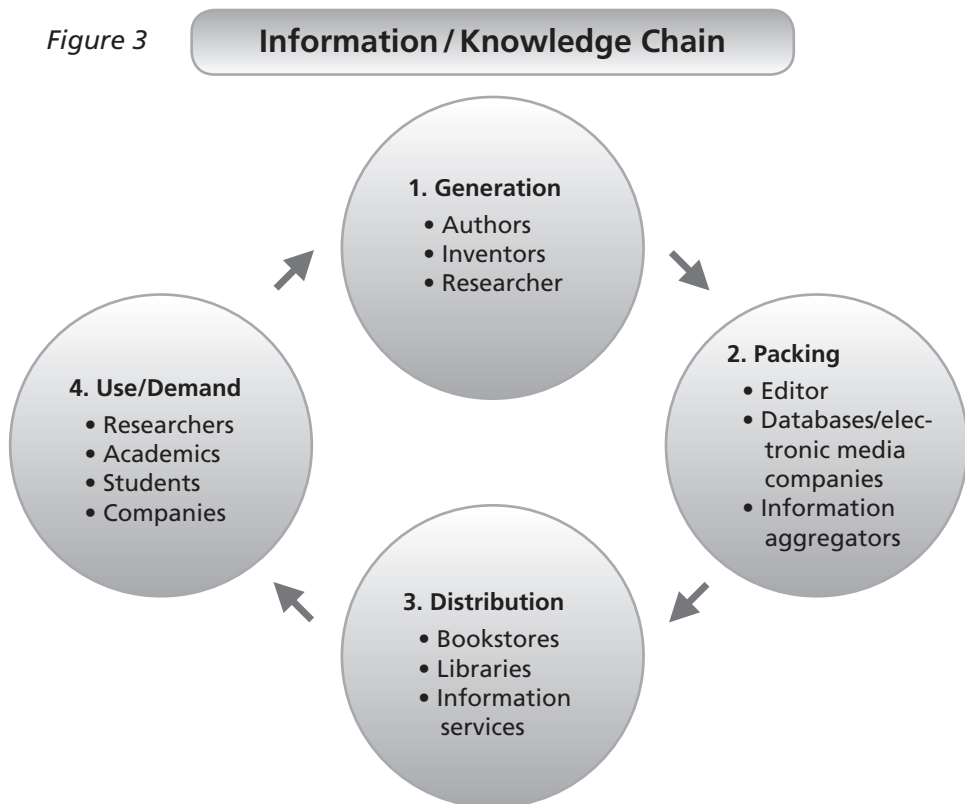
<sup>2</sup> after Peters and Besley, 2006



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their community. These forms of knowledge are packaged by publishers, database builders, webmasters and electronic media companies. This processed information is in turn stored and distributed by bookstores, libraries and other information providers to meet the demands of researchers, faculty, students, companies and society (see Figure 3).

Figure 3

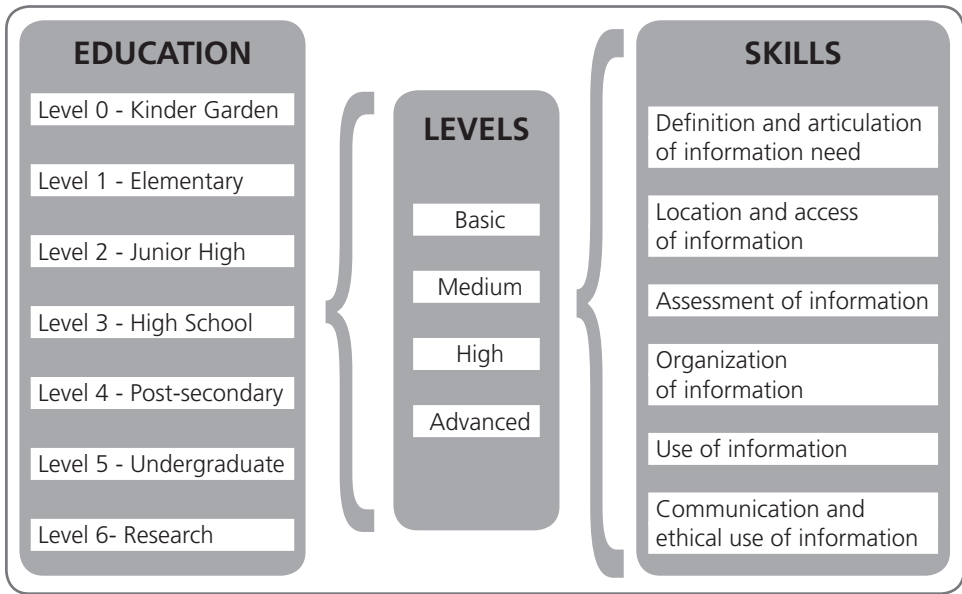


## Information Literacy Standards

The various IL standards share the principle that IL skills are a continuum both in terms of the capacities required at different levels of human endeavour, and also in the sense that the elements are utilised in an integrated fashion, rather than as a strictly linear process. Within education, the development of IL starts in the earliest stage and continues through to graduate studies and adult continuing education (see Figure 4). In more developed societies, IL skills are developed in conjunction with ICT skills because digital technology and electronic databases are a primary source of information. Hence people require a combination of cognitive and technical skills to access and use information.

Figure 4

## Information Literacy Continuum



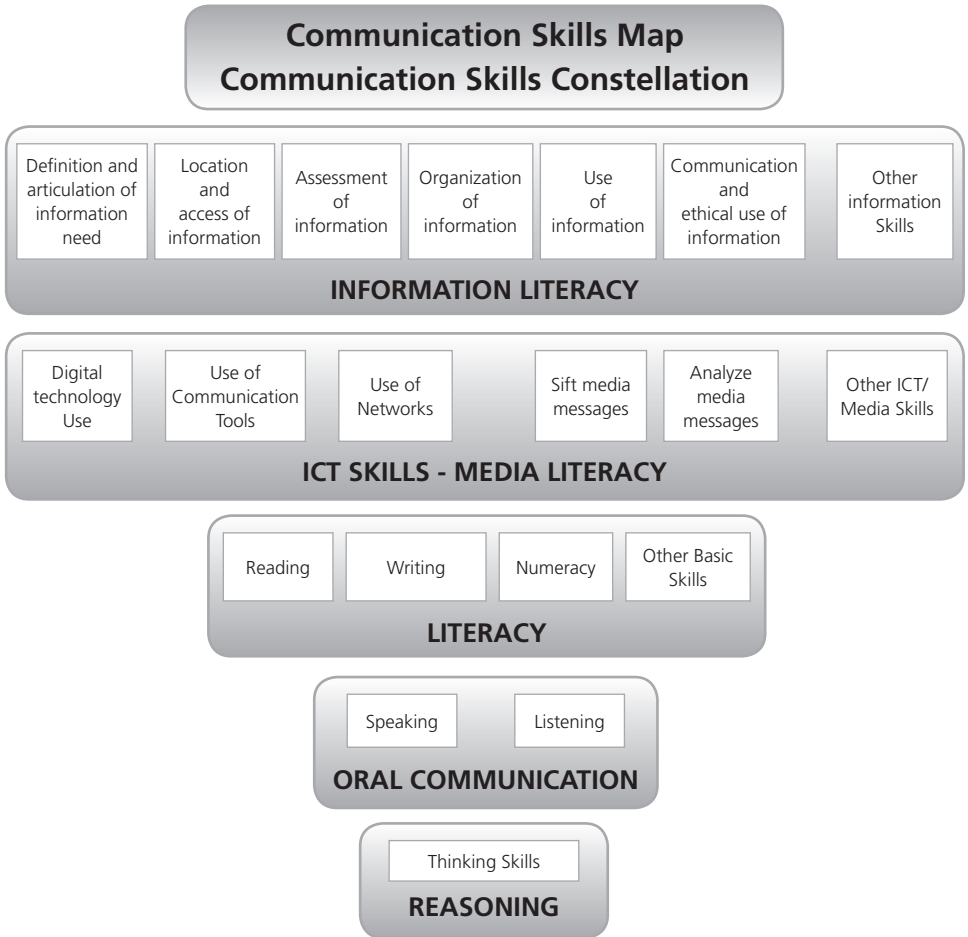
Elites in business and government normally have access to information using all media whether they live in developing countries or in the developed world, although there may be technical constraints and higher costs in the former. However, at the other extreme, those without access to electricity or basic needs like clean water, food and sanitation may rely on oral and other non-written sources for information.

## Information Literacy and Adult Competencies

IL is viewed as a central element in many models of adult competencies. For instance, as outlined in Figure 5, Pasadas (2007) suggests that writing, reading and numerical skills are at the base; followed by ICT and media skills, communication tools and use of networks. Above these strata are IL skills that include identifying an information need, the capability to locate, retrieve, evaluate, and use information, and to respect intellectual property in communicating information and knowledge.

Pasadas argues that all these skills are valid in every society regardless of socio-economic development. For the sake of creating a simplified chart, only the IL skills are described in full in Figure 5.

Figure 5



Information Literacy skills are part of a bigger constellation of adult skills and underpin some of the Millennium Development Goals (MDGs, 2003). For instance, combating diseases (goal 6) and enhancing employment opportunities (target 16) require that people have the ability to apply information into practice. Reeff et al (2006) proposed that problem solving abilities are at the centre of adult competencies (see Figure 6). They identify various forms of literacy upon which problem solving depends including reading, writing and numeracy. IL in their model is embedded in ICT skills but can be identified in their definition of this construct. They distinguish static and dynamic aspects of problem solving as elements of the overall problem solving ability. Thus, just as Pasadas delineates aspects of IL, Reeff et al give more detail of the nature of problem solving abilities.

Figure 6

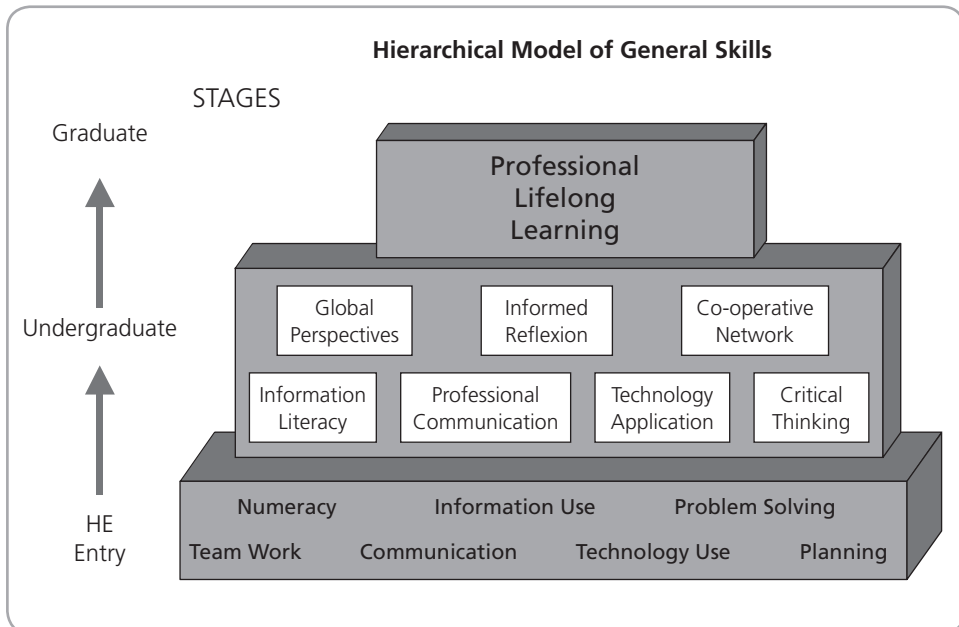
### General structure for an integrated framework of generic skills p9. Reef, et al (2006)

General Mental Abilities			CONTEXT: Social context/ICT-rich environment
Problem-Solving Abilities (modifiable)			
Reading Literacy	Numeracy	Problem Solving	ICT Literacy
Prose Literacy	Document Literacy	Static/Analytical Problem Solving	Dynamic Problem Solving

**Hierarchical skills model.** Catts (2007) also proposed a hierarchical model in which a distinction is drawn between core generic skills that apply across common life experiences, and the specific situated application of generic capacities in professional practice (see Figure 7).

Figure 7

### Hierarchical Model of Generic Skills in Higher Education



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This model has been developed for use in the development of higher education curricula within the context of lifelong learning. It differentiates basic generic skills that are a focus of general education from the situated professional capacities that are required of people operating in a knowledge economy. In this model the term 'informed reflection' is used to encapsulate the combination of information literacy with critical thinking and communication skills to make informed professional judgements relevant to each profession. Above all else is the concept of an autonomous learner who is able to apply all the underpinning skills to maintain their competence through continuing professional education. For the purposes of establishing international framework for IL indicators this model illustrates why IL skills need to be considered as a continuum of capacities.

# Information Literacy Indicators in Higher Education

Three standardized information literacy surveys have been developed for use in higher education. In the United States a consortium of library scientists developed a test of IL knowledge based on the Association of College and Research Libraries (ACRL) standards called Standardized Assessment of Information Literacy Skills (SAILS). More recently the Education Testing Service (ETS) has also published a computer based survey that they term iSkills Test, formerly known as ICT skills (ETS, 2008). In Australia an Information Skills Survey (ISS) has been published (Catts, 2005a).

The SAILS measurement tool was developed using latent-trait theory (O'Connor, et al, 2002), while criterion referenced assessment was used in the ISS developed by the Council of Australian University Librarians (Catts, 2005). The iSkills assesses simulated IL skills at two levels of performance. One targets students at entry level to post-secondary education while the second targets learners at the end of two years of higher education, a critical point in the United States higher education system for transfer from two to four year colleges.

Information literacy is viewed as a generic capacity and hence the level of information literacy necessary for effective performance can vary considerably across occupations. A latent trait model allows a more efficient estimation of capacity across a wide range of individual capacities. On the other hand, if the focus were on the specification of a level of information literacy essential for effective participation in a civic society, then a measurement model referenced against an international standard will normally provide a more efficient measure. The iSkills survey seeks to accommodate this dilemma by providing criterion-referenced assessment at two levels of performance.

SAILS, the CAUL ISS, and iSkills provide an interesting comparison of how to measure IL. The SAILS is a test of the knowledge of each respondent about information

literacy based on the American ACRL (American Library Association, 2005) standards 1, 2, 3 and 5. Therefore the tool measures only what people know about information literacy at a general level of abstraction, rather than what they actually do in practice. The CAUL ISS is a self-report inventory that asks each respondent to describe what they do with information. It measures across standards 2 to 6 of the information literacy framework of the Australian and New Zealand Institute for Information Literacy (ANZIIL) (Bundy, 2004). The iSkills provides a simulated computer based test of performance of IL skills. In the higher education environment with access to computers, it is feasible to adopt simulated performance which provides the most direct measure of IL skills.

In the absence of this environment, the self-report approach is likely to provide the best evidence of practice, as compared to knowledge about IL. There is some evidence to support the view that more sophisticated information users may rate their practice against different criteria to those who are less sophisticated (Clark and Catts, 2007) so the design and validation of a self-report survey needs to investigate the validity of the respondents across levels of sophistication in the use of information. A self-report survey designed using a latent trait model may capture the benefits of both approaches.

In higher education literature there are many local librarian or faculty devised surveys of information literacy. As in other research in education, these surveys are often of use to evaluate curricula because they assess the objectives of particular teaching programs. An example is provided by Mittermeyer and Quirion (2003) who investigated the information literacy skills of undergraduate students in Quebec. These types of surveys are however not designed for use as indicators of IL at national or international level.

## Information Literacy and Oral Traditions

Each of the models of adult competencies we have described above identifies the capacities of reading, writing and numeracy as prerequisites for problem solving and creating knowledge. These models however are proposed in the context of an ICT driven information society. In a society that depends upon an oral tradition to disperse information it is possible for a person to be information literate, and necessary for effective decision making (Campbell, 2004). However, although such people may be information literate within their oral tradition, the limited information sources available to a person living within an oral tradition will restrict their capacity to compete in a global economy. Within a culture that relies on oralcy, the individual is dependent upon others to source alternate views and consequently this may be considered a special case. Normally people need to be able to read, to plan and organize and to use problem solving skills in order to demonstrate information literacy.

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**IL standards relevant to all societies.** Although published IL standards relate to the written word, but they can equally be applied to oral societies, where citizens, need skills to identify their oral information needs. In some traditional cultures information is codified in a way that helps to maintain the accurate transmission of culturally sensitive information. These peoples use and adapt traditional technologies to create records in the forms of paintings, carvings and other symbols. Skills in creating and interpreting these records are crucial to the transmission of information. However, the introduction of new information, such as knowledge about the transmission of HIV/AIDS, requires attention to traditional practices and taboos to enable the information to be received and acted upon in a culturally sensitive manner.

**Oral Traditions and ICT.** Globalisation and ICT is now impacting on the lives of many people from oral traditions. We note that in many traditional societies, national governments have provided infrastructure including roads and electricity; and service workers such as teachers, police, health and aid workers who often utilise ICT systems. When these technologies can be accessed by traditional communities they may be quick to adapt these to their needs. We suggest therefore that for UNESCO the focus on IL should be as it relates to the written word and ICT.

## Ethics and Information Literacy

Established IL standards incorporate the application of ethical principles to the access and use of information (see for example ALA, 2005, Bundy, 2004). Within the education system, plagiarism has been a concern. Several reports have suggested that this has increased in those countries where there is easier access to the internet at all levels of education, but some studies have concluded that training in information use that emphasises ethical practice reduces the incidence of plagiarism (Loertscher and Woolls, 2002, 66).

**Ethical use of information.** Ethical practice applies to the creation and distribution of information, and to its use. It is inevitable that there will be bias in the creation and distribution of information because each author brings their values and norms to the way they create and represent their knowledge. Such bias may be unintended in some cases, but it is not surprising that organisations may deliberately suppress 'bad news' or put a 'spin' on the information they distribute. An example that is widely acknowledged is the way that tobacco companies in several countries have represented or suppressed information about the relationship between smoking and lung cancer (Kruger, 1996, 676). This example is but one of many cases where firms and governments have been found to have distorted or misrepresented information. An information literate society is one whose peoples are able to evaluate information sources and it follows that such people will question all sources of information. In disseminating information received from others, those who are information literate should flag the potential bias in the original sources rather than transmitting claims without qualification.

### Indicators of Ethical Use of Information

In the three standardised tests of IL in higher education different approaches to the ethical use of information have been adopted. In the SAILS instrument people are asked their knowledge of ethical practice, which does not necessarily equate to their actual practice. In the ISS people are asked to self-report their practice in relation to copyright and plagiarism. The evidence is that people will self-report breaches of ethics under a condition of anonymity. In the iSkills test ethical aspects of IL skills are not assessed. As a performance based test unethical practice might require a form of entrapment.

## Information Literacy and Equality

The OECD through its International Adult Literacy Survey (IALS) project has identified a correlation between ICT skills and literacy. They note that those with ICT skills are likely to have higher literacy levels and report that this relationship applies both between countries with high and low ICT access, and also within countries. For instance, they report that fifteen year olds with access to home computers have higher reading skills (OECD, 2005a, 184) than those without home access. It is noted however that a correlation shows only that a relationship exists, and does not identify cause. In this case, access to ICT at home could well be a proxy variable for access to many benefits of economic power including access to education and hence literacy.

The World Summit on the Information Society (WSIS) raised concern about the digital divide between nations. This divide is also evident between regions within many nations. A notable example is the divide between rural and urban communities, but the digital divide is also evident within all countries between affluent people and those in relative poverty. In many countries, women report less access to ICT and less ICT skills (OECD, 2005a, 193). This may be the case also in relation to other forms of information supply. Initiatives to address such differences in access to information are important since access is a prerequisite to IL practice.

**Language role impact.** Language is also a key factor in access to information. Those who speak English have access to a wider pool of information in most fields of knowledge due to the dominance of English, especially in electronic information data bases (UNESCO 2005). This is not only the case for those people whose language is used in a relatively small and geographically confined area such as is the case for many indigenous peoples, but also applies to many large and geographically dispersed populations such as the Mandarin-speaking and the Spanish-speaking populations. Language barriers to information may affect the economic development of countries. Where economies are more service-oriented (more economically developed), the demand for and use of information is higher. Where citizens have greater access to education including languages, and more economic resources to access information, they may be able both to utilise English language resources and, in addition, have



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privileged access to local and regional resources available exclusively in their first language. However, if English is not a common commercial and professional language in a community, then access to global culture and information is restricted and this may limit international competitiveness.

**Cultural constraints.** Information and the skills to use it are needed in every society, but the ways that a citizen may identify and express information needs are affected by family patterns, language, and religion, among other social factors. Therefore while the concept of IL is valid across cultures, the development of indicators has to take account of cultural differences that are shaped by socio-economic, historic and political factors.

**Political constraints** can also influence the development of an information literate society. The assumption that access to and the effective use of information is related to economic growth is made by many governments who seek to foster greater involvement in the global knowledge economy. Greater and easier access to information is likely to be associated with enhanced economic opportunities.

**Economic constraints** can impact on IL in all countries including developed nations. For instance, institutions determine which electronic sources to enable through licence fees. The policies of both the host library and the owners of the data bases determine whether articles can be accessed on-line. In other cases the user receives a message to the effect that 'you do not have rights to view the article'. There is then an opportunity to buy, which means in practice that normally the information in that document is not accessed. Hence, electronic information sources and the purchasing policies of libraries raise possibilities for distortion in favour of the information that is available electronically and without charge to the end user.

**IL around the world** The international Federation of Library Associations (IFLA), in conjunction with UNESCO, has developed a report on the international state of the art in IL (Lau, 2007). This report demonstrates both the interest in IL around the world and also the diverse stages of development in various countries. It provides a useful summary of the state of IL policy and practice.

## Options for Developing IL Indicators

We considered three options for the development of IL Indicators. These are briefly outlined below together with our rationale for the preferred option. The first possibility was to develop a set of indirect indicators of IL. These might encompass products of IL such as numbers of books published, numbers of patents registered, and volume of internet usage. These are part of the information cycle (see Figure 3) but this approach is flawed because these indirect indicators are influenced by economic conditions and hence are better considered as outcomes of IL practice than indicators of IL. Another possibility would be to design a new international survey of IL skills. This would have the benefit of being a full and comprehensive survey

of IL. If there were no other alternate options, this might be justified but it involves considerable costs, both in terms of development and implementation. We consider these costs to be neither justified nor necessary. Available resources are far better allocated to projects to enhance information literacy. We recall the old adage that one does not fatten a pig by weighing it.

Our preferred option is to develop a set of indicators of IL from items in an existing international survey. We are delighted to report that in the LAMP survey being developed by UIS there are sufficient items to provide adequate coverage of information literacy, with the exception of the ethical use of information. We examined other international survey tools and have not found any that address ethical practice. It may be feasible to draft a small number of additional items for inclusion in LAMP to address ethical practice, but in any case, the use of LAMP will provide an otherwise comprehensive range of IL Indicators.

## Existing Sources of Information Literacy Indicators

UNESCO, OECD, International Labour Organization (ILO) and World health Organization (WHO) all conduct household or school based surveys that collect responses from large numbers of people in many countries. These surveys are designed to establish particular aspects of human behaviour and capacities. For instance the Programme for International Student Assessment (PISA) surveys are conducted in schools. PISA aims to compare scientific, mathematical and reading capacities and also gathers information about access to information. Likewise, WHO (2006) uses household surveys to collect information about people's health behaviours and UNESCO surveys households to collect information about literacy (LAMP). While these surveys are designed to collect valid information about their primary topic, some items within these surveys can provide evidence of aspects of information literacy.

**Relevance of LAMP.** As is noted in the UIS Paper, 'A Statistical Framework for Information Literacy' (UIS, 2007), the Literacy Assessment and Monitoring Programme (LAMP) has applied surveys carried out by OECD to developed a household survey of Literacies applicable across many countries. LAMP is currently being piloted and it has been reported that LAMP data will be available from 2009. The content validity for IL of selected items from the LAMP survey could be investigated as part of the current developments. If content validity is confirmed, statistical evidence of construct and concurrent validity could be investigated using data sets currently being collected, and this could mean that indicators of IL could be available in a timely manner. The advantages of adopting indicators of IL based on LAMP include the timeliness of the development, the number of potentially valid items, and the quality control that UIS exercises in survey implementation. In Appendix 1 we present the twenty-eight items from the current LAMP survey that we consider suitable for consideration as indicators of IL.

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This is likely to provide a sufficient set of items to enable the production of a set of indicators with satisfactory levels of reliability. It is noted that reliabilities that met the criteria for standardised tests for the two forms of the ISS survey with between 20 and 24 items, including reliabilities for sub-scales sufficient for accurate reporting of group performance.

It may not be possible immediately to identify items that indicate the ethical aspect of information use with indicators from LAMP. We considered proposing a reduced definition of IL to avoid this area but have retained this dimension of IL both because it is an essential part of the IL construct and because this may prompt the development of suitable survey items in the further development of LAMP.

It is evident that developing indicators of ethical use of information is a challenging task. Beyond the norms and conventions that govern the use of information in academic publishing, the definition of ethical use of information is challenging but is feasible. It would require development and trial of examples that are robust across cultures. Items might be considered around concepts like claiming other people's ideas as one's own, opening and reading other people's mail, or making copies of copyright music or movies.

**Potential of PISA items.** Although our recommendation is to focus initially on the LAMP survey, we have also considered the potential of selecting items from other international surveys. The Programme for International Student Assessment (PISA) collects evidence of the attainment of school students in Mathematics, Reading and Scientific competencies at various age levels. The assessment of scientific competencies gives priority to three competencies each of which contains three elements. Two of these elements are *prima facie* also elements of information literacy. The first of these is 'Identifying scientific issues by identifying the keywords to search for scientific information' which equates with part of the Information literacy element, 'Locate and evaluate the quality of information'. The second element is 'interpreting scientific evidence and making and communicating decisions' which equates to 'apply information to create and communicate knowledge'. Examples of potential items are listed in Appendix 2.

**Potential of DHS surveys.** The Demographic and Health Surveys (DHS) collect data from eligible individuals include women of reproductive age (15-49) and men age (15-59), or in some cases (15-54). In some countries only women are interviewed. Individual questionnaires include information on marriage, fertility, family planning, reproductive health, child health, and HIV/AIDS. Each survey is different, with questions that diverge from the standard. The questionnaires used in one country, while containing essentially the same information, may be different in many ways from those used in another country. It is also important to understand that model questionnaires change frequently over time. Examples of potential items are listed in Appendix 2.

## Content Validity of Indicators of IL

The proposal that IL indicators be created by developing indices from existing survey items is based on efficiency, cost effectiveness and the need for timely development of IL Indicators. However, to ensure that the selected survey items are valid indicators of IL it will be necessary to demonstrate the content validity of each element. The items were after all developed to measure other constructs such as problem solving skills, communication skills, or literacy. The conduct of 'blind' trials of items to verify their relevance will require the cooperation of experts in information science, public health and lifelong learning. This is an essential stage in the development of IL indicators. An example of this process is provided in the development of the Information Skills Survey for use in Australian Universities (Catts, 2005b).

While there may appear to be a mapping of elements from LAMP with elements of Information Literacy, individual items need to be examined to determine whether they represent valid examples of Information literacy. An example of how content validity might be considered is presented below using a sample item from the PISA Scientific Competencies (OECD, 2006, 28).

### Illustration of Content Validity

*Sample Item: Catching the Killer*

*Which one of the following questions cannot be answered by the scientific evidence (presented in the item)?*

- a) What was the medical or physiological cause of the victim's death?*
- b) Who was the victim thinking of when he died?*
- c) Is taking cheek scrapings a safe way to collect DNA samples?*
- d) Do identical twins have exactly the same DNA profile?*

This is a task where the person has to evaluate information and decide if further information is required and hence is also evidence of information literacy situated within a scientific disciplinary context. Some might wonder which of the five aspects of information literacy is the most salient to this task. Of the five, the following two might be likely to be considered:

- ▷ Recognise their information needs;
- ▷ Locate and evaluate the quality of information;

The possibility that this item represents more than one of the IL elements is why the use of secondary analysis of items must be subject to content validation. This is achieved by showing information science experts the item and asking them to select the element of information literacy that best describes the item. If experts do not agree on a particular IL element, then even though the item may be seen as evidence of information literacy, it is not useful for delineating capacities across the elements of information literacy.

## Criteria for IL for Teachers

Nations have a responsibility to ensure the competence of their teachers. This normally includes the establishment of criteria for initial teacher education and, also for continuing professional development. For the principles of lifelong learning to be successfully embedded within elementary schooling, it is crucial that elementary school teachers model lifelong learning competencies in their practices, including information literacy.

This is a significant issue because when teachers model IL they adopt a constructivist approach to teaching and learning, whereas in many societies a didactic model of teaching is practiced. Didactic practices are considered teacher centred, whereas constructivist models are described as learner focused. Many authors have argued that the constructivist approach enables greater learning or deeper learning (e.g. Bryce and Macmillan, 2005), whereas the didactic approach is said to foster rote learning. Other writers argue that the quality of teaching is important, no matter which approach is adopted (e.g. Jones, 2007) and it has also been argued that the differences are not substantial when actual practice in a classroom is observed (Terhart, 2003). Nonetheless the potential implications for the norms and values of various societies need to be acknowledged.

The IL practices of teachers in relation to the use of research to inform their pedagogic practices have been described by Williams and Coles (2007). They found that teachers made little use of information sources and relied primarily on their senior managers and on informal exchanges of ideas with peers. Teachers often claim that time limits their opportunities to search for information, but this implies that they need better IL skills in order to access information in an efficient and effective manner. While academics may wish for teachers to make more use of research in their practice, of more importance still is their modelling of IL to their pupils. Loveless and Longman (1998) have argued 'that information literacy for teachers is more than competence and capability in information retrieval and presentation, but requires awareness of the ideological, cultural, epistemological and pedagogical practices in which these capabilities are developed.'

Recent evidence confirms that even in advanced economies, teachers tend to focus on the mechanics of information technologies (i.e. ICT skills) rather than the practice of using information to inform practice (Tondeur et al, 2007). Therefore, the development of a statement of IL competencies for beginning elementary school teachers could make a contribution to the improvement of teacher education and teaching practice for all countries.

The generic information literacy standards outlined in this paper should inform a more detailed statement from which to operationalise information literacy indicators for elementary school teachers. We propose that in preparing a statement of IL Indicators for teachers we situate the statement in a broader context of professional competencies along the lines outlined in various national standards for teachers and by Evers et al (1998).

**Teachers' Information Literacy.** Several studies have suggested that a barrier to developing an information literate society is the lack of IL behaviour modelled by teachers (Loertscher and Woolls, 1992, 60). In terms of priorities for international benchmarks the development of IL skills among primary school teachers is important since it sets a standard for learning that can be closely aligned within a broader literacy strategy that will enhance the capacity of future generations to use information skills in their further education, at work, for their health, and in participation in civic society.

### Concerns with benchmarking

The feasibility of developing indicators for IL skills implies a form of standardised measurement suitable for benchmarking at the national level and for use in international comparisons. Therefore attention is drawn to some reservations with the benchmarking of IL.

The notion of standards and indicators for IL in the higher education context is not universally supported. The American and Australasian standards are perceived by some, especially in Scandinavian countries, to be associated with behaviourist traditions of teaching and assessment that are the antithesis of the enquiry driven model of teaching that underpins a constructivist approach. A reading of the framework proposed in the Australian and New Zealand publication (Bundy, 2004) indicates that the authors conceive of the standards as being applied within a constructivist model of learning, but nonetheless if the standards are viewed without the explanatory framework, then a behaviourist interpretation is possible. In approaching the task of developing international IL indicators, there is a need to be sensitive to this debate and to offer an approach that is empathic with the lifelong learning agenda, and in particular in supporting autonomous learning.

### Deciding Levels of IL Competence

The question of what constitutes a sufficient level of Information Literacy is not amenable to a single answer. There is no one criterion that will describe the level of information literacy required of people in any of the domains of application included in the Alexandria proclamation. Furthermore what constitutes a satisfactory level for any particular context will change over time. This is the nature of any human capacity. At any time, a new situation may require a new level of information literacy capacity. Hence there is no point in defining a minimum level of information literacy. That is why a measurement model is proposed that identifies items, and hence people, along a continuum of information literacy capacity.

## Conclusion

The development of IL Indicators will contribute to the efforts to monitor achievements in the international decade of literacy. The proposal that IL indicators be derived from secondary analysis of existing survey elements from LAMP will enable the task to be undertaken in a cost effective and efficient manner so that data can be made available in the near future.

The identification of information supply and access for all people to information are necessary prerequisites to enable people to practice IL, but information usage is the core IL task.

Appendix 1 - Information Literacy Indicators located within the LAMP Household Survey

## APPENDIX 1

### Information Literacy Indicators located within the LAMP Household Survey

#### a) Recognise information needs

Comparator Source	Comparator Element
LAMP B28	Informal learning activities (most pertinent elements to be determined)
LAMP C20	Requirement to read at work (possibly C 22 provides evidence of level of IL skills)
LAMP E11	Finding out how to see a doctor or health worker
LAMP E16	Reading about health issues
LAMP G 5.7 to 5.11	Searching for information using the internet.

#### b) Locate and evaluate the quality of information

Comparator Source	Comparator Element
LAMP E17	Understanding health issues
LAMP E18 &19	Understanding instructions on the use of products

#### c) Store and Retrieve information

Comparator Source	Comparator Element
D 2.3	Fill in Forms
G 3.5	Keeping a schedule or calendar (using ICT)
G 3.6	Reading information from CD ROM or DVD (using ICT)
G 5.6	Obtaining or saving music (ICT)

#### e) Make effective and ethical use of information

Comparator Source	Comparator Element
LAMP C 26	Calculations with numbers at work (C28 provides indicators of levels of IL)
LAMP D 1	8 elements may provide indicators of levels of IL
LAMP D2.5	Produce bills, invoices or budget tables
LAMP G 3.1 to 3.4	Items may imply levels of IL



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### f) Apply information to create and communicate knowledge

Comparator Source	Comparator Element
LAMP C 23	Writing messages at work (C25 offers levels of IL)
LAMP D2.1	Write personal letters, messages or emails.
LAMP D2.2	Write official letters to an authority or organisation
LAMP D 2.4	Write reports or articles
LAMP D2.6	Produce charts, diagrams or maps

## APPENDIX 2

### Examples of Information Literacy Indicators in the PISA School Assessment and DHS Household survey

Information Literacy Element	Source	Item
Recognise information needs	DHS 2007 women's survey	unmet needs for family planning
Locate and evaluate the quality of information	PISA Scientific Competencies OECD (2006, 29)	Identifying scientific issues by identifying the keywords to search for scientific information
	PISA Reading Literacy OECD (2006, 50)	Retrieving specified information from texts
Store and retrieve information	DHS (2007) women's survey	knowledge of a source of contraception
	DHS (2007) Women's survey	knowledge about ways to avoid getting AIDS
	DHS (2007) Women's survey	knowledge about high-risk sexual behaviour
Make effective and ethical use of information	DHS (2007) Women's survey	use of contraceptive methods
Apply information to create and communicate knowledge	PISA Scientific Competencies OECD (2006, 29)	interpreting scientific evidence and making and communicating decisions

## APPENDIX 3

# International indicators for the supply, access and reception of information, and of ICT Skills

By UNESCO Institute for Statistics<sup>3</sup>

### UNESCO's global mandate for monitoring information literacy

The need for indicators on information literacy is driven by the recommendations of two global summits in which UNESCO has played a leading role.

- The *Dakar 2000 Education for All* meeting set out six global education goals to be attained by 2015 covering all aspects of education from pre-primary to tertiary and adult education. None of these goals specifically address information literacy. However the 2005 Global Education for All Monitoring Report on the subject of literacy defined the improvement of the 'literacy environment' as one of the three global priorities to foster literacy. The Report is written by an independent team working at UNESCO, and the statistics for the report are largely provided by UNESCO Institute for Statistics. Since the 2005 report the team has become further interested in presenting a more comprehensive view of the literacy environment. At the same time the Education Sector at UNESCO has highlighted the issue during its current series of regional conferences in support of the UN Literacy Decade 2003-12.
- The *World Summit on the Information Society 2003/5* has also stressed aspects of information literacy in its Action Plans delivered at Geneva in 2003 and Tunis in 2005. After the Geneva round of the Summit a number of international agencies formed the Partnership for the Measurement of ICTs for Development (OECD, UNCTAD, ITU, UIS and UN Regional Commissions) which has been established as the international body for global monitoring of the outcomes of the Summit. The Partnership has developed 48 'core indicators' for ICT use in businesses and the home. Within the Partnership UIS has been mandated to develop indicators for ICTs in Education but has also continually stressed the usage of technology old and new as well as the overall Information for All goal of public access to information. This has led UIS to relaunch surveys of Press and Broadcast media in 2005 and

<sup>3</sup> Simon Ellis was principal author. Subramanyan Venkatraman, Claude Akpabie, and Patrick Lucas provided important input.

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2006 as well as a pilot collection on ICTs in Education in 2006/7. UIS strategy has thus stressed the use of old and new technologies, as well as measurement of the various channels by which public information is distributed and the skills needed to access and comprehend this information.

- UIS 'beacon' project has been the development of a new literacy assessment tool LAMP (Literacy Assessment and Monitoring Programme). LAMP takes literacy assessment as carried out in OECD countries under the IALS and ALL programmes and adds further modules for addressing the component or pre-literacy skills such as letter and word recognition. LAMP is at present being piloted across a range of different countries. Most pertinently for the present discussion LAMP includes data collection on use of computers including Internet, newspapers, radios and TVs in the home and school.
- Finally while information literacy is not a target of the Millennium Development Goals certain potential indicators for information literacy are official MDG indicators. Literacy is included in the MDGs as an indicator of sustainable outcomes of primary education. Internet subscriptions and availability of PCs are included with reference to the target to encourage the spread of new technologies.

### **Approach adopted**

The conceptual framework paper, *Toward Information Literacy Indicators* (Catts and Lau, 2008) provides a set of indicators of information literacy which is defined as the transformation of information into knowledge.

This paper suggests a range of indicators that identify the prerequisites to Information Literacy namely supply, access, and reception of information, together with ICT skills which are closely linked to the WSIS & EFA summits in UNESCO's mandate, UIS role as global data provider, and UIS institutional place in official global monitoring mechanisms. Many initiatives adopt an approach to this topic based on ICTs (eg ITU's Digital Opportunity Index).

The proposal in this paper has been brought forward as a 'medium' or 'channel' independent approach to measurement of pre-requisites to information literacy. That is to say that while the 'digital divide' risks widening the gap between the 'information rich' and the 'information poor' the prime consideration is that people should have access to public information through a variety of channels, and the precise channel (eg Internet or newspaper) is less important than the fact of having access to the information that is needed in a usable/comprehensible form.

The paper also adopts the perspective of UIS. UIS' primary function is to collect data from as many countries as possible to present a global perspective based on internationally comparable data. Thus UIS collects national aggregate data rather than data from administrative or other units within a country. UIS is also interested to collect a small key set of 'indicators' to show overall trends, and which are available from a large number of countries. This has the advantage of minimizing the burden of collecting new data, as well as the difficulties of supporting a large number of

countries in methodological development and capacity building. Thus the potential for reducing the appended list of indicators to a smaller number of key measures should be considered. This small number of international indicators should be an abstraction of a much richer national database clearly tailored to meet national policy requirements.

The proposal is based on a three part division of the indicators:

**Supply:** these indicators reflect the degree to which government or other official national agencies supply information through a variety of channels to the public. It is important to examine use of information in relation to supply as people may have the skills to access information, but will not be able to obtain the information they need unless it is supplied or made available to them. Furthermore it may well be desirable to produce indicators relating usage to supply to distinguish between countries where supply is good but usage is poor, and countries where usage is good but supply is poor. Indicators of supply are the easiest to collect as they can be commonly provided by the appropriate national authorities. In the present case supply has been interpreted to mean both the provision of infrastructure (radio, TV, computer), and content (education and health programmes for example). Measuring content is difficult as it requires identifying specific categories which will be culturally sensitive, but measuring the provision of such programmes is easier than measuring their 'usefulness'.

**Reception:** these indicators reflect the degree to which people actually receive the information that is supplied. They may be divided into two groups. Firstly, indicators associated with availability which looks at the degree to which the national 'supply' actually reaches people who may be prevented from using the information by barriers such as social stigma or language. Secondly indicators of actual usage in the sense of reception and adoption of information which measure either what information people look at or whether they adopt the information in their lives. 'Availability' is much easier to measure, and data are much more readily available than for actual 'adoption'. 'Availability' is often used as a synonym for usage; for example number of Internet subscribers is often shown as number of Internet 'users' when it is not clear how often a subscriber actually uses the internet, and indeed one subscriber can represent a household of users. The fact that information is 'available' thus does not necessarily mean it is used. Assessing the 'benefit' that two people, even in the same community, obtain from the same 'content' can be extremely difficult, and usage figures are more likely limited to time spent than to 'impact' measures. Data on usage and availability are usually collected through household surveys.

**Skills:** Catts and Lau (2008) identify adult literacy and ICT skills as prerequisite skills for the practice of IL in a knowledge society. It is considered that a prime mandate of UNESCO is to examine the degree to which people acquire the skills necessary to use ICTs through the formal or non-formal education systems. Lack of skills can be one reason why information that is 'available' is not 'used'. Data on training and

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skills can be collected either through household assessment like LAMP, or through school assessments like OECD's PISA. Skills assessments normally require sophisticated statistical modeling especially to obtain internationally comparable results. UNESCO's regional bureau for education in Bangkok has conducted a major programme on ICT indicators in schools, and UIS has also had a number of projects on this topic, in particular specifying global indicators for the Partnership for WSIS follow-up.

**Information literacy skills.** Information literacy skills are the subject of the preceding paper by Catts and Lau. The indicators that they recommend are from the LAMP/IALS set and, as outlined in the table that follows, these IL indicators complement the existing set of indicators outlined above.

### Some important gaps in information

**Reception.** It is important to know how information and technology is actually used to decide if information can be received. For example computers may be 'used' in schools purely for administrative purposes and accountancy. Indicators such as 'number of computers used for educational purposes' still do not indicate whether the actual ICT skills needed to function in the information society are being taught. Skills assessment can be very complex, and expensive. While it is possible to envisage further work in this area it may prove extremely difficult to produce an international profile of 'usage'.

**Book production.** While publishing data is good for OECD countries in many developing countries coverage is limited to a few major publishers. UIS' view is that it is not possible to collect representative data on book production from developing countries. This may be the most problematic element in indicators of 'supply'.

**Definitional problems.** Measurement issues in these prerequisite information domains are not defined systematically enough or have not been operationalised in surveys. For example the term Public Internet Access Centre has been defined by ITU, but little data is as yet available. The important area of the ICT skills required to locate and access information have not been defined with sufficient clarity to allow international data collection. The definitions for on-line media also require clarification. UIS Press and Broadcast surveys are attempting this.

**Libraries.** Definitional issues and lack of coverage in developing countries also affects the availability of data on libraries. UIS is working with the International Federation of Library Associations and the International Standards Organisation group on library statistics to try and address this issue.

### Potential indicators on information literacy including sources, problems and links to official indicators for EFA, MDGs, and WSIS

Dimension	Topic	Indicator	Source	References to international goals
	Supply			
1.	Print (newspapers)	Titles per 1,000,000 inhabitants	UIS Press Survey 2006	EFA 2B
2.	Radio	Channels per 1000 inhabitants	UIS Broadcast Survey 2006	
3.		Radio sets per 100 or 1000 inhabitants		EFA 2B WSIS A11
4.	television	Channels per 1000 inhabitants	UIS Broadcast Survey 2006	
5.		Television sets per 100 or 1000 inhabitants	UIS Broadcast Survey 2006	EFA 2B WSIS A12
6.	Journalists	Print Journalists per 1,000,000 inhabitants	UIS Press Survey 2006	
7.		Broadcast Journalists per 1,000,000 inhabitants	UIS Broadcast Survey 2006	
8.		Graduates (and Enrolment) in Journalism and Information	UIS Annual Education Survey	
9.	Broadcast content	% of annual radio broadcasting time devoted to news and information, or education and science	UIS Broadcast Survey 2006	Limited data, difficult to compare
10.		% of annual television broadcasting time devoted to news and information, or education and science	UIS Broadcast Survey 2006	Limited data, difficult to compare
11.	On-line media	No of on-line newspapers per 1,000,000 inhabitants	UIS Press Survey 2006	
12.		No of Internet radio stations per 1,000,000 inhabitants	UIS Broadcast Survey 2006	

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Dimension		Topic	Indicator	Source	References to international goals
13.			% of localities with public internet access centres (PIAC) by the number of inhabitants	ITU	WSIS A10 Problems in conception, and data collection
14.		PCs	Number of PCs per 100 or 1000 inhabitants	ITU	WSIS A3 MDG 48a EFA 2B
15.		Libraries	Public libraries - volumes of books	UIS libraries survey	EFA 2B Only surveyed in Latin America in 2007
16.			Library employees per 1,000,000 inhabitants	UIS libraries survey	Only surveyed in Latin America in 2007
17.		Book production	Titles per 1000 inhabitants		EFA 2B No comprehensive data for developing countries
18.	Availability	Newspapers	Circulation Total, & per 1000 inhabitants		EFA 2B
19.		Radio	% households with a radio	LAMP and (inter)national household surveys	EFA2B WSIS HH1
20. 14.		TV	% households with a TV	LAMP and (inter)national household surveys	EFA2B WSIS HH2
21.		On-line media	% of households with Internet access		WSIS HH7 EFA 2B
22.			Internet subscribers per 100 or 1000 inhabitants		MDG 48b WSIS A4
23.			% of schools with an Internet connection		WSIS Ed
24.	Information Reception	Newspapers	% of households/ persons reporting they read a newspaper	LAMP and (inter)national household surveys	
25.		Radio	% of households/ persons reporting they read a newspaper	LAMP and (inter)national household surveys	

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Dimension		Topic	Indicator	Source	References to international goals
26.		TV	% of households/ persons reporting they watch TV	LAMP and (inter)national household surveys	
27.		On-line media	% of households/ persons reporting they use on-line media		WSIS HH10
28.			% of households/ persons reporting they use the Internet	LAMP and (inter)national household surveys	WSIS HH10 +13
29.		Broadcast content	% of persons reporting they watch different content types	LAMP and (inter)national household surveys	Very little data, not compiled on a comparable basis
30.		Use of libraries	% of households/ persons reporting they borrow newspapers, books or magazines	LAMP and (inter)national household surveys	
	Skills				
31.		Literacy	Literacy rate	UIS annual survey	Does not measure competency
32.		Literacy skills	Level of literacy	LAMP/IALS	Internationally comparable measure of competency
33.		ICT skills in schools	% Teachers with formal training in ICT	UIS Annual Education Survey	WSIS Ed
34.			% schools with PCs used for educational purposes	UIS Annual Education Survey	WSIS Ed
35.		Languages	% of people speaking minority languages	SIL and other sources	Data collection and definitions often problematic
36.	Information Literacy	Recognise information needs	See Catts and Lau	LAMP/IALS	Internationally comparable measure of competency
37.		Locate and evaluate information	See Catts and Lau	LAMP/IALS	
38.		Store and retrieve information	See Catts and Lau	LAMP/IALS	



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Dimension	Topic	Indicator	Source	References to international goals	
39.		Make effective use of information	See Catts and Lau	LAMP/IALS	
40.		Apply information to create and communicate knowledge	See Catts and Lau	LAMP/IALS	

These indicators just represent *some* of the potential indicators that might be used. Further work is required to identify a core set of indicators. Some of the qualities that might be used to identify the 'core' are described below.

### Some principles of indicator development

The following list presents *some* of the qualities that are desirable in good statistical indicators. Potential indicators should be assessed using these qualities in order to select the minimum necessary to cover the relevant domain:

- Pertinent: the data are relevant to decision-making and the issue to be measured.
- Timely: the data are made available quickly before they become out-of-date.
- Accurate: the data are correctly calculated and not subject to error.
- Frequency: the data collection can be repeated on a regular cycle to measure trends.
- Cost: data collection is not too expensive (few developing countries can afford dedicated surveys of more than top policy priorities).
- Valid: the data measure what they are intended to measure.
- Reliable: the data are stable, not changing too quickly to be captured.
- Consistency: indicators do not contradict each other or individual responses contradict each other.
- 'Economy': it is preferable to pick the minimum number of indicators necessary in order to cover the maximum extent of the topic. This minimises the burden of collection on countries.
- 'Independence': indicators should measure different aspects of a topic, they should not be intercorrelated though some indicators may be related.
- Transparency: the sources of data and how indicators have been calculated should be as clear as possible to the 'reader'.
- Comparability: the use of data at the international level adds a further dimension of complexity, that data should be comparable across different cultures and economies.

## Sources and References

- EFA: Education for All Global Monitoring Report 2006 Literacy for Life, Table 2b Literate environment.
- IALS & ALL: The International Adult Literacy Survey developed by OECD countries assesses five levels of literacy. Most recent version the Adult Literacy and Life Skills Survey. <http://www.statcan.ca/english/freepub/89-603-XIE/89-603-XIE2005001.htm>
- LAMP: UIS Literacy Assessment Programme, developed from the IALS methodology. In addition to the five levels of literacy assessed through IALS LAMP will collect data on 'components' of literacy such as recognition of letters, syllables, phrases etc. [http://www.uis.unesco.org/ev.php?URL\\_ID=6409&URL\\_DO=DO\\_TOPIC&URL\\_SECTION=201](http://www.uis.unesco.org/ev.php?URL_ID=6409&URL_DO=DO_TOPIC&URL_SECTION=201)
- MDG: Target 18 of the Millennium Development Goals reads 'in co-operation with the private sector, make available the benefits of new technologies, especially information and communications.' The indicators marked MDG are official global indicators for progress towards this target. <http://millenniumindicators.un.org/unsd/mdg/Default.aspx>
- UIS Annual Education Survey: UIS regular collection of national administrative data on education. In 2006 this survey included an element on use of ICTs in education for the first time. [http://www.uis.unesco.org/ev.php?URL\\_ID=5750&URL\\_DO=DO\\_TOPIC&URL\\_SECTION=201](http://www.uis.unesco.org/ev.php?URL_ID=5750&URL_DO=DO_TOPIC&URL_SECTION=201)
- UIS Annual Literacy Survey: collects responses to simple questions on literacy in inhabitant censuses and household surveys. Such responses are 'self declarations' or declarations of literacy made by the head of household on behalf of all household members. They are likely to overestimate available literacy skills. [http://www.uis.unesco.org/ev\\_en.php?ID=6862\\_201&ID2=DO\\_TOPIC](http://www.uis.unesco.org/ev_en.php?ID=6862_201&ID2=DO_TOPIC)
- UIS Libraries Survey: A new survey developed in close collaboration with IFLA and ISO. Problems in availability of data mean this will initially be piloted only in South America in 2007.
- UIS Broadcast Survey 2006: In 2006/7 UIS relaunched the UNESCO Broadcast survey dealing with national supply and viewers/listeners for radio and television. New items included community and on-line services. Data tables will be prepared by the end of 2007. [http://www.uis.unesco.org/ev.php?ID=6554\\_201&ID2=DO\\_TOPIC](http://www.uis.unesco.org/ev.php?ID=6554_201&ID2=DO_TOPIC)
- UIS Press Survey 2006: In 2005/6 UIS relaunched the UNESCO Press survey dealing with national supply and circulation of printed news. New items included community newspapers and on-line newspapers. Data tables are currently being prepared. [http://www.uis.unesco.org/ev.php?ID=5831\\_201&ID2=DO\\_TOPIC](http://www.uis.unesco.org/ev.php?ID=5831_201&ID2=DO_TOPIC)
- WSIS: Partnership on Measuring ICT for Development, Core ICT Indicators, 2005.
- WSIS Ed: UIS Core Indicators for Education, 2005. The Partnership consists of UNCTAD, OECD, ITU, UIS, and the Regional UN Statistical Commissions. The Partnership has published 48 'core' indicators on ICT use by businesses and households. Core indicators on education have been developed by UIS.

## References

- American Library Association. (2005) Information Literacy Standards. Located at <http://www.ala.org/ala/acrl/acrlstandards/informationliteracycompetency.htm>
- Blanskat, A; Blamire, R.; and Kefala, S. (2006) The ICT Impact Report: A review of studies of ICT impact on schools in Europe. Brussels, European Community. Located, October 2007, at <http://ec.europa.eu/education/doc/reports/doc/ictimpact.pdf>

## TOWARDS INFORMATION LITERACY INDICATORS

- Big Blue (2001) *The Big Blue: information skills for students*. Located at <http://www.library.mmu.ac.uk/bigblue>
- Bruce, C. (1997). *The relational approach: a new model for information literacy*. *The New Review of Information and Library Research*, 3, 1–22.
- Bryce, Tom and Macmillan, Kenneth (2005) 'Encouraging conceptual change: the use of bridging analogies in the teaching of action-reaction forces and the 'at rest' condition in physics', *International Journal of Science Education*, 27:6, 737 - 763
- Bundy, A. (2004) *Australian and New Zealand Information Literacy Framework: Principles, Standards and Practice*. 2nd ed. Adelaide: ANZIL.
- Byerly G. and Brodie, C. S. "Information Literacy Skills Models: Defining the Choices. In Stripling, B. K (1999) *Learning and Libraries in an Information Age*. Englewood, Colorado, Libraries Unlimited.
- Campbell, S (2004) *Defining Information Literacy in the 21st Century*. World Library and Information Congress: 70th IFLA General Conference and Council, 22-27 August
- Carneiro, R. (2005) *The big picture: Where is learning going?* In the proceedings of the Futures for Learning Seminar Report, Glasgow, pp 19 – 21.
- Catts, R. (2005a) *Information Literacies and Lifelong Learning: Keynote Address*. Motesplats Infor Framtiden. (Swedish Library Association Annual Conference) Boras, Sweden, October
- Catts, R. (2005b) *Information Skills Survey, Technical Manual*, Canberra, CAUL.
- Catts, R (2007) *Evaluating Information Literacy Initiatives in Higher Education*, in Nevgi, A. (ed.) (2007) *Informaatiolukutaito yliopisto-opetuksessa*. Information Literacy in Higher Education. Published in Finnish). Helsinki: Yliopistopaino Kustannus / Palmenia-sarja
- Cheuk, B. (2002) *Information Literacy in the Workplace Context: Issues, Best Practices and Challenges*, White Paper for use at the Information Literacy Meeting of Experts, Prague, The Czech Republic. Located, October 2007 at <http://www.nclis.gov/libinter/infolitconf&meet/papers/cheuk-fullpaper.pdf>
- Clark, C., and Catts, R. (2007) *Information Skills Survey: its application to a medical course*. *EBLIP* 2, (3) 3 – 26.
- Cochrane Collaboration (2007) accessed October 2007 at <http://www.cochrane.org/index.htm>
- DHS (2007) *Demographic and Health Surveys*. Located at <http://www.measuredhs.com/aboutsurveys/dhs/questionnaires.cfm#2>
- Emmett A. and Emde, J. (2007) *Assessing information literacy skills using the ACRL standards as a guide*. *Reference Services Review* 35 (2) 210 – 229. Located October 2007 at <http://www.emeraldinsight.com/Insight/viewPDF.jsp?Filename=html/Output/Published/EmeraldFullTextArticle/Pdf/2400350202.pdf>
- ETS (2008) *iSkills Assessment*. Located at <http://www.ets.org/portal/site/ets/menuitem.1488512ecfd5b8849a77b13bc3921509/?vgnnextoid=159f0e3c27a85110VgnVCM10000022f95190RCRD&vgnnextchannel=e5b2a79898a85110VgnVCM10000022f95190RCRD>
- Evers, F.T.; Rush, J.C; and Berdrow, I. (1998). *The Bases of Competence: Skills for Lifelong Learning and Employability*. San Francisco: Jossey-Bass
- Field, J. (2001) *Nationality, Citizenship and Lifelong learning: Building Social Capital in the Learning Society*. In Bron, M and Field, J. 2001 (Ed) *Adult Education and Democratic Citizenship III*, pp17 - 36. Wroclaw, Lower Silesian University College of Education.
- Garner, S.D. (Ed) (2006) *Final Report of High-Level Colloquium on Information Literacy and Lifelong Learning* Alexandria, Washington DC IFLA, located October 2007, at <http://www.ifla.org/III/wsis/>

- High-Level-Colloquium.pdf
- Grant, S (2002) Information Literacy and Consumer Health, White Paper for use at the Information Literacy Meeting of Experts, Prague, The Czech Republic. September 2003, located October 2007 at <http://www.nclis.gov/libinter/infolitconf&meet/papers/grant-fullpaper.pdf>
- Jones, Steve E. (2007) Reflections on the lecture: outmoded medium or instrument of inspiration? *Journal of Further and Higher Education*, 31 (4), 397 – 406
- Katz, I R and Macklin A S. (2006) Information and Communication Technology (ICT) Literacy: Integration and Assessment in Higher Education  
*Journal of Systemics, Cybernetics and Informatics* 5 (4) 50 - 55
- Kruger, R. (1996) *Ashes to Ashes - America's Hundred-Year Cigarette War, the Public Health, and the Unabashed Triumph of Philip Morris*, NY, Alfred A. Knopf.
- Kuhlthau, C. *Information Skills for an Information Society: A review of the research*. Syracuse, NY ERIC Clearinghouse on Information Resources.
- Lau, Jesus. (2006) *The Impact of Information Competencies on Socio-Economic Development in the Southern Hemisphere Economies*. In Martin, A. and Madigan, D. *Digital Literacies for Learning*. London: Facet.
- Lau, J. (2007) Information Literacy resource Directory, IFLA, <http://www.infolitglobal.info>
- Loertscher, D. V. and Woolls, B. (2002) *Information Literacy: A review of the Research*. 2nd Edition. San Jose, CA, Hi Willow.
- Loveless, A. and Longman, D (1998) *Information Literacy: Innuendo or insight?* *Education and Information Technologies* 3 (1) 27 - 40.
- Millenium Development Goals (MDGs, 2003) <http://unstats.un.org/unsd/mi/pdf/mdglist.pdf>
- Mittermeyer D, and Quirion, D. (2003) *Information Literacy of Incoming First-Year Undergraduates in Quebec* Paper presented at the Conference of Rectors and Principals of Québec Universities, 2003
- Nevgi, A. (Ed.) (2007) *Informaatiolukutaito yliopisto-opetuksessa*. (Information literacy in Higher Education; Published in Finnish). Helsinki: Yliopistopaino Kustannus / Palmenia-sarja
- O'Connor, L. G., Radcliff, C.J. and Gedeon, J.A. (2002) *Applying Systems Design and Item Response Theory to the Problem of Measuring Information Literacy Skills*. *College and Research Libraries*. 63, (6) 528-543.
- OECD (2005) *Learning a Living*. Located November, 2007 at <http://www.oecd.org/dataoecd/44/7/34867438.pdf>
- OECD (2006) *Assessing Scientific, Reading and Mathematical Literacy: A framework for PISA*. Paris, OECD
- OECD (2007) *Measuring the Progress of World Societies: The Istanbul Declaration*. Accessed at [http://www.oecd.org/site/0,3407,en\\_21571361\\_31938349\\_1\\_1\\_1\\_1\\_1,00.html](http://www.oecd.org/site/0,3407,en_21571361_31938349_1_1_1_1_1,00.html)
- Ogris, G. and Westphal, S. (2006) *Indicators on Active Citizenship: The Political Domain* Vienna, SORA Institute for Social Research and Analysis, located October, 2007 at [http://crell.jrc.ec.europa.eu/ActiveCitizenship/Conference/02\\_SORA.pdf](http://crell.jrc.ec.europa.eu/ActiveCitizenship/Conference/02_SORA.pdf)
- Pasadas, C. (2007) Personal communication with J Lau.
- Peters, M. with Besley, A. (2006) *Building Knowledge Cultures: Education and Development in the Age of Knowledge Capitalism*. Oxford, UK. Rowman and Littlefield.
- Reeff, J-P; Zabal, A.Q., & Blech, C. (2006) *The Assessment of Problem-Solving Competencies*. Located, October 2007 at [http://www.die-bonn.de/espid/dokumente/doc-2006/reeff06\\_01.pdf](http://www.die-bonn.de/espid/dokumente/doc-2006/reeff06_01.pdf)

## TOWARDS INFORMATION LITERACY INDICATORS

- Terhart, E. (2003) Constructivism and teaching: a new paradigm in general didactics? *Journal of Curriculum Studies*, 2003, 35, (1), 25–44
- Tondeur, J., van Braak, J., & Valcke, M. (2007) Curricula and the use of ICT in education: Two worlds apart? *British Journal of Educational Technology* 38 (6) 962–976
- UIS (2007) A Statistical Framework for Information Literacy. Working Group on Measurement, April 3.
- UNESCO (2005). *Toward Knowledge Societies: UNESCO World Report*. Paris, UNESCO.
- UNESCO (2005). *Measuring Linguistic Diversity on the Internet*. Paris, UNESCO
- UNESCO (2007). *Information for All Programme*, located October 2007 at [http://portal.unesco.org/ci/en/ev.php-URL\\_ID=21293&URL\\_DO=DO\\_TOPIC&URL\\_SECTION=201.html](http://portal.unesco.org/ci/en/ev.php-URL_ID=21293&URL_DO=DO_TOPIC&URL_SECTION=201.html)
- Virkus, S (2003) Information literacy in Europe: a literature review. *Information Research*, 8 (4), paper 159 located, October 2007, at <http://informationr.net/ir/8-4/paper159.html>
- Webber, S. (2006) Information literacy standards and statements. Accessed October 2007, last updated 2006. <http://dis.shef.ac.uk/literacy/standards.htm>
- WHO (2006) *Reproductive Health Indicators: Guidelines for their generation, interpretation and analysis for global monitoring*. Geneva, Switzerland, World Health Organization. Located at [http://www.who.int/reproductive-health/publications/rh\\_indicators/guidelines.pdf](http://www.who.int/reproductive-health/publications/rh_indicators/guidelines.pdf)
- Williams, D. and Coles, L. (2007) 'Teachers' approaches to finding and using research evidence: an information literacy perspective', *Educational Research*, 49:2, 185 – 206

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