

Accessing Information and Creating Knowledge:

Some implications for providers and for users

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Abstract:

In this paper Ralph Catts reviews the nature of Information Society Technology (IST) skills (called Information Literacy in the USA and Australia) and some recent research into IST acquisition and practice. He then turns to recent developments in European and international agencies that are likely to impact on IST policy at national level in Central Europe, and asks questions about the implications for information providers, librarians and end users.

Information Society Technology Skills (IST)

Many of you will be familiar with the acronym ICT. I wonder if IST rolls off the tongue quite so easily? Let me start therefore by defining three terms.

Information and Communication Technology (ICT):

The following definition is from Statistics Canada (2008).

ICT includes technologies such as desktop and laptop computers, software, peripherals and connections to the Internet that are intended to fulfil information processing and communications functions.

However, when we add the word, skills the definition can become ambiguous. Based on the above it should mean the technical capacity to use IC and T. However, the term 'use' is taken by some to include the cognitive processing of the information accessed. If one thinks back to the days when library resources were accessed by card catalogues, learning how to locate a book was seen as a distinct skill from the capacity to read and interpret the content of the book. It is helpful to maintain that distinction when considering the use of electronic catalogues. The popular 'European computer drivers licence' is an example of a course whose outcomes focus on the technical capacity to use ICT. These skills are a necessary prerequisite for the attainment of Information Society Technology Skills, but are not a sufficient set of skills. The other skills component is termed 'information literacy'.

Information Literacy:

In a recent UNESCO report, I provided the following definition of Information Literacy (Catts, & Lau, 2008).

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.*

It is possible to be information literate in a society or culture that has no ICT, such as was the case in Europe up to the 20th Century and is still the case in some remote indigenous communities, where an intimate knowledge of land, and of traditions has been essential to survival and continuity over tens of thousands of years.

While the definition of information literacy provided above does not specify an ICT context, this is implicit in terms of its application to 21st Century Europe. It there becomes synonymous with the concept of Information Society Technology skills.

Information Society Technology (IST) skills:

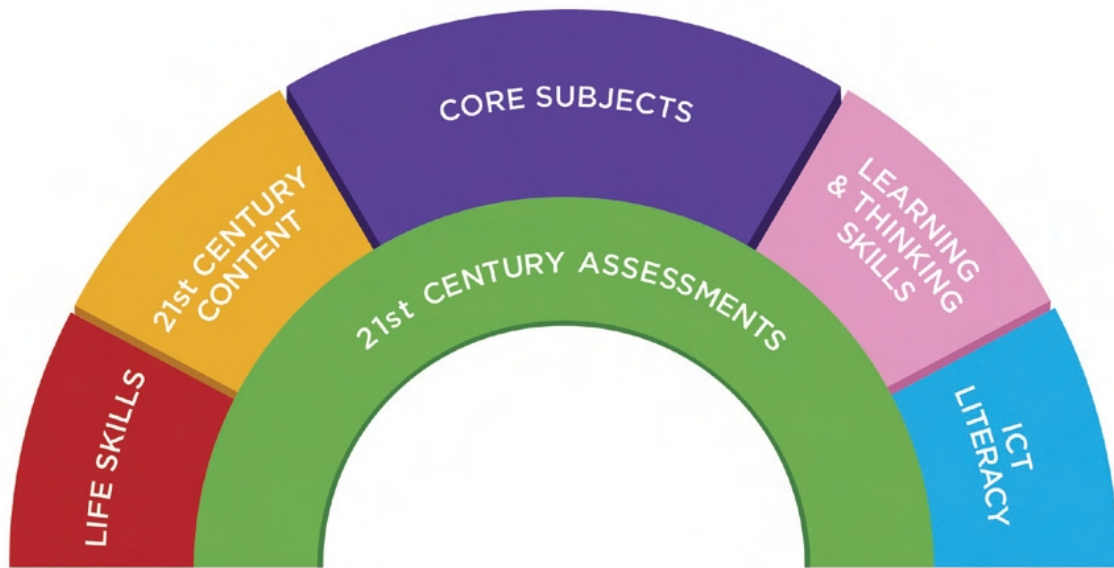
It is hard to find a precise definition of IST skills from either the many volumes written on this topic arising from the Lisbon Strategy or by UNESCO and OECD, which is a surprise given that both these agencies address the requirements for national success in the global Information Society. The core distinction between IST and ICT skills is that the former incorporates the processes required to use information in productive activities. IST skills therefore incorporate both the definition of Information Literacy and ICT skills. Perhaps the ambiguity in policy terminology reflects the different priorities placed on IST skills development in various countries. Some seem to have an exclusive preoccupation with acquisition of hardware and relevant software, whereas others place more emphasis on the development of skill in use of the available resources.

As you can see from the Statistics Canada definition, the precise meaning of the phrase *Information and Communication Technology* refers to the technical capacity to use equipment. However, often people who refer to ICT skills include or imply at least aspects of the wider concept of IST skills. The distinction between ICT and IST skills has been evident in many recent national initiatives. For example, in the USA the ‘No child left behind’ legislation led to the formation of the 21st Century skills organisation, a coalition between business, social enterprises and government. They formulated a model for 21st Century skills which specified ICT skills as a component of what are termed the key skills. The model they adopted is illustrated in Figure 1. The US National Forum for Information Literacy influenced thinking about what was meant by ICT skills, and as a result the definition adopted was situated in the broader context of using information.

‘Information and communications technology (ICT) literacy is the ability to use technology to develop 21st century content knowledge and skills, in the context of learning core subjects. Students must be able to use technology to learn content

and skills — so that they know how to learn, think critically, solve problems, use information, communicate, innovate and collaborate.’ P5.

FIGURE 1.
USA 21ST Century Skills Model



Source: <http://www.21stcenturyskills.org/documents/stateleaders071906.pdf>

In Europe, the term 'ICT skills' has often been used to describe information literacy. For instance, in an EU report on progress toward the implementation of the Lisbon strategy, European Commission (2003, 13) the following is found which embraces a far wider construct than that envisaged in the Statistics Canada definition cited above, and by including the word 'create' it recognises the use of information to create new knowledge:

ICT skills comprise the use of multi-media technology to retrieve, store, create, present, sort and exchange information.

However in many policy statements there is a possible ambiguity in the use of the term ICT. For example, in the Czech Republic strategy for Lifelong Learning concludes that in terms of 'the ability to use the internet for communication, for searching and processing information, the level of skills of Czechs is about a third lower than EU 25 nations' (Czech Republic, 2007). As with many policy statements it is not entirely clear whether in this statement the focus is on the narrower notion of receiving and transmitting information or the wider notion of transforming information.

The Czech report is concerned with the level of ICT skills and notes the relationship between ICT capacities and age. In common with many studies it finds a negative correlation between age and level of ICT skills. This of course poses challenges for all developed economies where the primary untapped sources of labour are older workers, and migrants from less developed, and hence ICT literate countries. A similar result has been reported in Britain.

Use of the internet according to age (in %) – 1st Quarter, 2005

Age Group	16 – 24	25 - 34	35 -44	45 -54	55 - 64	65 -74
CZ	64	41	41	29	15	2
EU 25	80	67	60	47	32	12
EU 15	82	71	64	52	36	14
Best 97	97 (SE, NL)	95 (SE, FI)	93 (SE)	85 (SE)	74 (SE)	34 (NL)

Source: EUROSTAT, Community Survey on ICT Usage in Enterprises, in households and by individuals. Luxembourg, EUROSTAT 2005. Note: Data for the 1st quarter of 2005

The Importance of information transformation

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.

Figure 2

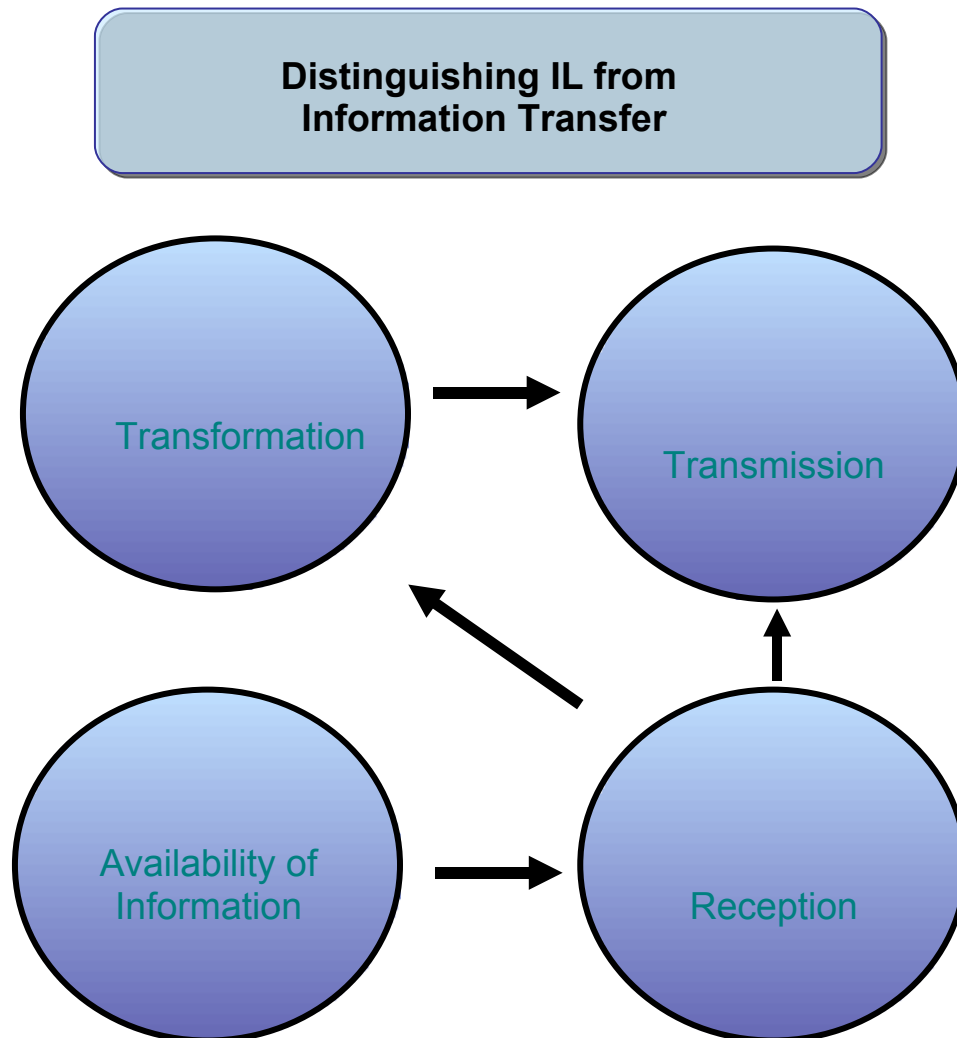


Figure 2 is taken from the recent report published by UNESCO on Indicators of Information Literacy (Catts, and Lau, 2008). This figure captures the distinction to be made between passive reception of information and active use of information. This is the essential distinction between the notion of ICT skills and IST skills.

European, OECD and UNESCO policies on the Information (or Knowledge) Society.

The European approach is outlined in the Lisbon Strategy, which was first adopted in 2000 and renewed in 2005 after member states concluded that progress had been limited, and that Europe was falling behind the USA (European Commission, 2006, 6).

'The EU has not been able to exploit ICTs for productive purposes –, both as a user and as a producer – to the full extent. The EU invests less in ICTs, the ICT sector is less efficient, and the performance has been disappointing in ICT-using sectors.'

In the policy re-launch the link between employment growth and ICT is unambiguous, as is illustrated in the following extract (European Commission, 2007a, 3)

The re-launched Lisbon strategy provides a comprehensive framework for reform efforts to raise growth and jobs potential, encompassing measures which promote macroeconomic stability, increase labour utilisation and enhance labour productivity: The Lisbon strategy places considerable emphasis innovation and promoting a knowledge-based economy,

Although some European voices have called for the focus to be on IST skills, this does not seem to have been recognised by the drivers of the economic focus of the Lisbon Strategy.

At the OECD, the distinction between what they term knowledge transmission and knowledge transformation is identified as of crucial importance in achieving what they term the 'knowledge economy'.

As has been indicated above, UNESCO has in its Information for All Programme (IFAP) made a clear commitment to IST skills and this has informed its considerable efforts across its 193 member states.

Some issues for practice in Higher Education

There are many issues that arise in relation to information software. Those that are most commonly used in higher education are the tools for access, storage and retrieval of information from databases. We also use software to help address plagiarism, an issue that attracts much debate. It is important to note that neither are new phenomena caused by the arrival of the digital age.

Plagiarism is an issue reflects cultural norms and values that can and have changed over time. An example of how attitudes to copying others work have changed is close to

Czech hearts. Jan Hus (1369 to 1415) is renowned for his treatise, *De Ecclesia*, which subsequently furnished most of the material for the charges brought against him at the Council of Constance, and was formerly considered the most important of his works. Herben (1926) and Avis (1996), among others, claim that *De Ecclesia* is mainly a translation from English into Czech of Wyclif's work of the same name, with certain elements deleted with which Hus presumably disagreed. I wonder however if it is fair to call this plagiarism, when it is said that the tinder to light the fire by which Hus was burnt to death was a copy of one of Wyclif's books, and the same Council that ordered the death of Hus, also ordered Wyclif's bones dug up and burnt and scattered. Clearly others were aware of his source. Hus provided Czech nobles access to pre-reformation ideas that supported their desire for independence from Rome and hence, in terms of figure 2, he transmitted information.

My colleague and University choir master, Prof. David King has pointed out another example from French Literature. In his notes for a concert held in Dunblane Cathedral on May 10 2008 he records:

The Cantique de Jean Racine is a setting of words taken from Hymnes Traduites du Bréviare Romain by the French tragedian Jean Racine (1639-99). These words are actually a paraphrase by Racine of a hymn Consors Paterni Luminis (O Light of Light) that has been attributed to St Ambrose (340-397).

I have included a line by line comparison of the original and Racine's version in the appendix for those interested in this case. I will return to this example when I discuss some implications for information providers.

These examples raise important issues about communicating information including the value of transmission, the importance of translating or paraphrasing for different audiences, and the distinction between these tasks and the use of information to create new knowledge.

Another dimension of the misuse of academic data bases is the way people scan for literature. In 2007 I submitted an article for refereed publication and included, after a thorough literature search, that there was little previous research into the research issue on which the study provided evidence. One of the reviewers wrote back in a scathing manner that 'had the author bothered to check standard data bases the following 15 relevant references would have been located. This comment could have had the article dismissed from further consideration because the originality of the research was an important justification for its consideration.

I spent two days valuable time locating and carefully reviewing all 15 citations suggested by the referee and was then able to add a phrase to my paper which said that many authors have called for research to be undertaken in this field, and cited all the references listed by the reviewer. It seems likely that the reviewer had done a quick key word search and had located articles with titles that addressed the topic and assumed without further

investigation that they were reporting research, whereas in fact each was an article reflecting on the research issue and calling for research.

In many professions, commercial data bases are relied upon for information. For instance, medical practitioners have access to information to aid diagnosis, locate equipment, and select pharmaceutical products. Lawyers increasingly access case law and sentencing information on-line. In the automotive industry, parts suppliers normally look up data bases to locate parts and even to source supply.

In all these applications, software can provide for efficient searching for information. This efficiency in access to information is fundamental to productivity in all aspects of enterprise and is why the Lisbon strategy has a focus on IST skills. However, the effectiveness of the process is dependent upon both the quality of the access to information, and the skills of users to make effective use of the available resources. This raises implications for providers, librarians and users.

Some implications for Librarians

The implications of the need for IST skills for librarians are considerable, both in terms of decisions about access to data bases, and also in terms of reader education. Too often librarians focus on ICT skills rather than embedding IST skills within the practice of their clients, despite research that shows that only embedding IST skills within the professional content of the learners will lead to effective information literacy practices in their professional contexts.

Some Implications for industry and society.

There should be now doubt that industry and society rely upon the capacity of people to transform information to create new knowledge for the benefit of society as a whole, and especially for the benefit of industry in gaining a competitive edge. Many industries have embraced the concept of the 'knowledge economy' and in particular the role of the 'learning organisation' in achieving an adaptable and hence competitive workforce.

Some implications for Information Providers

The challenge for the providers of the software on which we depend is considerable. You compete in a market place that is price sensitive and ever more demanding in terms of technical capacities. Not only is your software expected to meet demanding and changing technical standards, but also you have to ensure it is intuitively sound, because most people expect to be able to make sense of the process without recourse to technical manuals. Casual users will often forget not only simple processes, but also are bound to forget passwords or unique procedures. You are of course not alone in facing this challenge. Have you ever got into a rental car and turned the wipers on when trying to indicate a turn. This is an example of not taking time to become familiar with the settings or controls for the model you are using. Fortunately such variations do not cause a crash on the road as often as incompatible software causes computer crashes.

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There are many issues that arise in relation to information software. The packages that are most commonly used are the tools for access to, and the storage of, information from databases. In all our software applications, the task of seeking information is squeezed between other tasks including administration, teaching, research activities and grant applications. This is in part why so much responsibility rests with the software provider.

A particular responsibility for software providers rests with marketing claims. I have selected one example that is peculiar to higher education to illustrate the challenges for both the software providers and users. In making use of this example I first want to emphasize that the software in question is an excellent product if used for the purpose for which it was designed, which was to detect copying.

Plagiarism by students is a topic of much interest and software has been developed to help address plagiarism. The software widely adopted is called 'Turnitin'. The website for this software makes the following claims:

- 'Turnitin's comprehensive plagiarism prevention system lets you quickly and effectively check all of your students' work in a fraction of the time necessary to scan a few suspect papers using a search engine.'
- 'Turnitin's plagiarism prevention is often so successful that institutions using our system on a large scale see measurable rates of plagiarism drop to almost zero.'

Source: <http://turnitin.com/static/plagiarism.html>

The bold in this quote is in the original from the Turnitin web site, while the underlined words are my added emphasis. The reason for underlining the term ‘plagiarism’ is to bring out a distinction between what the software does very effectively and efficiently, and what at least some of my colleagues expect the software to provide.

If we turn to the dictionary for a definition of ‘plagiarism’ this is what we find:

- ***transitive verb***: to steal and pass off (the ideas or words of another) as one's own: use (another's production) without crediting the source.
- ***intransitive verb*** : to commit literary theft : present as new and original an idea or product derived from an existing source

Source: Merriam- Webster Dictionary Online:

Again I have added an underline to the word ‘idea(s)’ to help you to appreciate the distinction between what the software does and what some academics expect that the claims made by the software providers mean. The software will detect when one uses the words of another. It will do this faster and more reliably than anyone could do by hand, provides easy to interpret pie charts, and reports ‘significant plagiarism’ or ‘no plagiarism’. Herein is the problem – because the report actually distinguishes between significant copying word for word and no copying. Consequently, the claim made by Turnitin that ‘**rates of plagiarism drop to almost zero**’, which they put in bold on their web page is misleading. Students soon learn that if one paraphrases, then the Turnitin software will not detect the plagiarism.

When this is pointed out, some defenders of the process argue that if the student can paraphrase successfully then they have understood the information and hence should not be failed. The question then becomes one of what the purpose is of higher education. Is the goal to understand information, or is it to interpret and use information to create new knowledge. We need only to turn to the taxonomy of knowledge (Bloom, 1956) to appreciate the distinction. The lowest level of knowledge, presented in *italics* in Table I, is the ‘knowledge level’ and this is what we find when a student turns in the words of others as their own. They know that the material applies to the assignment, but that is all that is evidenced. Those who seek to justify paraphrasing as knowledge are satisfied with the second level of the Taxonomy presented in Table 1, and consider that comprehension is sufficient. Most of us however, expect application, analysis, synthesis and evaluation as necessary for academic attainment, together with professional values and, as appropriate, motor skills necessary for professional practice. These capacities are essentially the cognitive skills required for Information Society technology skills.

Unfortunately, some academics fear that should a student appeal, the lawyers who might hear the matter may not differentiate between levels of the Taxonomy, and in any case there is no reward to the academic and a considerable cost in raising issues of plagiarism. So, while the claims of the software providers are not the entire problem, they contribute to a climate in which plagiarism through paraphrasing is a blossoming industry.

TABLE 1.**Summary of Bloom's Taxonomy of Cognitive Knowledge**

Levels of Cognitive Knowledge	Meaning	Example
<i>Knowledge</i>	<i>Rote learning and recall of terms or procedures</i>	<i>Learns a multiplication table; recites a poem.</i>
Comprehension	Understands meaning and states in own terms	Paraphrases a definition
Application	Uses information to provide an outcome	Calculates a result using a formula; Prepares a set of minutes
Analysis	Classifies and prioritises information	Stores information and assigns priority based on quality of source.
Synthesis	Combines information to create a summary or conclusion	Uses information sources to create a report
Evaluation	Make informed judgements	Reviews a report to determine whether it is fit for purpose.

The 17th Century example of paraphrasing by Racine example provides an interesting 21st Century ICT challenge. This is not something that the 'Turnitin' software, is designed to detect, because it matches text to detect direct copying. The task of detecting paraphrasing is complicated further because the original hymn was in Latin, and Racine wrote in French. However, I am aware that some academics responsible for deciding cases of plagiarism rely on Turnitin to decide cases where its use is no more appropriate. It is quicker for the senior academic to have someone else run the software, rather than make the time to make an informed judgement. This illustrates an example where the technology has dominated over sound academic judgement. On this basis, Racine would also be posthumously exonerated!

Some implications for school teachers and their training.

In the Lisbon Strategy, the ICT dimension is narrowly focused on uptake of ICT and the role for schools and libraries seems rather narrowly defined (European Commission, 2007b 6) as: '*Promoting digital literacy through the reform of school curricula, training, on-line libraries and knowledge resources.*'

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). The IL practices of teachers in relation to the use of research to inform their pedagogic practices have also been

described (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.

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 the development of IL skills, a focus on teachers, and especially elementary school teachers is important, since elementary education 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.

Therefore, the development of IST skills for beginning elementary school teachers could make a contribution to the improvement of teaching practice for all countries, and hence for the capacity of countries to participate in the 'knowledge economy'. I am sure that the solutions to this challenge will include the information software providers.

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APPENDIX:

A Comparison of the words of the Cantique from Jean Racine's *Hymnes Traduites du Bréviare Romain*, and the 4th Century Hymn which it is said has been paraphrased. Original and *Racine's alleged paraphrase* – passage by Passage.

Word equal to the Most High, our unique hope, eternal day of the earth and of the heavens, we break the silence of the peaceful night;

O light of light, O Dayspring bright, coequal in Thy Father's light: assist us, as with prayer and psalm Thy servants break the nightly calm.

Divine Saviour, cast your eyes upon us; spread out over us the fire of your mighty grace so that hell itself flees at the sound of your voice.

All darkness from our minds dispel, and turn to flight the hosts of Hell:

Dispel the slumber of a pining soul which drives it to forget your laws!

bid sleepfulness our eyelids fly, lest overwhelmed in sloth we lie

O Christ, show favour to these faithful people now assembled to praise you;

Jesu, Thy pardon, kind and free, bestow on us who trust in Thee

receive these songs that they offer to your immortal glory, and these full offerings returned to you.

and us Thy praises we declare, O with acceptance hear our prayer.