Impact of Recent Trends in Information and Communication Technology on the Validity of the Construct Information Literacy in Higher Education

Bilgi ve İletişim Teknolojilerindeki Son Gelişmelerin Yükseköğretimdeki Bilgi Okur Yazarlığı Yapısının Geçerliliği Üzerine Etkisi

A.A.J. (Jos) van Helvoort

The Hague University of Applied Sciences, Academy of ICT&Media, Post Box 13336, 2501 EH The Hague, The Netherlands. a.a.j.vanhelvoort@hhs.nl

Abstract: *The objective of this paper is a reflective discussion on the validity of the construct Information Literacy in the perspective of changing information and communication technologies.*
The research question that will be answered is: what is the impact of technological developments on the relevance of the Information Literacy concept? Technological developments that will be discussed are:
- *content integration (federated search engines)*
- *amateur publishing (user generated content)*
- *use of social networks to find information*
- *personalisation and push technology*
- *loss of context / fragmentation of information.*

Research methods: desk research and critical analysis of the results that were found. The analysis of the influence of the discussed technologies on the Information Literacy concept is represented by arrow diagrams.
Findings: The Information Literacy concept refers to a set of sub skills varying from retrieval skills to critical use of scholarly information. Changing technologies reduce the significance of the more instrumental sub skills of the Information Literacy concept. On the other hand, higher order cognitive skills (for instance critical evaluation of resources and analysis of content) become more and more important for students and professionals who try to solve their information problems.
The paper concludes with a description of the facets of the Information Literacy concept that need extra attention in the education of the knowledge workers of the future.
Keywords: *Information technology, communication technology, information literacy, higher education*

Öz: *Bu bildirinin amacı değişen bilgi ve iletişim teknolojileri perspektifinden Bilgi Okur Yazarlığı yapısının geçerliliğini tartışmaktır. Yanıt aranacak araştırma sorusu şudur: Teknolojik gelişmelerin Bilgi Okur Yazarlığı kavramının ilgililiği üzerindeki etkisi nedir? Tartışılacak teknolojik gelişmeler şunlardır:*
- *içerik bütünleştirme (federe arama motorları)*
- *amatör yayıncılık (kullanıcı tarafından yaratılan içerik)*
- *bilgi bulmak için sosyal ağların kullanımı*
- *kişiselleştirme ve itme teknolojisi*
- *bağlamın kaybolması / bilginin parçalanması*

Araştırma yöntemleri: Masa başı araştırma ve bulunan sonuçların kritik analizi. Tartışılan teknolojilerin Bilgi Okur Yazarlığı üzerine etkisinin analizi ok diyagramlarla gösterilmektedir.
Bulgular: Bilgi Okur Yazarlığı kavramı erişim becerilerinden bilimsel bilginin eleştirel kullanımına kadar değişen bir dizi alt beceri anlamına gelmektedir. Değişen teknolojiler Bilgi Okur Yazarlığı kavramının daha araçsal alt becerilerinin önemini azaltmaktadır. Öte yandan üst düzey bilişsel beceriler (örneğin kaynakların eleştirel değerlendirmesi ve içeriğin analizi) bilgi sorunlarını çözmeye çalışan öğrenciler ve profesyoneller için giderek daha önemli hale gelmektedir.
Bu bildiri geleceğin bilgi çalışanlarının eğitiminde fazladan dikkat gösterilmesi gereken Bilgi Okur Yazarlığı kavramının farklı yüzlerinin tanımlanmasıyla sona ermektedir.
Anahtar sözcükler: *Bilgi teknolojisi, iletişim teknolojisi, bilgi okur yazarlığı, yüksek öğretim*

Background and Purpose of the Paper

The title of this contribution suggests a problem with the appropriateness of the paradigm Information Literacy (IL), due to developments in information and communication technology. The assumption is that the importance of information literacy education is not recognised by many of our colleagues, who teach in faculties and disciplines different from the Information Studies Departments. Information Literacy as an important learning goal is mainly defended by librarians and by some educational researchers but is certainly not accepted by all higher education teachers and their students. In a paper in the *Journal of eLiteracy* 2005 Peter Godwin gives a couple of reasons for this "academic apathy and disinterest" in Information Literacy:

- The confusion between information literacy and internet skills: academics see that most of their students are very skilful in internet searching and for that reason they conclude that the students are competent information problem solvers. This belief that good internet skills result in good information problem solving skills is very ingrained and hard to change.
- Some academics are very good information finders, using their peers in their social networks and recommendations they receive from alerting services and the scholarly journals they read. These information sources combined with the use of easy to handle general search engines are "good enough" for them. They do not realise the complexity of information selection for novices in their discipline.
- Academics are often more interested in teaching their subjects than in training general skills. They defend attention for their discipline based issues in the curricula and do not want them to become overwhelmed by more general items such as writing skills and information searching.
- Finally, some academics are frustrated by the pace of change of the information and technology tools and the lack of standardisation (different interfaces, passwords etc). "Why can't it be as simple as the Google search box?" they ask themselves.

From the Information Studies viewpoint, I do not wish to accept all the objections of these academic colleagues. In this contribution I want to share with you my arguments as to why Information Literacy is still (and in my opinion particularly these days) an appropriate learning goal for Higher Education. This will be done by reviewing some developments in Information and Communication Technology (more specifically trends that are well known as "Web 2.0") and by answering the main research question: what is the impact of those technological developments on the relevance of the Information Literacy concept? First of all, however, we will elaborate on the content of the construct Information Literacy.

Existing Conceptions of Information Literacy

Information Literacy has been discussed for more than thirty years in international Information Science literature. Most authors on Information Literacy agree that the concept refers to a person's broad ability to use information from external resources, including a set of sub skills such as the abilities to:
- recognise an information need
- formulate a search question
- choose relevant information sources
- use ICT to consult information sources
- select, evaluate and organise the information that is found
- (re)use and disseminate the information (Boekhorst, 2000, p. 103; Webber & Johnston, 2000, p. 382).

Although most of the authors do not really differ in their definitions for the Information Literacy concept, phenomenographic research[a] makes clear that in the context of education at least two different conceptions of the phenomenon can be distinguished:

- Information Literacy as a set of skills to solve specific information problems. In this conception Information Literacy is school task oriented and helps students to complete the assignments that they receive from their teachers. This conception of Information Literacy is called by Bruce the "information process conception" (1997;1998) but her "information technology conception" and "information sources conception" are included in the educational models for this school task oriented conception of Information Literacy. Berkowitz & Eisenberg's Big6-model (Berkowitz & Eisenberg, 1990) is a well known example of the task oriented conception of Information Literacy.

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[a] Phenomenography is a qualitative research method that is aimed at "description, analysis, and understanding of experiences" (Marton, 1981, p. 180). Phenomenographic research of Information Literacy is introduced by Christine Bruce.

- Information Literacy as a personal knowledge base. In this conception Information Literacy is no longer associated with a specific task but is experienced as an individual's ability to gather information and to organise it in a personal mindset for use at an appropriate time (Maybee, 2006, p. 83). In the personal knowledge base conception of Information Literacy the sub skills are used by a person in a strategic way to prepare him/herself for information use in the long term. It includes the construction of mental models ("know what"), cognitive strategies ("know how"), cognitive tasks ("know when") and self knowledge.

The six sub skills listed above play a role in both conceptions of Information Literacy.

Current Relevance of the Information Literacy Concept

Although the concept of Information Literacy in itself is not related to the digital manifestation of information, there is no doubt that the attention given to IL in the eighties of the last century was a result of the growing use of computers, computer networks and the availability of new media to store and to retrieve large amounts of information. It is of course not coincidental that the most authoritative publications such as the ACRL standards and Christine Bruce's book '*The Seven Faces of Information Literacy*' were published in the years that the Internet developed into the World Wide Web, which created easy access to digital information for all citizens of the developed world.

However, because ICT has not stood still since the year 2000, it might be that technological developments have made the Information Literacy concept less appropriate for higher education these days or, on the contrary, even more important than ever before. This observation was the motivation to start the research that is described in this contribution.

Research Methods

Literature on technological developments in Library and Information Science was retrieved and collected by monitoring the main Dutch library bloggers for more than five years. The Netherlands has an active community of "bibliobloggers" that daily refers to books, articles, reports etc. from all over the world. These references to international LIS literature were managed with the Refworks research management tool and were analysed to find the main trends. In the appendix you can find a selective bibliography with the titles on recent developments in information and communication technology that were used to write the overview in the next section of this paper.

Overview of Developments in Information and Communication Technology and their Impact on the Information Literacy Concept

Easy Access to a Variety of Bibliographic Tools and to Full Text Documents

For many years library and information professionals have adopted the idea of the 'invisible' or the 'deep' web (Bergman, 2001). The statement was that the most trustworthy information was in databases that cannot be indexed by the general search engines. That was the reason why Information Literacy training often included the use of a lot of different bibliographic databases and a variety of user interfaces. Moreover, the information users had to learn how to find the full text documents of the titles they retrieved from abstract services like ERIC, LISA or MEDLINE. Not surprisingly, for the average information users it was not clear why the retrieval systems offered by the library were not as easy to use as the popular search engines Google and Yahoo. This was more than true from the moment that general search engines made it possible to present the results from dynamic web pages and the records of bibliographic databases (see also Devine & Egger-Sider, 2009, p. X) and the launch of general search engines like Google Scholar and Scirus for the retrieval of academic information.

For that reason information service providers such as libraries and information centres have invested a lot of time and money in the development of easy to use Meta Search or Federated Search Engines, combined with Open URL services that link to the full text documents available in the digital library collection of the institution ("link resolvers"). A good example of this kind of integrated search is the Summon search engine that provides search facilities similar to Google but with well indexed academic content (see for instance the website of the University of Liverpool Library).

As expressed in Figure 1, the availability of such easy to use integrated search facilities makes the knowledge of resources and the availability of ICT skills less significant for the average information users. In general, integrated search engines do not provide the more advanced search facilities that are provided by the individual bibliographic databases but for most of the amateur searchers their results are "good enough" (Godwin, 2006; Morville, 2005, p. 55). This is at least true for solving information problems in the context of specific research or study tasks. For

Information Literacy interpreted as a skill to be kept informed of current developments in a discipline, knowledge of specific resources and the use of more advanced retrieval tools such as RSS aggregators continue to be important. Knowledge of specific resources can also be useful to evaluate the quality of the documents found on the results page. An article on the history of cancer research, for instance, is considered to be more reliable if Google has retrieved an abstract of the article from the PUBMED database.
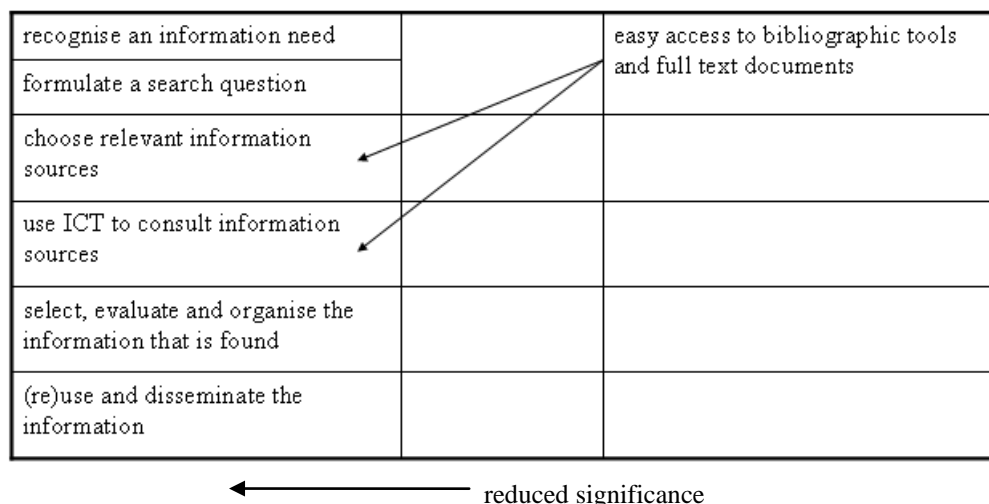
recognise an information need		easy access to bibliographic tools and full text documents
formulate a search question		
choose relevant information sources		
use ICT to consult information sources		
select, evaluate and organise the information that is found		
(re)use and disseminate the information		

reduced significance

Figure 1. Impact of easy access to bibliographic tools and full text documents on the Information Literacy sub skills

Easy to Use Publishing Tools

The World Wide Web has developed into a platform upon which the publication model that has been used for many years has changed dramatically. The classical information chain with an author, a publisher, a mediator, such as a library, and the reader as a consumer, is no longer everyday practice. Content creators can put their articles, stories, pictures, podcasts and audiovisuals directly on the internet. They can even use publication channels like Blogger and YouTube at no cost. Criticasters such as Andrew Keen fulminate against this practice as a threat to the creative industry (Keen, 2007). However, from the Information Literacy point of view, the rise of these possibilities for amateur publishing has significance for two other reasons.

On the one hand it increases the importance of the ability to evaluate critically the information resources on reliability, completeness and accuracy. The fact that information is found on the internet does not of course mean that it is worthless. Not only amateurs but also professional researchers and journalists use internet publication channels such as bulletin boards, weblogs, wiki's and forums to publish their preliminary research results or drafts of their papers and articles. All these publication types have their rules, formats and structures (Morville, 2005, p. 47). For internet users it becomes important to develop their ability to recognise these genres and to use them to filter the more trustworthy information from the more doubtful. On the internet the qualifying role of publishers and journal editors is, indeed, often missed which means that selecting and evaluating the information that is found is harder than in the classical publishing situation.

On the other hand, the ease of online publishing creates a magnificent playground for students to train their research, debating and writing skills on a more informal platform, where they can nevertheless receive comments from their peers and their professors. It is, in other words, a great platform for their first steps in the academic publishing world (Johnson, Levine & Smith, 2009, p. 20). Information Literacy should not be restricted to information retrieval but should also include the critical use of information in the students' own knowledge products. The use of publishing channels on the internet should be promoted for educational reasons but it also increases the significance of the students' skills in writing and publishing their products, which include their abilities to understand and to avoid plagiarism and to respect the intellectual properties of other content creators. It seems that handling these issues is rather simple but in practice students struggle a lot with them, just as with the avoidance of situations which can harm their privacy (Windham, 2006).

recognise an information need		
formulate a search question		
choose relevant information sources		easy to use publishing tools
use ICT to consult information sources		
select, evaluate and organise the information that is found		
(re)use and disseminate the information		

◄ – – – – – – – – · increased significance

Figure 2. Impact of easy to use publishing tools on the Information Literacy sub skills

Network Functions of the World Wide Web

Professional information seeking behaviour is not restricted to direct keyword searching but implies the reflection on relevant search results and further retrieval on footnotes, citations, supplied subject headings and key authors. The modern retrieval tools on the World Wide Web facilitate these berrypicking techniques (Bates, 1989) by presenting those elements as clickable hyperlinks. Starting from one article in a retrieval system, the information searcher can, for instance, jump to the main subject heading in the description and retrieve with one click all other articles with the same subject heading. Another example of a retrieval tool that uses the networked character of the World Wide Web is the 'Cited by' button of Google Scholar.

These examples are from the field of scholarly publishing but they have their counterparts in the more popular places on the World Wide Web such as the social bookmarking site Delicious and the recommendations in online shops like Amazon. Hopping from one point on the World Wide Web to another is what Carroll (1999) called a "meandering search strategy". It reduces the importance of a good search question formulation but makes the searcher's evaluation skills a much more critical factor, since this strategy (if it is based on user generated content) depends on the expertise of the people that have tagged the websites or have written the recommendations.

Another example of the networked character of the new World Wide Web is the social function. In the first decade of our new century the World Wide Web has developed from a place to find information to a platform primarily used for communication and social activities. Young people spend a lot of time on instant messaging platforms such as Windows Live Messenger (formerly MSN) and social networking sites like MySpace and Facebook. Just like professional researchers who consult their peer network for recommendations to solve their information problems, there are a lot of students who use their social network on the internet to get their information for completing a study task. As the most popular Dutch Library Blogger has recently expressed: "the new way of searching is asking questions" (Mijnsbergen, 2009).

However, just as in the real world also on the internet one friend is not the same as the other, and the quality of the answers depends a lot on the expertise of the person that gives them. Also from this point of view, there is no doubt that the use of networks on the World Wide Web for information problem solving makes the role of evaluation skills increasingly important.
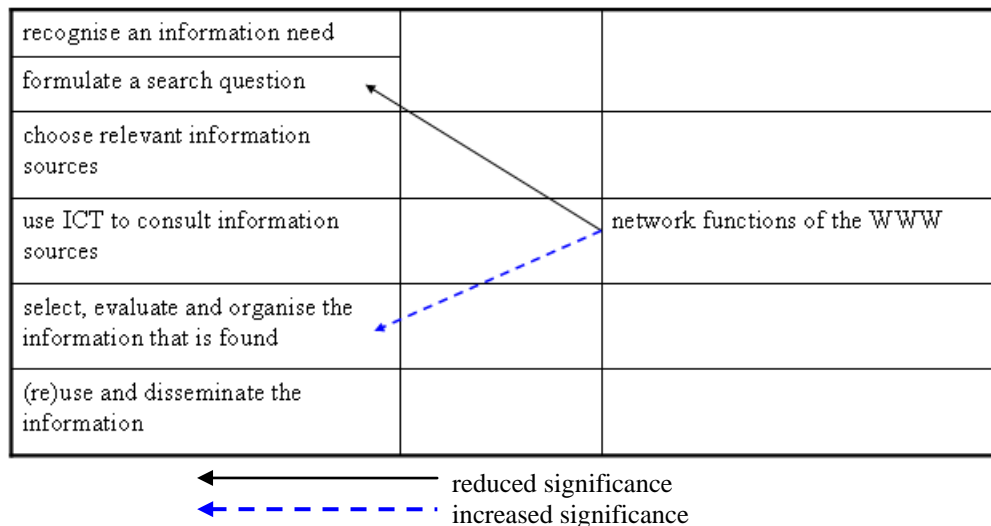
recognise an information need		
formulate a search question		
choose relevant information sources		
use ICT to consult information sources		network functions of the WWW
select, evaluate and organise the information that is found		
(re)use and disseminate the information		

←————————— reduced significance

←– – – – – – – increased significance

Figure 3. Impact of the use of network functions of the WWW on the Information Literacy
sub skills

Personalisation of the Information Dissemination

Professional information users not only search actively for information for solving a specific problem but also monitor resources to keep in touch with the newest publications and information on the World Wide Web. This more passive way of information seeking nowadays is strongly supported by push technologies that use personal profiles of the subscribers for a service. An interesting example of this current technology is customised traffic information based on the location of your smart phone with a GPS signal (Global Positioning System).

In the academic and professional world these kinds of personal alerting services were introduced in the 1960's (we know them as 'Selective Dissemination of Information' or 'Current Awareness Services') but the use was restricted to a small number of early adopters. Nowadays the push technology is used by a lot of people for subscription to electronic newsletters and discussion lists but professional information users also use it to be notified of new content in a database or on a website that matches a personalised query or 'profile'. The alerting is mostly done by sending an email and sometimes by text messaging (SMS). However, after some time a lot of people experience it as information overload or as spam. Also irritating are the difficulties to unsubscribe to the alert following an automatic subscription that is used by a commercial website.

An alternative to email alerting is the use of Web feeds (RSS, Atom). They have the advantage of being less influenced by spam and almost all dynamic websites provide such a feed, which is certainly not true for email alerts. Nevertheless, the use of Web feeds is hardly accepted by the general public; this may be due to the fact that you often need a separate feed reader. A Research Information Network study from the United Kingdom reports that the non use of RSS is even true for academic researchers (2006, p. 8).

Just like the use of social networks for finding information, the use of alerting services results in query formulation's becoming less important. However, alerting services also require extra skills and knowledge:

- ICT skills for installing and management of the right software or online tools (specifically for web feeds), and for subscribing and unsubscribing
- knowledge of relevant information sources that provide email alerts or web feeds and the skills to estimate the relevance, reliability and completeness of these sources
- the skill to recognise the information need while scanning the subjects or the headings of new messages. The reason why this can be problematic is discussed in the next sub section of this paper.

Another facet of personalisation in information research is the fact that search engines produce more 'customised result lists', based on the IP address of the computer that is used and the recent search history on that computer (Garb, 2008). For mobile devices with GPS the location coordinates of the machine are of course used by the search engines to present location based personalisation of the search results (Arias, Cantera, & Vegas, 2008). A rather new phenomenon is personalisation, with content from your social networks ("social search", see for instance Carmel et al. 2009). These examples make clear that it is really useful to have more than average knowledge of how search engines work and to have some skills to correct your search engine if that customisation is not desired.
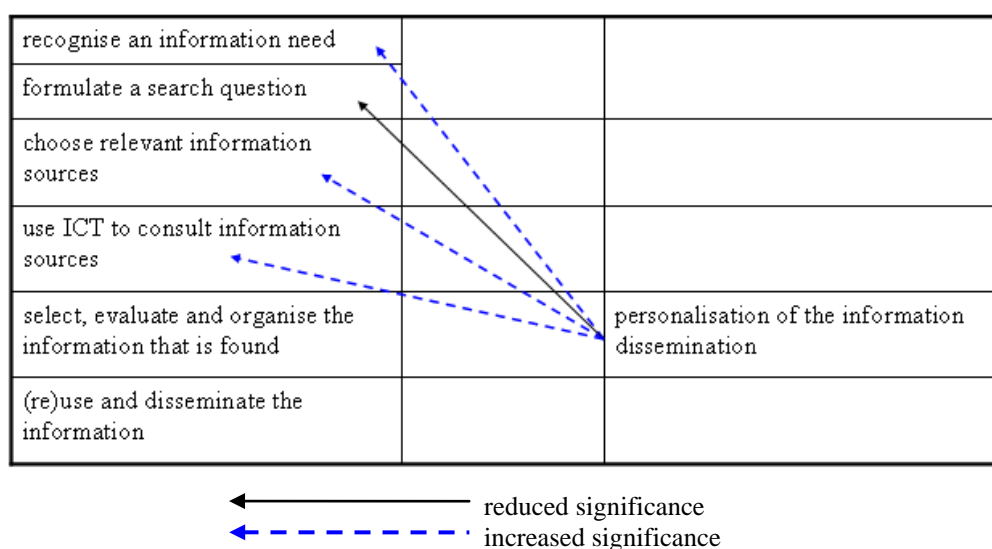
recognise an information need		
formulate a search question		
choose relevant information sources		
use ICT to consult information sources		
select, evaluate and organise the information that is found		personalisation of the information dissemination
(re)use and disseminate the information		

←——————— reduced significance

←- - - - - - - increased significance

Figure 4. Impact of the personalisation of the information dissemination on the Information Literacy sub skills

Fragmentation of Information

Discussing the use of alerting tools (web feeds, email) in the previous sub section of this paper, I observed that it is rather hard to recognise information needs while scanning the subjects or the headings of new messages. If someone follows fifteen weblogs, news sites or journals in an RSS aggregator like Netvibes or Google Reader, then it is quite normal that he or she receives about sixty new articles every day. To handle this daily amount of new information users only scan the headlines of the new items and restrict complete readings to the most meaningful messages. However, decisions about what is meaningful necessitate a lot of experience in evaluating the short headlines that are presented without their contextual information (Tuominen, 2007, p. 8). This fragmentation of information happens not just with alerting services but can also be seen in the presentation of the hit lists of the general search engines, since they only present titles of websites combined with the URL and a very short snippet of the phrase in which the keywords were found. In the section about easy to use publishing tools, it was emphasised that typical web 2.0 channels such as Wiki's and Weblogs demand extra skills from internet users to evaluate reliability, completeness and accuracy. The tendency to disseminate information on the internet separate from its context, underlines the growing importance of this Information Literacy sub skill.

However, the influence of information fragmentation goes even further. It also has the consequence that students and professionals have to piece together the information from a variety of information sources to their own meaningful knowledge framework (Siemens & Tittenberger, 2009, p. 1-2). In other words, the fragmentation of information also leads to an increasing importance of the sub skill to reuse and disseminate the information. David Weinberger refers to the same phenomenon when he claims that "Wikipedia […] expects the reader to be *actively* involved, alert to the signs" (Weinberger, 2007, p. 142).

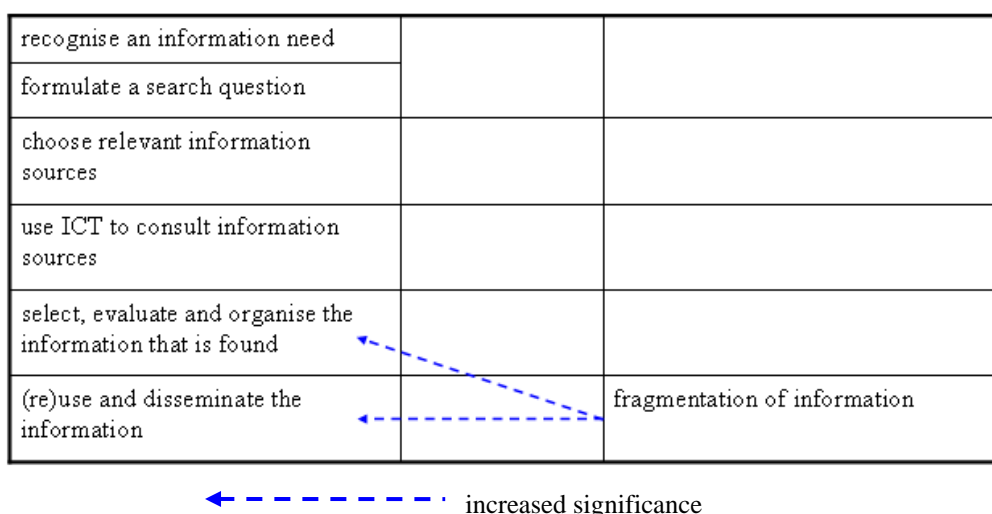|		
recognise an information need		
formulate a search question		
choose relevant information sources		
use ICT to consult information sources		
select, evaluate and organise the information that is found		
(re)use and disseminate the information		fragmentation of information

←- - - - - - - increased significance

Figure 5. Impact of the fragmentation of information on the Information Literacy sub skills

Discussion and Conclusions

Figures 6 and 7 present a visual overview of the findings of this research. They make clear that some developments in information and communication technology reduce the significance of some more instrumental Information Literacy sub skills (Figure 6). This is true, for instance, for the formulation of search questions ("queries") and for the use of ICT.

However, Figure 7 shows that the significance of some other Information Literacy sub skills has increased, not in spite of the use of advanced ICT tools but because of it. This is particularly true for the sub skills to evaluate and to reuse information. The fact that these higher order cognitive skills become more important due to the use of advanced technologies is the main finding after analysis of the literature that was found on recent developments in information and communication technology.
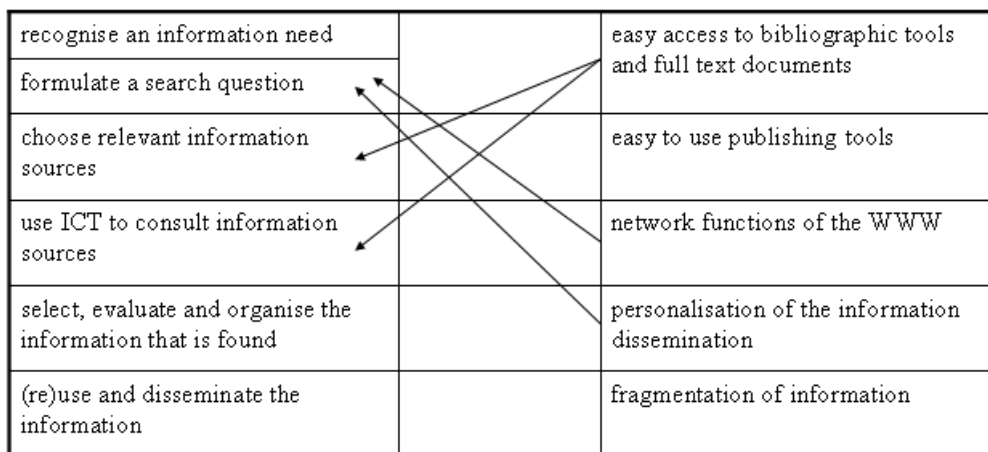
recognise an information need		easy access to bibliographic tools and full text documents
formulate a search question		
choose relevant information sources		easy to use publishing tools
use ICT to consult information sources		network functions of the WWW
select, evaluate and organise the information that is found		personalisation of the information dissemination
(re)use and disseminate the information		fragmentation of information

Figure 6. Reduced significance of Information Literacy sub skills

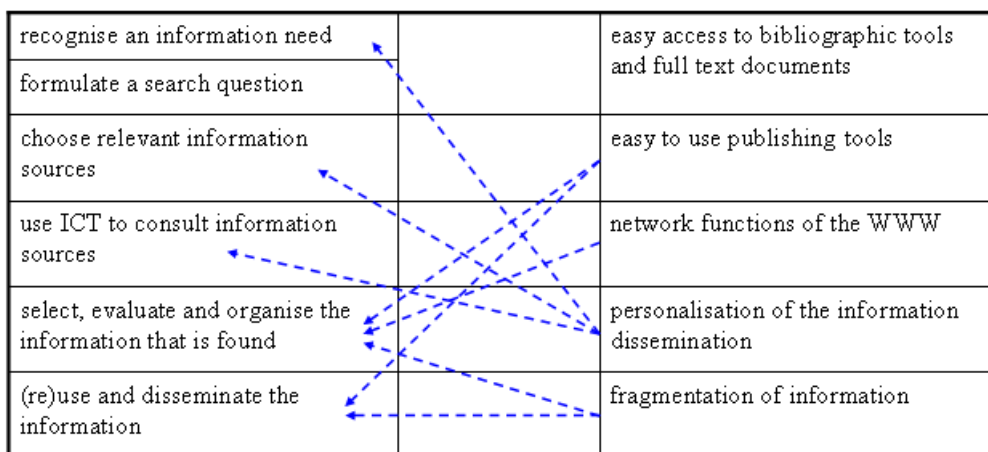| recognise an information need | | easy access to bibliographic tools and full text documents |
formulate a search question		
choose relevant information sources		easy to use publishing tools
use ICT to consult information sources		network functions of the WWW
select, evaluate and organise the information that is found		personalisation of the information dissemination
(re)use and disseminate the information		fragmentation of information

Figure 7. Increased significance of Information Literacy sub skills

In this paper the focus was on the influence of ICT developments on the relevance of the concept Information Literacy. One of the findings is that the formulation of search queries has become less important because of the alternative methods for information seeking that are provided by various retrieval systems and the World Wide Web. This does not mean of course that the formulation of search queries is not important at all. What I wanted to emphasise is that the concept of Information Literacy is constituted by a set of sub skills and that extra attention should be paid to some more cognitive skills that refer to the use of information.

This is in line with a change in higher education to "social constructivist learning" that we also know under names such as problem based learning, resource based learning and discovery learning. All these learning theories underline the importance of the exploration of resources and learning materials by the students themselves to build their own knowledge base (Dochy & McDowell, 1997, p. 283). Information problem solving plays an essential role in this

educational approach and the necessary skills take a lot of effort and experience to master (Brand-Gruwel, Wopereis, & Vermetten, 2005, p. 488). Answering the academic teachers who were paraphrased in the first section of this paper, it can be noticed that they focus too much on the instrumental sub skills of the competence Information Literacy and that they underestimate the complexity of the cognitive processes that also belong to it. However, this also means that Information Literacy programmes and courses should focus less on retrieval details and knowledge of library resources and should focus more on training students in their writing skills and on the use of quality information in their school assignments. I guess that this can only become a success if library staff and teaching staff collaborate to incorporate these facets of the new knowledge work in the discipline based curricula.

References

Arias, M., Cantera, J., & Vegas, J. (2008). Context-based personalization for mobile web search. *VLDB, Auckland (New Zealand), August 24-30, 2008.* Retrieved January 5, 2010, from http://persdb08.stanford.edu/5-PersDB-Paper.pdf.

Bates, M. (1989). The design of browsing and berrypicking techniques for the online search interface. *Online Review, 13*(5), 407-424.

Bergman, M. (2001). The deep web: Surfacing hidden value. *Journal of Electronic Publishing, 7*(1).

Berkowitz, R. & Eisenberg, M. (1990). *Information problem-solving: The big six skills approach to library & information skills instruction*. Norwood, N.J.: Ablex Pub. Corp.

Boekhorst, A. (2000). *Informatievaardig worden in het onderwijs, een informatiewetenschappelijk perspectief: Een vergelijkende gevallenstudie in Nederland en Zuid-Afrika*. Pretoria: University of Pretoria. [In Dutch language].

Brand-Gruwel, S., Wopereis, I., & Vermetten, Y. (2005). Information problem solving by experts and novices: Analysis of a complex cognitive skill. *Computers in Human Behavior, 21*(3), 487-508.

Bruce, C. (1997). *The seven faces of information literacy*. Adelaide: Auslib Press.

Bruce, C. (1998). The phenomenon of information literacy. *Higher Education Research & Development, 17*(1), 25-43.

Carmel, D., Zwerdling, N., Guy, I., Ofek-Koifman, S., Har'el, N., Ronen, I. et al. (2009). Personalized social search based on the user's social network. *Proceeding of the 18th ACM conference on information and knowledge management, Hong Kong (China), November 2-6, 2009.*

Carroll, J. (1999). Expert internet information access. *Journal of Educational Computing Research, 20*(3), 209-222.

Devine, J. & Egger-Sider, F. (2009). *Going beyond Google: The invisible web in learning and teaching*. New York [etc.]: Neal-Schuman Publishers.

Dochy, F. & McDowell, L. (1997). Assessment as a tool for learning. *Studies in Educational Evaluation, 23*(4), 279-298.

Garb, R. (2008). More transparency in customized search results. *The Official Google Blog.* Retrieved July 30, 2008, from http://googleblog.blogspot.com/2008/07/more-transparency-in-customized-search.html.

Godwin, P. (2005). Making life easier for academics: How librarians can help staff weather the technological storm. *Journal of eLiteracy, 2*(2), 68-79.

Godwin, P. (2006). *Information literacy in the age of amateurs: How Google and Web 2.0 affect librarians' support of information literacy*. Retrieved December 28, 2009, from http://www.ics.heacademy.ac.uk/italics/vol5iss4/godwin.pdf.

Johnson, L., Levine, A., & Smith, R. (2009). *The 2009 Horizon Report*. Austin, Texas: The New Media Consortium.

Keen, A. (2007). *The cult of the amateur: How today's internet is killing our culture*. New York, N.Y.: Doubleday.

Marton, F. (1981). Phenomenography—describing conceptions of the world around us. *Instructional Science, 10*(2), 177-200.

Maybee, C. (2006). Undergraduate perceptions of information use: The basis for creating user-centered student information literacy instruction. *Journal of Academic Librarianship, 32*(1), 79-85.

Mijnsbergen, E. (2009). *Het nieuwe zoeken heet vragen*. Retrieved October 25, 2009, from http://www.zbdigitaal.nl/2009/10/het-nieuwe-zoeken-heet-vragen.html. [In Dutch language].

Morville, P. (2005). *Ambient findability*. Sebastopol, Calif.; Farnham: O'Reilly.

Research Information Network. (2006). *Researchers and discovery services: Behaviour, perceptions, needs*. Retrieved December 23, 2009, from http://www.rin.ac.uk/our-work/using-and-accessing-information-resources/researchers-and-discovery-services-behaviour-perc.

Siemens, G. & Tittenberger, P. (2009). *Handbook of emerging technologies for learning*. Manitoba: University of Manitoba. Retrieved December 27, 2009, from http://techcommittee.wikis.msad52.org/file/view/HETL.pdf.

Tuominen, K. (2007). Information literacy 2.0. *Signum, 5*, 6-12.

Webber, S. & Johnston, B. (2000). Conceptions of information literacy: New perspectives and implications. *Journal of Information Science, 26* (6), 381-397.

Weinberger, D. (2007). *Everything is miscellaneous*. New York: Henry Holt and Company.

Windham, C. (2006). *Getting past Google: Perspectives on information literacy from the Millennial mind.* [S.L.]: Educause. Retrieved April 12, 2008, from http://connect.educause.edu/Library/ELI/GettingPastGooglePerspect/39341?time=1208003180.

Appendix

Selective bibliography of literature on recent developments in information and communications technology
Scope: Relevance for Information Literacy education

Publication years 2005-2009

Bailin, A. & Grafstein, A. (2005). The evolution of academic libraries: The networked environment. *The Journal of Academic Librarianship, 31* (4), 317-323.

Carr, N. (2008). Is Google making us stupid? *The Atlantic, 2008* (July/August). Retrieved December 30, 2009, from http://www.theatlantic.com/doc/200807/google.

Dempsey, L. (2009). Always on: Libraries in a world of permanent connectivity. *First Monday, 14* (1). Retrieved January 3, 2010, from http://firstmonday.org/htbin/cgiwrap/bin/ojs/index.php/fm/article/viewArticle/2291/2070.

Devine, J. & Egger-Sider, F. (2009). *Going beyond Google: The invisible web in learning and teaching*. New York [etc.]: Neal-Schuman Publishers.

Friedewald, M., Da Costa, O., Punie, Y., Alahuhta, P., & Heinonen, S. (2005). Perspectives of ambient intelligence in the home environment. *Telematics and Informatics, 22* (3), 221-238.

Garb, R. (2008). More transparency in customized search results. *The Official Google Blog,* (July 30, 2008). Retrieved January 2, 2010, from http://googleblog.blogspot.com/2008/07/more-transparency-in-customized-search.html.

Godwin, P. (2006). *Information literacy in the age of amateurs: How Google and web 2.0 affect librarians' support of information literacy*. Retrieved March 27, 2008, from http://www.ics.heacademy.ac.uk/italics/vol5iss4/godwin.pdf.

Hagedorn, K. & Santelli, J. (2008). Google still not indexing hidden web URLs. *D-Lib Magazine, 14* (7/8).

Hamilton, B. J. (2009). Transforming information literacy for NowGen students. *Knowledge Quest, 37* (5), 48-53.

Hill, B. (2007). Federated search at the Intel library. *Information Outlook, 11* (9), 11-23.

Ipsos MORI. (2007). *Student expectations study: Key findings from online research and discussion evenings held in june 2007 for the joint information systems committee*. Bristol etc.: JISC. Retrieved March 29, 2008, from http://www.jisc.ac.uk/publications/publications/studentexpectationsbp.aspx.

Johnson, L., Levine, A., & Smith, R. (2009). *The 2009 Horizon report*. Austin, Texas: The New Media Consortium.

Keen, A. (2007). *The cult of the amateur: How today's internet is killing our culture*. New York, N.Y.: Doubleday.

Kennedy, T., Smith, A., Wells, A., & Wellman, B. (2008). *Networked families: Parents and spouses are using the internet and cell phones to create a new "connectedness" that builds on remote connections and shared internet experiences*. Washington DC: Pew Internet & American Life Project. Retrieved October 31, 2008, from http://www.pewinternet.org/pdfs/PIP_Networked_Family.pdf.

KPMG. (2007). *The impact of digitalization: A generation apart*. Retrieved January 2, 2010, from http://www.kpmg.nl/%5CDocs/Corporate_Site/Publicaties/Impact_Digitalization.pdf.

Kraut, R., Brynin, M., & Kiesler, S. (2006). *Computers, phones, and the internet : Domesticating information technology*. Oxford; New York: Oxford University Press.

Laverty, C. (2009). Our information literacy heritage: from evolution to revolution. *Feliciter, 55* (3), 88-91.

Lewandowski, D. (2006). Suchmaschinen als konkurrenten der Bibliothekskataloge: Wie Bibliotheken ihre angebote durch Suchmaschinentechnologie attraktiver und durch Öffnung für die allgemeinen Suchmaschinen populärer machen können. *Zeitschrift für Bibliothekswesen und Bibliographie, 53* (2), 71-78.

Lorenzo, G., Oblinger, D., & Dziuban, C. (2007). How choice, co-creation and culture are changing what it means to be net savvy. *Educause Quarterly, 2007* (1), 6-12.

Mikki, S. (2009). Google scholar compared to web of science: A literature review. *Nordic Journal of Information Literacy in Higher Education, 1* (1), 41-51.

Morville, P. (2005). *Ambient findability*. Sebastopol, Calif.; Farnham: O'Reilly.

Oblinger, D. & Oblinger, J. (2005). *Educating the net generation*. [S.L.]: Educause. Retrieved April 4, 2008, from http://www.educause.edu/educatingthenetgen.

O'Reilly, T. (2005). *What is web 2.0: Design patterns and business models for the next generation of software.* Retrieved February 21, 2009, from http://www.oreillynet.com/pub/a/oreilly/tim/news/2005/09/30/what-is-web-20.html.

Pan, B., Hembrooke, H., Joachims, T., Lorigo, L., Gay, G., & Granka, L. (2007). In Google we trust: Users' decisions on rank, position, and relevance. *Journal of Computer-Mediated Communication, 12* (3), 801-823.

Qualman, E. (2009). Is Google a social media company? *Search Engine Watch,* (October 5, 2009). Retrieved October 6, 2009, from http://searchenginewatch.com/3635188.

Research Information Network (2006). *Researchers and discovery services: Behaviour, perceptions, needs.* Retrieved December 23, 2009 from http://www.rin.ac.uk/our-work/using-and-accessing-information-resources/researchers-and-discovery-services-behaviour-perc.

Salo, D. (2006). Design speaks. *Library Journal, Suppl. Net Connect, 131* (Fall), 4-6.

Siemens, G. & Tittenberger, P. (2009). *Handbook of emerging technologies for learning*. Manitoba: University of Manitoba. Retrieved December 27, 2009, from http://techcommittee.wikis.msad52.org/file/view/HETL.pdf.

Sullivan, D. (2008). Google now fills out forms & crawls results. *Search Engine Land*. Retrieved December 23, 2009, from http://searchengineland.com/google-now-fills-out-forms-crawls-results-13760.

Tonta, Y. (2009). Information services and web 2.0: New challenges and opportunities. *Electronic Library: International Scientific Conference, Belgrade (Serbia), September 25-28, 2008.* Retrieved January 3, 2010, from http://yunus.hacettepe.edu.tr/~tonta/yayinlar/tonta-belgrade-2008-full-text-son.pdf.

Tuhus-Dubrow, R. (2008). The turn to online research is narrowing the range of modern scholarship, a new study suggests. *The Boston Globe*. Retrieved November 28, 2008, from http://www.boston.com/bostonglobe/ideas/articles/2008/11/23/group_think/ .

Tuominen, K. (2007). Information literacy 2.0. *Signum, 5*, 6-12.

UCLA Newsroom. (2006). *Don't talk to a friend while reading this; multi-tasking adversely affects the Brain's learning systems.* Retrieved November 1, 2008, from http://newsroom.ucla.edu/portal/ucla/Don-t-Talk-to-a-Friend-While-Reading-7212.aspx?RelNum=7212.

University College London (UCL) CIBER group (2008). *Information behaviour of the researcher of the future*. London: University College London. Retrieved April 11, 2008, from http://www.jisc.ac.uk/media/documents/programmes/reppres/gg_final_keynote_11012008.pdf.

Veen, W. & Vrakking, B. (2006). *Homo zappiens : Growing up in a digital age*. London: Network Continuum Education.

Weinberger, D. (2007). *Everything is miscellaneous*. New York: Henry Holt and Company.

Williams, J. & Goodwin, S. (Ed.) (2007). *Teaching with technology: an academic librarian's guide*. Oxford: Chandos Publishing.