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DIGITAL DIVIDE: A STUDY ON PORTUGUESE MUNICIPALITIES' WEB SITES

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ABSTRACT

This paper presents a study performed on Portuguese Municipalities' web sites in relation its usability with regard to digital inclusion. A recent study has shown that Portugal ranks among top in making available e-government facilitators (i.e. web sites and portals) to its citizens. Through a desktop qualitative cognitive walkthrough, using a set of pre-selected usability guidelines linked with digital literacies, a subset of municipalities' web sites were assessed and results showed that in terms of usability for digital inclusion only two of the municipalities' web sites evaluated scored good and a clear majority of 65% of these scored reasonable. This means that there is a long way to work in order to bridge this digital divide. This paper makes an innovative contribution to the discussion about minimising digital exclusion through usability guidelines.

KEYWORDS

Usability guidelines, digital inclusion, local e-government, Portugal, information literacy, cognitive walkthrough.

1. INTRODUCTION

This research focuses on the human aspects of information literacy as a crucial factor that influences the ability to use information and communication technologies in general and e-government in particular (Dutton, 2004; Mark Warschauer, 2002, 2003).

This paper argues that there is a need for specific usability guidelines to help designers of e-government mitigates the effects of digital exclusion (eInclusion@EU, 2004) phenomena as a result of low levels of literacy when it is necessary to overcome the difficulties in using public websites. The paper presents the findings of a research project that aimed at explicitly relating usability with the digital inclusion (eEurope Advisory Group, 2005) in the design of web sites of local government in Portugal.

This study focus on understanding the relationship between the design of content services for the lowest possible common denominator of digital literacies in a particular social environment.

2. DIGITAL INCLUSION, INFORMATION LITERACY AND E-GOVERNMENT

The meaning of the term literacy has had a variety of meanings with significant changes over time (Bawden, 2001). For the purpose of an e-government study, it surely is more important to focus on what a participative and literate citizen is expected to do while using both e-government content and services.

One important implication, emerging from the characterisation of the information literacy concept by Paul Zurkowski in the 70s and well defined by Doyle (1992), is that the e-citizen is supposed to be literate in all media, including electronic media on the Internet. An additional implication of this set of competences, as pointed out by the UK Educational Testing Service (2002) and Shetzer and Warschauer (2000), is the need to

define a set of higher-level macro-competences and skills that actually represent the instantiation of the set in today's information and knowledge society. These could be subdivided into two main categories: cognitive competences and ICT competences. Cognitive competences comprise the fundamental skills in day-to-day life and, in terms of literacy, include reading, writing, numeracy, problem solving and critical thinking, spatial literacy and visual literacy. ICT competences refer to the integration and application of cognitive skills and techniques to enable people to maximize the capabilities of these technologies. These can be summarized in terms of the technique necessary to use the ICT itself, in the search for information, in communication, and in the construction of contents (Shetzer & Warschauer, 2000). These competences were specifically used in order to qualify the evaluation of the usability guidelines.

The integration of the technology and cognitive macro-level competences lead to a redefinition of digital literacy as a set of competences and skills needed to use digital technologies, communication media, social networking tools and networked information to be able to be actively involved in a society based on information and knowledge. These competence-based digital literacies comprise (Shetzer & Warschauer, 2000; Mark Warschauer, 2003):

- **Computer literacy:** Computer literacy has acquired a skills connotation, implying competency in using and exploiting today's computer applications, such as word processing and email as well as the ability to physically operate and manipulate computer technology. However, it is important to note that feeling comfortable and knowledgeable about current hardware, software, networks and operating systems, should not be an end in itself and, in the course of time, the acquisition of new skills is required (Williams, 2003).
- **Information literacy:** information literacy encompasses the analytical and critical skills to understand information needs, formulate research questions, search for and access a variety of information types, evaluate the results of these searches in order to meet identified information needs and, finally, be able to process and apply this information in practice (Lenox & Walker, 1993; Webber & Johnston, 2000). Therefore, information literacy involves the use of computer literacy in terms of specific knowledge of technology (e.g. using a browser and search engines) but requires a new set of cognitive competences (e.g. analyze and evaluate sources of information). Processing the large amounts of information available via the web, as well as dealing with information overload and information anxiety is therefore only within reach of those who have appropriate information literacy skills and competences.
- **Multimedia literacy:** In very simple terms, multimedia is the use of computer-based technology to present and combine text, graphics, audio, and video with links and tools that let the user navigate, interact, create, and communicate (Hofstetter, 2003). Therefore, multimedia literacy is concerned with meaning-making in the ever changing world of computer based technology and the web, that is the ability to interpret and produce documents combining texts, sounds, graphics, and video (M. Warschauer, 2007). According to Lemke (2000) multimedia literacy comprises simultaneously three kinds of meaning: presentational, orientational, and organizational. Presentational meanings are those that tell something about the world, about a state of affairs or relationship, and which construe in words the doings and beings we wish to present (Lemke, 2000).
- **Computer-mediated communication literacy:** refers to the mastery of the pragmatics of synchronous and asynchronous computer mediated communication (CMC) (M. Warschauer, 2007). That is, the ability to express yourself, interpret and interact online in order to communicate effectively online. CMC literacy ranges from the ability to use "netiquette", which corresponds to the informal rules and common courtesy online, to the capability of argumentation and persuasion. From a technology competence point of view, CMC literacy may even include how to establish and manage online communications for the benefit of groups of people (e.g. discussions and training on-line).

In sum, digital literacies can be seen as a combination of technology and cognitive competences and expressed in terms of a set of computer, information, multimedia, and CMC literacies. Lack of these literacies may result in digital exclusion. Consequently, successful e-government depends on active and participative digital literate citizens.

E-government refers to the use by government agencies of information technologies (such as Wide Area Networks, the Internet, and mobile computing) that have the ability to transform relations with citizens, businesses, and other arms of government. These technologies can serve a variety of different ends: better

delivery of government services to citizens, improved interactions with business and industry, citizen empowerment through access to information, or more efficient government management. The resulting benefits can be less corruption, increased transparency, greater convenience, revenue growth, and/or cost reductions (World Bank, 2005).

If aspects of the digital divide are not seriously considered, the adoption of this innovative form of government is limited to those who have access to technology and the literacies and competences to exploit these electronic services. In this sense as highlighted by Carter and Bélanger (2004) e-government in itself can be a major contributor to deepen the digital divide in society. To mitigate this situation development and design of e-government sites and services should include a set of usability guidelines and recommendations that are closely related to the digital literacies identified above. Usability, which is related to how easy it is to use a technology artifact (Nielsen & Loranger, 2006, p. xvi), is therefore a requirement to successfully deliver services provided by e-government to citizens (Millard, 2004).

3. RESEARCH QUESTION AND METHODOLOGICAL APPROACH

The study reported in this paper aimed at exploring the relationship between usability and digital literacies with the ultimate goal of proposing ways to bridge the digital divide. The study also aimed at surveying the e-government reality in Portugal.

Portugal was reported to be the leader in the European Union in public online service sophistication and availability by the eGov benchmark 2010 report published by the European Commission on 21 February (Capgemini et al., 2010). Portugal ranked top not only in the European tables for the sophistication and availability, but also in usability, user-centric design, and service bundling (Capgemini et al., 2010, p. 9). Nonetheless, this research was interesting in investigate if this image of success was also addressing the issues of digital divide and the necessary addressing of digital literacies in both usability and design. That is, this research was interested to relate this clear success in design with the need to go beyond graphical design, navigability, functionality and accessibility. Thus, the research question driving this study was expressed as:

“Does the very successful usability of Portuguese Municipalities’ websites reflect concerns with the digital inclusion?”

In order to respond to this question, and since there is very little literature available explicitly connecting the usability and digital literacies concepts, the research project started by trying to establish a detailed set of usability guidelines that were clearly link to digital literacies. This was followed by a desktop cognitive walkthrough (CW) study that assessed 28 local government websites in Portugal.

The CW traditionally used as an usability evaluation method, with special attention to how well the interface supports "exploratory learning," i.e., first-time use without formal training (Rieman et al., 1995). It focuses on evaluating user interfaces of a system as to attribute ease of learning, particularly by exploration, i.e., guessing what to do using the signals provided by the system. Based on early propositions by Wharton et al. (1994) and on Lewis and Polson's CE+ theory of exploratory learning (Polson et al., 1992), CW simulates users performing navigation tasks on a website by assuming that users perform goal-driven exploration (Blackmon et al., 2002).

This method is particularly useful for the study reported since it focuses on simulating the process of resolving user's behaviour problems for ease of learning (Wharton, et al., 1994) and assuming that no specific formal training was provided to the same user. This is particularly applicable to e-government usability evaluation and the testing of required digital literacy.

4. MATCHING EXISTING USABILITY GUIDELINES WITH DIGITAL INCLUSION

Before proceeding with the CW planned for the study was the need to link existing usability guidelines and digital literacy. Considerable problems in defining a base set of usability guidelines for this research was found. There are a number of different and not always compatible set of guidelines, proposed by different authors with different aims. These guidelines are often conflicting with each other, which often require that the choice of one prevents the implementation of another. To complicate the scenario in usability studies, the

more general rule is, the greater the possibility of conflict with other rules and the greater the need to understand the theory that supports it (Dix et al., 2004, p. 259).

Given the need to select a base set of usability guidelines and then adjust these to reflect digital divide concerns, the research team followed the process of selection proposed by Brajnik (2004) and decided to adopt the Research-Based Web Design & Usability Guidelines (U.S. Health and Human Services Department, 2006).

In order to adjust the selected usability guidelines to digital inclusion concerns, the team had to further reduce the level of abstraction of the macro-competences discussed above and define detailed and precise micro-competences. The model of micro-competences established - SCONUL+1 - was constructed by using the Digital Literacy model presented in Figure 1 and was based on:

- Macro-competences from the literacy of digital literacy, as defined in this study;
- The model of the seven pillars of information literacy from SCONUL1 (Bainton, 2001);
- Term learning outcome (Wareing, 2004);
- The case studies for the development of information literacy of students produced by SCONUL (2004).

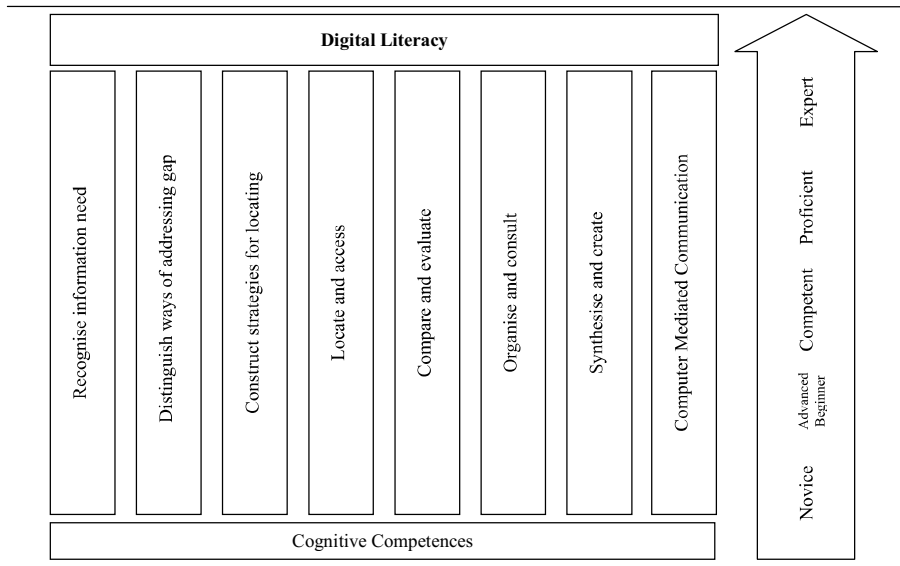


Figure 1. SCONUL⁺¹ – Digital literacy model, based on the information skills model (SCONUL, 2004), on the framework for ICT literacy (Educational Testing Service, 2002), on the works of Shetzer e Warschauer (2000) and Warschauer (2003)

This adjustment process and subsequent guideline selection resulted in a subset of 53 usability guidelines for digital inclusion.

5. RESEARCH DESIGN AND PROCESS

The CW was performed to evaluate 28 local government websites in Portugal. The execution of tasks of the cognitive walkthrough were recorded in video format and the data collected, as a numerical interpretation of a 5 level Likert scale (Very poor; Poor; Reasonable; Good; Very good) per task. Both the score and all

¹ SCONUL – Society of College, National and University Libraries, is involved in developing the profile of information literacy in higher education since 1997 (www.sconul.ac.uk/groups/information_literacy).

qualifying comments were stored in a purposefully built tool. All collected data was analyzed at the end of the walkthrough process.

In detail, the following CW phases, as proposed by Wharton et al.(1992), were undertaken:

1. **Preparatory phase:** Implied defining the user profile, the tasks that test digital literacies and prepare the action:
 - **Users:** portuguese citizens with low denominator digital literacy skills, seeking information or use of services on the web sites of Portuguese municipalities;
 - **Tasks:** the number of tasks had to be limited but representative and their selection followed the guidelines of Wharton et al. (1992):
 1. To register on the website;
 2. To get online information on opening hours for City Hall;
 3. To make a complaint online;
 4. To make an online licensing application for the restoration house works of a building, with road obstruction during the construction period;
 5. To consult the last Municipal Assembly's deliberation;
 6. To participate in an online public debate on the activities of the City Council, through available discussion forums;
 7. To request a regular information about the council by e-mail (e.g. newsletter).
 - **Actions:** each of the above high-level tasks may require the e-government user to take several actions. Therefore, for each task a detailed list of actions was devised and directly related with the defined micro-competences (see Table 1 for a detailed example) necessary for their execution.

Table 1. Example of the definition of a task and respective actions and micro-competences

Task	Action	Micro-competence
To register on the website	1 Find access to the registration page	3; 9; 10; 12; 13; 14; 16; 29; 30; 31; 32; 39
	2 Access to the registration page	29
	3 Read and interpret	5; 36; 37; 38; 39; 40
	4 Fill out the registration form	39; 41; 42; 45; 48; 50; 57; 58; 59; 60
	5 Register	42; 49; 50
	6 Be sure that the registration was done	49

2. **Analysis phase:** The analysis phase was performed by attempting to execute the tasks identified in the preparatory phase. The execution of these tasks always started from the homepage of Municipality web site being evaluated. It consisted in verifying the compliance of the interfaces of the municipality's web site with the usability guidelines identified for digital inclusion and the objective of minimizing the need for a certain competency. The result of the analysis was expressed, as indicated above, in terms of a Likert scale with 5 levels (Very poor; Poor; Reasonable; Good; Very good).

Additionally options were added for the following exception where constraints could arise during the evaluation:

- A Boolean option was added to reflect if the task or any of the actions was achievable or not on the web site under evaluation;
- Since the combination of usability guidelines to micro-competences was designed independently of the tasks used in the evaluation, the option "not rated" was added to the guideline level and resulted from the 2 following possibilities:
 - (1) *Guidelines unverified by the way the task or action was done;*
 - (2) *Guidelines not applicable in the assessment task or action.*

The unit of evaluation was composed by the identification of the municipality, the tasks, the actions performed to accomplish each of the tasks and the usability guidelines for each action.

3. **Interpretation of results phase:** The data collected per municipality was analysed and interpreted first on an individual level and then compounded to obtain a holistic view. Since the data was collected

using a Likert scale, only discrete statistics were used, namely through the use of medians and frequencies. The summarized results are presented in the next section..

6. RESEARCH FINDINGS

As discussed above, the CW process was based on trying to perform 7 basic tasks on municipal web sites. Table 2 provides an overview of the tasks performed and the municipality web site that allow the task to be performed. From a quick analysis of this table it is immediately apparent that tasks 4, 5 e 6 are not supported by the great majority of sites. These tasks aimed at testing different aspects of e-government provision and it emerged that only one of the sites provided a discussion forum and that one other provided direct access to the Municipal Assembly's deliberations. This shows a low level of transparency and encouragement of citizen participation, but did not enable the researchers to draw conclusions in terms of usability for digital inclusion. Table 2 depicts the overall evaluation of the task performance, having into consideration digital inclusion concerns.

Table 2. Overall evaluation of task performance in terms of usability for digital inclusion

Municipality	Tasks ⁽¹⁾							Compound Results per Municipality
	1	2	3	4	5	6	7	
1 Abrantes	3	4			4		2	3
8 Alcanena	3		3				2	3
28 Alentejo		4					3	4
57 Calheta (Açores)	2		2					2
61 Cascais	4						4	4
83 Casp	2							2
88 Entrecameros	3		3				2	3
96 Fátima do Alentejo	1						7	1
115 Fátima	3		3	3				3
128 Lagoa (Açores)	4		4					3
172 Lagos (Açores)				4			4	4
172 Naveiros	4		4				7	4
202 Ponta Delgada		3	2	2				3
224 Ribeira Grande	3	3					2	3
241 Santa Cruz das Flores		4	4					4
242 Santa Cruz das Flores	2	2	1					2
245 Sardoal	3						2	4
256 Tomar	3	4					2	3
269 Torres Novas	3		4				2	4
276 Velas							2	2
287 Vila do Porto			1				1	1
290 Vila Franca do Campo	3		3			1	2	2
291 Vila Nova de Barquinha	3	4					2	3
Compound Results per Task	3	4	3	3	Not meaningful	Not meaningful	2	

(1) 1- To receive the website;
 2- To get online information on opening hours for City Hall;
 3- To make an application online;
 4- To make an online application for the collection of basic works of a building, with road obstruction during the construction period;
 5- To consult the last Yearly Municipal Assembly's deliberation;
 6- To participate in an online public debate on the work of the City Council; then go website discussion on the issue;
 7- To receive a regular information about the council by e-mail (reg. newsletter)

One important conclusion is that none of the websites supported all the tasks. Again, that does not help in understanding usability compliance in the design of the web sites evaluated. From the evaluation of those tasks that were actually performed successfully, there are three main conclusions that emerge:

- With very few exceptions, the overall scenario is reasonable, but not entirely satisfactory. Most evaluations score values around 3 (Reasonable) and 2 (Poor) when digital inclusion concerns were taken into account. This scenario was confirmed by both compound results per municipality and per task.
- Task 7 revealed severe lacks in design for digital inclusion. In general terms, the design of the website in relation to supporting citizens in subscribing online newsletters were extremely poor. Many of the sites assumed levels of literacy and understanding of semiotic symbology that were far beyond the average citizen's capabilities. Some even required the understanding of third party technology that also required a steep learning curve and extra training by the user. There was an additional problem related to the provision of feedback after the subscription attempt, leaving the user anxious and unsure of the success of the task.

- Only two municipalities got a compound score of 4 (Good), none scored 5 (Very good). This reveals on one hand a fairly homogenous scenario, but on the other a fairly poor one. In fact, in terms of usability guidelines that are explicitly linked with digital literacies the scenario is far from being as optimistic as the aforementioned (Capgemini, et al., 2010).

These results are far from being satisfactory, but require a closer analysis in order to understand where the failure was actually occurring and how these sites were failing to support digital inclusion. Table 2 was built based on the qualifying comments that were collected to justify the score given during the CW. Analyzing the results in Table 2, it is clear that the majority of problems encountered were outside of the traditional areas of concern in usability. In fact, those that are situated at the traditional centre of usability, namely navigation, multimedia objects and page layout, are the ones that fair better in the CW performed.

7. CONCLUSIONS

In general terms, the CW conducted was deemed a successful process, and was completed with satisfactory results. The overall findings showed that there was a poor consideration of digital inclusion issues and guidelines in the design of local e-government sites in Portugal. The subset of 53 guidelines proposed was extremely useful in guiding the study, that otherwise would showed a very different picture. The analysis of the websites used the traditional usability technique of using a quantitative 5 point Likert scale that was complemented with a qualitative qualification and justification of the score given. This enabled a richer analysis of results and an identification of problems linked to digital literacies.

The study attempts to make two main theoretical contributions. On one side the linking of usability guidelines with digital literacies, on the other an extension of traditional information literacy models by proposing an extension to SCONUL.

Finally, the study attempts at making a practical contribution to the current situation on Portugal. In truth, the main conclusion emerging from this study points to a rather average performance of municipal e-government sites in relation to digital inclusion. This average scenario is clearly apparent when considering that only two of the municipalities' web sites evaluated scored good and a clear majority of 65% of these scored reasonable. On an encouraging note, it was clear that if using central usability parameters these sites would have scored rather better, justifying the findings of the Capgemini et al (2010) study.

This less than good scenario is particularly worrying in a country with less than average literacy skills, like Portugal, and indicates that there is still a need for an important effort of both awareness of digital literacies and the digital gap. There is also a need to understand much better the link between digital literacies and usability, so that these concepts can be embedded in web design for e-government.

REFERENCES

- Bainton, T. (2001). *Information Literacy and Academic Libraries: The SCONUL Approach (UK/Ireland)*. Paper presented at the Proceedings of the 67th IFLA Council and General Conference, August 16-25, 2001, Boston, USA.
- Bawden, D. (2001). Information and digital literacies: a review of concepts. *Journal of Documentation*, 57(2), 218-259.
- Blackmon, M. H., Polson, P. G., Kitajima, M., & Lewis, C. (2002). *Cognitive walkthrough for the web*. Paper presented at the Proceedings of the SIGCHI conference on Human factors in computing systems: Changing our world, changing ourselves.
- Brajnik, G. (2004). *Using automatic tools in accessibility and usability assurance processes*. Paper presented at the 8th ERCIM Workshop "User Interfaces For All", June, Vienna.
- Capgemini, IDC, Rand Europe, Sogeti, & DTi. (2010). *Digitizing Public Services in Europe: Putting ambition into action. 9th Benchmark Measurement. December 2010*: European Commission. Directorate General Information Society and Media.
- Carter, L., & Bélanger, F. (2004). The Influence of Perceived Characteristics of Innovating on e-Government Adoption. *Electronic Journal of e-Government (EJEG)*, 2(1), 11-20.
- Dix, A., Finley, J., Abowd, G. D., & Beale, R. (2004). *Human-computer interaction (3rd ed.)*. Upper Saddle River, NJ, USA: Prentice-Hall, Inc.

- Doyle, C. S. (1992). *Outcome Measures for Information Literacy within the National Education Goals of 1990, Final Report to National Forum on Information Literacy, Summary of Findings*. Syracuse, NY.
- Dutton, W. H. (2004). *Social Transformation in an Information Society: Rethinking Access to You and the World*. Paris: UNESCO, United Nations Educational, Scientific and Cultural Organization.
- Educational Testing Service. (2002). *Digital transformation: A framework for ICT literacy. A report of the international ICT literacy panel*. Princeton, New Jersey.
- eEurope Advisory Group. (2005). *e-Inclusion: New challenges and policy recommendations*: European Commission.
- eInclusion@EU. (2004). Strengthening eInclusion and eAccessibility across Europe. Retrieved 16-05-2005, from http://www.einclusion-eu.org/files/eInclusion_D1-1_analytic-framework_final.PDF
- Hofstetter, F. T. (2003). *Advanced web design*. Boston: McGraw-Hill.
- Lemke, J. (2000). Multimedia literacy demands of the scientific curriculum. *Linguistics and Education*, 10(3), 247-271.
- Lenox, M. F., & Walker, M. L. (1993). Information Literacy in the Educational Process. *Educational Forum*, 57(2), 312-324.
- Millard, J. (2004). *eUSER D1.1: Conceptual and Analytical Framework. Evidence-based support for the design and delivery of usercentred online public services. First Version*.
- Nielsen, J., & Loranger, H. (2006). *Prioritizing Web Usability*. Berkeley, California: New Riders, Pearson Education.
- Polson, P. G., Lewis, C., Rieman, J., & Wharton, C. (1992). Cognitive walkthroughs: a method for theory-based evaluation of user interfaces. *International Journal of man-machine studies*, 36(5), 741-773.
- Rieman, J., Franzke, M., & Redmiles, D. (1995). *Usability evaluation with the cognitive walkthrough*. Paper presented at the Conference companion on Human factors in computing systems, CHI '95, New York, NY, USA.
- SCONUL. (2004). *Learning Outcomes and Information Literacy*. London, UK: The Society of College, National and University Librarians.
- Shetzer, H., & Warschauer, M. (2000). An Electronic Literacy Approach to Network-Based Language Teaching In M. Warschauer & R. Kern (Ed.), *Network-based Language Teaching: Concepts and practice* (pp. 171 - 185). New York: Cambridge University Press.
- U.S. Health and Human Services Department. (2006). Research-based Web Design & Usability Guidelines Available from <http://usability.gov/guidelines/index.html>
- Wareing, S. (2004). What's a learning outcome? *Learning Outcomes and Information Literacy*. London, UK: The Society of College National and University Librarians (SCONUL).
- Warschauer, M. (2002). Reconceptualizing the Digital Divide. *First Monday*, 7(7).
- Warschauer, M. (2003). *Technology and Social Inclusion: Rethinking the Digital Divide*. Cambridge, Massachusetts: MIT Press.
- Warschauer, M. (2007). Technology and writing. In C. Davison & J. Cummins (Eds.), *International Handbook of English Language Teaching* (pp. 907-917). Norwell, MA: Springer.
- Webber, S., & Johnston, B. (2000). Conceptions of information literacy: new perspectives and implications. *Journal of Information Science*, 26(6), 381.
- Wharton, C., Bradford, J., Jeffries, R., & Franzke, M. (1992). *Applying cognitive walkthroughs to more complex user interfaces: experiences, issues, and recommendations*. Paper presented at the Proceedings of the SIGCHI conference on Human factors in computing systems, Monterey, California, United States.
- Wharton, C., Rieman, J., Lewis, C., & Polson, P. (1994). The Cognitive Walkthrough Method: A Practitioner's Guide. In J. Nielsen & R. L. Mack (Eds.), *Usability Inspections Methods* (pp. 105 - 140). New York: John Wiley.
- Williams, K. (2003). Literacy and Computer Literacy: Analyzing the NRC's "Being Fluent with Information Technology". *Journal of Literacy and Technology*, 3(1), 1-20.
- World Bank. (2005). A Definition of E*Government. Retrieved 20-11-2005, from <http://www1.worldbank.org/publicsector/egov/definition.htm>