Computer Literacy Systematic Literature Review Method

Roeland H. P. Kegel\textsuperscript{a} and Susanne Barth\textsuperscript{a,c} and Randy Klaassen\textsuperscript{b} and Roel J. Wieringa\textsuperscript{a}

\textsuperscript{a}University of Twente, Faculty of Engineering, Mathematics and Computer Science, Services, Cybersecurity and Safety Research Group, PO Box 217, 7500AE Enschede, The Netherlands

\textsuperscript{b}University of Twente, Faculty of Engineering, Mathematics and Computer Science, Services, Human Media Interaction Research Group, PO Box 217, 7500AE Enschede, The Netherlands

\textsuperscript{c}University of Twente, Faculty Behavioural, Management and Social Sciences, Department of Communication Science, PO Box 217, 7500AE Enschede, The Netherlands

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ABSTRACT
Although there have been many attempts to define the concept ‘computer literacy’, no consensus has been reached: many variations of the concept exist within literature. The majority of papers does not explicitly define the concept at all, instead using an unjustified subset of elements related to computers to assess a subject’s level of computer literacy. This can limit the generalizability of research and can lead to fallacious conclusions. This is an internal report listing the method by which the research was conducted.

KEYWORDS
Computer Literacy, Computer Skills, Digital Literacy, Systematic Literature Review, Questionnaire Development

1. Method

This structured literature review was performed based on the Evidence Based Software Engineering (EBSE) approach [2]. First, initial search keywords were identified. These were refined into search queries to gather an initial set of papers. The abstracts of these papers were examined to determine whether they mention computer literacy. After prioritizing these papers by likelihood of relevance, they were all examined individually. From these papers, concepts mentioned in the paper related to computer literacy were extracted, including constructs such as computer anxiety and variables such as age. These concepts were described, ordered and then clustered using a predefined method in order to remove synonymous and irrelevant terms. Finally, the elements of computer literacy definitions and measurements were compiled into two separate diagrams in order to summarize this gathered information. Each of these applied steps is described in more detail below.

CONTACT: Roeland. H. P. Kegel, Email: r.h.p.kegel@utwente.nl, Phone: +3153 489 4192
1.1. Preliminaries

To start the review process, we performed an unstructured search for literature by consulting experts from the computer science and social science domains. These experts provided starting sources for defining computer literacy and possible synonyms. From this, we selected a review article from 2001 [1] as a suitable starting point. This article contained several definitions of computer literacy and a general overview of related literacies. This led to our initial search terms:

- Information literacy;
- Computer, IT, information technology, E-, electronic and electronic information literacy;
- Library literacy;
- Media literacy;
- Network, Internet and hyper literacy;
- Digital and digital information literacy.

In the interests of scope and time we consulted a single scientific database, Scopus, for the initial collection of articles. The first search query included any paper that contained information, computer, library, media, Internet or digital literacies in the title or keywords. This yielded 8579 hits.

The top 3 subject areas for the publications in this query were social sciences (56.5%), computer science (21.6%) and medicine (21.0%), with all other categories in the single digits. Since the goal of this literature review is to find definitions and measurements of computer literacy, we removed the terms information literacy, library literacy and media literacy (related, but not synonymous), and the terms digital literacy and internet literacy (too broad and too narrow in scope, respectively).

This leaves computer literacy as the primary search term. In all subject areas, within the Scopus database, this still resulted in 2840 hits. The majority of these publications are from the medicine domain, with social sciences and computer science as 2nd and 3rd domains. The majority of publications in the medicine domain are irrelevant to our goal because of their focus on health information literacy or the impact of computers on medical records. Since all age related computer literacy papers also fall under the social sciences domain, we decided to restrict the search to social sciences and computer science, resulting in 1131 hits.

1.2. Selection by Abstracts

The full text of publications from the previous step were retrieved if they met the selection criteria, based on their abstracts. Our selection criteria ask whether a study study provides any evidence about the primary research questions. Therefore, we defined the following three categories of papers:

1. Publications that develop and/or validate constructs related to computer literacy;
2. Publications in which computer literacy is measured;
3. Publications in which constructs related to computer literacy are measured.

We deemed any paper outside any of these categories as not promising enough to include in the next stage of the process. 66, 90 and 34 papers were found for the three categories respectively, leaving a total of 190 papers.
1.3. **Extraction of Concepts**

The final sample was examined for concepts that are related to computer literacy. The concepts that we identified are grouped as either a construct (e.g. computer literacy and computer skills) or a variable (e.g. age and perceived computer skills).

1.4. **Summarizing Computer Literacy Definitions**

To identify the common elements of computer literacy as defined, we examined all explicit definitions of computer literacy within the 190 consulted papers. Of the 70 papers where computer literacy was mentioned within the body of the text, only 31 papers gave an explicit definition of the construct. We extracted keywords from these definitions, refining them into a list of keywords that correspond to constructs. These constructs together form computer literacy as defined in these 31 papers. However, none of these keywords was used in all definitions to define computer literacy. We appended numbers to each keyword to indicate how many definitions included this keyword in its definition of computer literacy.

We organised this list by adding semantic links between constructs, organizing them from general to specific, based on our interpretation of the construct relationships in the consulted papers. This resulted in a tree diagram available in the main article.

1.5. **Summarizing Computer Literacy Measurements**

To create a human-readable summary of the elements of computer literacy as measured, the variables and constructs extracted from the 190 consulted papers were subjected to a clean-up phase as follows:

1. Removing irrelevant concepts from the list. Concepts that have proven to be uncorrelated to computer literacy (e.g. gender-typing), or that we deemed too far removed from computer literacy to make a meaningful contribution towards measuring it (e.g. technology knowledge).
2. Removing undefined and ambiguous concepts from the list. Concepts that did not have an explicit definition available within any of the consulted papers, or that had multiple conflicting definitions (e.g. computer use).
3. Clustering variables. Variables that occur no more than twice within consulted literature were were grouped under a parent concept (subsumed, see the coding scheme below).

The relations between concepts in the cleaned up list were then coded independently by the authors according to the following coding scheme:

1. Include: The element is sufficiently unique to merit inclusion;
2. Subsume: The element is a subset of a more general element that is already included;
3. Synonymous: The element is synonymous with an included element.

Step 3 was performed by three raters. The conflicts between raters were ordered by level of disagreement (slight, medium or severe). We then amended the final list by jointly analyzing and resolving these conflicts. Synonymous items were merged under
the most frequently occurring element. Subsumed items were grouped under their corresponding general element. This resulted in a tree diagram. Next, we amended and restructured the tree diagram by renaming, moving and re-ordering elements to improve readability and consistency in the element labeling. Finally, all concepts of the diagram that had two or less sources referencing them were removed, analogous to the removal of variables in the list clean-up phase. The only exception to this is the demographical information construct, which had too many frequently occurring sub-elements to remove. The resulting tree diagram is discussed in the discussion section.

2. conclusion

The results and discussion sections of this document can be found in the main article about the subject. We will update this document with a reference to this paper once it has been accepted for publication.

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References