

THE SOLUTION THRESHOLD OF INFORMATION OVERLOAD: A SYSTEMATIC LITERATURE REVIEW

KARTO ISKANDAR^{1,3}, HARJANTO PRABOWO², RAYMOND KOSALA¹
AND AGUNG TRISETYARSO³

¹Computer Science Department
School of Computer Science

²Management Department, BINUS Business School Undergraduate Program

³Computer Science Department, BINUS Graduate Program – Doctor of Computer Science
Bina Nusantara University

Jl. K. H. Syahdan No. 9, Kemanggisian, Palmerah, Jakarta 11480, Indonesia
{ karto_i; harprabowo; RKosala; atrisetyarso }@binus.edu

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ABSTRACT. *The Information Overload (IO) phenomena have occurred since the digitization initiated. In this respect, IO research case areas are evolving and varying through the times. In line with this, the researchers undertake IO related studies in a myriad of fields and offer a diverse solution. In regard to the idea, this study aims to summarize the implemented solutions to solve various IO research case areas. The research applied Systematic Literature Review (SLR) method to collecting, analyzing and synthesizing the relevant IO papers. The research consists of eighty-six relevant IO papers and represents six electronic databases. The topnotch solutions in this research are categorized into Information Processing, Application Utilization, and Information Searching. In this sense, the case areas of Education, Organizations and Research Dataset represent the most highlighted research fields. The research contributes to subsequent studies and contemporary state of the art IO references eventually.*

Keywords: Information Overload (IO), IO solution, IO research case areas, Systematic Literature Review (SLR)

1. Introduction. In recent years, various scientific papers related to the Information Overload are developing [1-3]. The discussion related to this topic provides limitless opportunity although Information Overload (IO) science has long been introduced by Jacoby et al. since 1974 through their paper [4]. Importantly, the phenomena of research related to the topic of IO are evolving along with technological developments, socio-cultural, and current digitalization conditions [5-7]. However, a series of studies depicted unassociated systematic research to summarize the implemented research and the solutions in distinctive research case areas. In this corridor, the research recapitulated IO research case areas and the solutions applied.

The IO represents a condition where users receive massive information more than they can process principally [1,8]. Then, additional information load no longer impacts on an information advantage to users. In this case, the term Information Overload entitles various synonyms and related terms, such as information glut, cognitive overload, sensory overload, communication overload, knowledge overload, and information fatigue syndrome. Undoubtedly, the research communities abbreviated Information Overload as IO. Graphically, Figure 1 described IO as an inverted-u curve [1,9].

Figure 1 provides the illustration of IO in general where the addition of information load (horizontal axis) will have a positive impact on the information advantage (vertical axis). Following that, the additional information has a no longer positive impact or saturated,

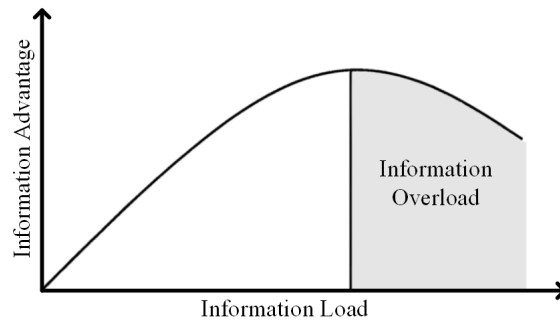


FIGURE 1. Information overload curve

even decreases [1,10]. In this respect, as visualized by the shaded area, the condition over the peak decision accuracy represents the IO. On the direction of the vertical axis, the information advantage represents the benefits gained from information usages, such as decision accuracy [1], productivity [9], performance [11], and decision effectiveness [12] at the end.

The significance of the study emphasizes on the information retrieval. In this vein, its concern leads to IO research implemented with a diverse background of studies. Moreover, the study will also elucidate the information such as applied multitude solutions in various case areas of the IO research. At this point, a variety of interesting information related to the field of IO research is collected from research papers eventually.

In this lens, the main purpose of this paper points out the solution of IO contributions in the field of study with a variety of cases based on the SLR method. Importantly, the researchers garnered related research papers based on SLR characteristics to answer the Research Questions (RQs) as follows:

RQ1: What solutions have been applied to Information Overload issues for each field of research? And how about the year of distribution?

RQ2: What are the research case areas that have been done on the Information Overload topic?

Previous work related to this study has been conducted by Melinat et al. in 2014 with year of distribution ranges between 2006 and 2013 with 17 research papers [13]. According to the study Melinat et al. have answered seven research questions that will be pointed out in this study. In addition, this SLR contributes to the scientific knowledge on computer science related by studying the implemented IO solution comprehensively, identifying the research case areas in the existing literature of IO, and contributing for further research and contemporary IO references. The structure of the paper comprises four sections, i.e., the introduction, methodology of the systematic review process, SLR result findings, and conclusion.

2. Methodology. The research applied Systematic Literature Review (SLR) method and complied with Tranfield et al. [14], Kitchenham and Charters [15] and Okoli and Schabram[16]. Based on the literature, SLR encompasses a sequence of activities such as planning (determining the research questions), conducting (search literature, study selection, and data synthesis), and reporting (report writing) [15,16]. Figure 2 exhibits the SLR model.

Firstly, in the planning activities, researchers define the Research Questions (RQs) based on the background introduced in Section 1. As this backdrop, this study contains two RQs that focus on colligating the implemented solutions to solve various IO research case areas and observing the case areas in the IO research field.

Secondly, administrative activities consist of the search strategy, study selection, and data synthesis. In this corridor, the search strategy activity encompasses the searching

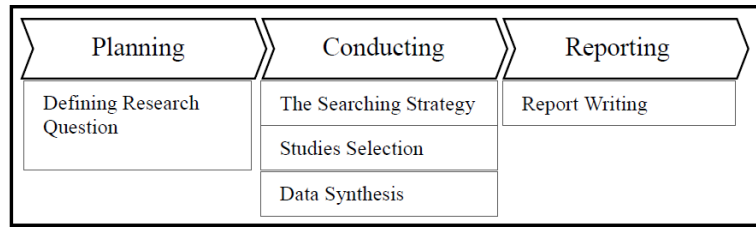


FIGURE 2. SLR model

terms, literature resources, and searching process. The derivation of research questions defines the search term. It then identifies the synonym for the search string. The initial search strings involved “information overload”, “information overload solution” and “information overload research case area”. Moreover, the terms used to search the journals in answering research question are undertaken by combining of boolean operators (AND and OR). These terms incorporated two combinations, i.e., (information overload OR IO) AND (information overload solution OR IO solution) and (information overload research case area OR IO research case area) AND (information overload issues OR IO issues).

The review refers to six electronic database resources including the ACM Digital Library, Emerald Insight, IEEE Explore, Researchgate, ScienceDirect, Taylor and Francis Tandfonline and Others to extract the data based on the title and the abstract. The Others involved research papers from Google Scholar website. Following that, the search terms are inserted into each publisher and then hundreds to thousands of general topics-related journals are displayed. It ushered to the relevant journals that are stored in the reference management tools for selection activities accordingly.

The study selection was divided into three stages as shown in Figure 3. Firstly, the selected journals are populated into 430 relevant papers to be reviewed, then categorized as ‘studies found’. At the next stage, the abstract of each appropriate journal is evaluated based on both research questions. In this case, duplicated and irrelevant papers were excluded, leaving only 201 papers that are grouped as the ‘candidate studies’. The filtering of the journals is continued at the third stage. The appropriate journals are downloaded and perused to answer both research questions. They are categorized as ‘selected studies’.

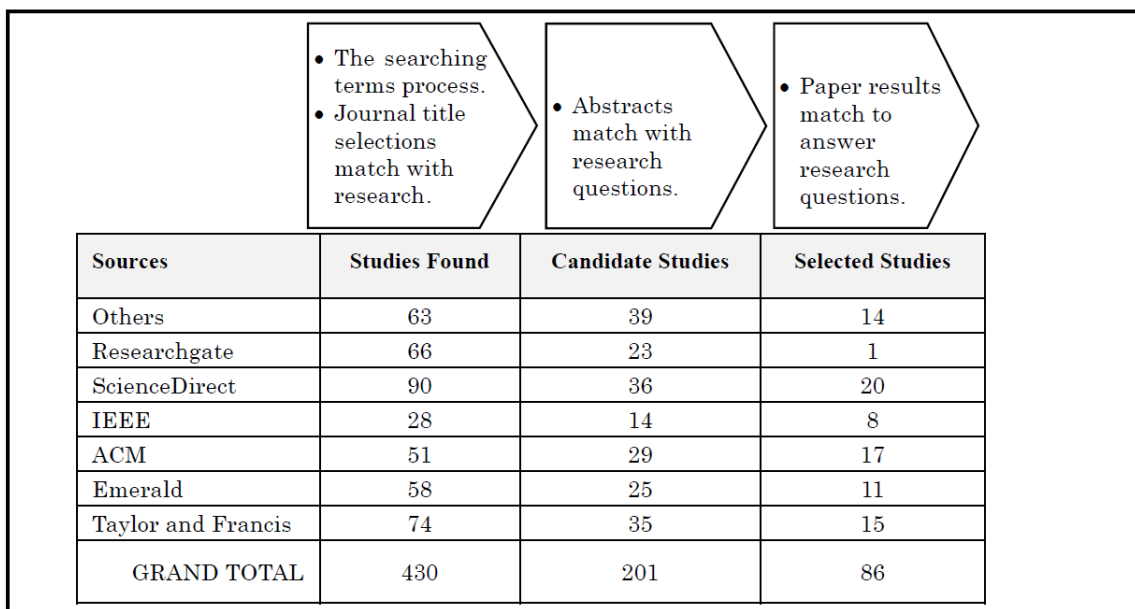


FIGURE 3. Steps for selecting journals and data extraction

TABLE 1. IO solutions and year of distribution

Solutions	Year Distribution	1995	1999	2000	2001	2002	2003	2004	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	Total
Information Processing		1	3	1				1					1	1	2	1	1	1	2	3	2	20
Application Utilization					1				1		1	1	1	1	1		1	3	2	4	2	19
Information Searching	1					1			1	1	1	1			1	1	2	1	2	2	3	18
Self/Behavior Management													1			1	2	1	3		1	9
Information Filtering					1					1								1	1	2	1	7
Information Reduction																			1	1	2	4
Recommendation System																	2				2	4
Ontology								1										1		1		3
Classification		1																1				2
Grand Total		1	2	3	1	2	1	2	2	2	2	2	3	2	4	3	8	9	11	13	13	86

Finally, 86 papers are approved for the data synthesis of evidence after conducting the exclusion criteria and screening of the detailed abstracts and full texts.

These 86 journals were collected in the span of about recent two decades. The year distribution and the number of selected journals can be seen in the grand total row of Table 1. Most of the journals have been collected in the last five years between 2014 and 2018 with fifty-four journals. Mathematically, this number shows 64%, i.e., 54 journals of 86 journals selected. The largest journal productions are collected mostly in 2017 and 2018 with the number of 13 journals annually. Table 1 shows the trend of research in the field of IO continuously to increase every year.

3. SLR Result. This discussion report presents the review findings of data synthesis to answer the RQs. Based on 86 papers collected, an investigation was conducted to answer RQ1: What solutions have been applied to Information Overload issues for each field of research? And how about the year of distribution? Based on the SLR method and the analysis of 86 selected journals, the researchers recognized nine solutions to solve IO concerns that are distributed from 1995 to 2018. The solutions of IO and the years of distribution are shown in Table 1. This table presents the solutions sorted by a total number of applied journals publication descendingly. Presumably, one journal applies more than one solutions combination. In this context, the researchers categorize the solutions into a group of majority or dominant one based on the assumption.

The solutions described are summarized from a publication stating the solution to solve the IO problem. Table 2 represents the description of each solution and its supporting journals concurrently.

Table 1 states that the three most widely implemented solutions for solving IO consist of Information Processing, Application utilization, and Information Searching. Each solution is represented by 20, 19, and 18 journals respectively. Total publications that apply these solutions amounted to 57 of 86 journals or 66%. In consonance with RQ2, the researchers intend to answer the following question: What are the research case areas that have been done on the Information Overload topic? Based on the SLR method and the analysis of the 86 selected journals, researchers recognized eighteen research case areas. Graphically, Figure 4 described the eighteen research case areas which are sorted by a number of the journal. The top three research case areas thematized on Education, General Organization, and Research Dataset. Each research case area indicated 11, 10, and 9 journals consecutively.

4. Conclusions. The study presents an overview of the implemented solution on Information Overload issues by applying Systematic Literature Review (SLR) method. All selected relevant research contains 430 papers. The category is labeled as 'studies found'. It is then filtered by abstract into 201 papers and categorized as 'candidate studies'. Ultimately, the reading process filtered the full text into 86 papers and categorized as 'selected studies'.

Based on 86 selected studies, an investigation was conducted and then analyzed into nine solutions to address IO issue. These nine solutions shed light on Information Processing (20 papers), Application utilization (19 papers), Information Searching (18 papers), Self/Behavior Management (9 papers), Information Filtering (7 papers), Information Reduction (4 papers), Recommendation System (4 papers), Ontology (3 papers), and Classification (2 papers). This result answers the first research question, i.e., what solutions have been applied to Information Overload issues for each field of research? The detail of this result is presented in Table 1 and Table 2.

The fields of research cases that are related to the IO topic are highlighted to answer the second research question. The case area and the number of papers included eleven Education papers, ten General Organization papers, nine Research Dataset papers, eight

TABLE 2. IO solutions description and supporting journals

Solutions	Description	Supporting Journals
Information Processing	The information collected is processed using various methods which increase the value of the information. The value serves as the optimizer and assistant of users in using information. Processing the information can be done manually, automatically, or by an agent. Information processing is also applied to various modern algorithms to solve the increasingly complicated problem of the information and user's needs.	[5,17-35]
Application Utilization	The use of the application is the most commonly used way to solve IO problems. The researchers find out many applications, such as Knowledge Management System (KMS), Document Management System (DMS), Email embedded Software, Electronic Knowledge Repository, Questionnaire System, and Personal Information System.	[3,12,36-52]
Information Searching	Information searching is one of the most common and most widely used information processing methods to generate valuable information for users. Generally, the information is sorted by alphabet, number, date, and price.	[7,53-69]
Self/Behavior Management	The solution focuses on improving personal skills in processing information, or building behaviors that enable it easier to understand the information.	[2,70-77]
Information Filtering	Utilizing technology to filter information and eliminate excessive sources is also effective in addressing IO issues and is increasingly popular in recent years.	[21,78-83]
Information Reduction	Reduced accessed information is the most basic and logical solution to solve IO problems. It becomes more popular recently.	[84-87]
Recommendation System	Recommendation systems enable and influence the users positively based on the information presented.	[88-91]
Ontology	The ontology-based solution is built on a better understanding of the concrete need for knowledge. The solution is more efficient and effective to gain the knowledge that the user needs.	[92-94]
Classification	Classification system processes the information based on the diversity to handle IO problem.	[6,95]

Corporate Organization papers, seven Internet and Website papers, seven Healthcare papers, six Social papers, six Personal papers, five Business Organization papers, three E-Commerce papers, three Library papers, three Banking and Finance papers, two Government papers, two Transportation papers, one Oil and Gas Sector paper, one Military paper, one Museum paper, and one Hospitality papers. This indicated that in the field of IO, the research case areas are widespread in various fields. The number of papers in the order of 4, 5, and 6 in this research illustrates that their significance is small compared

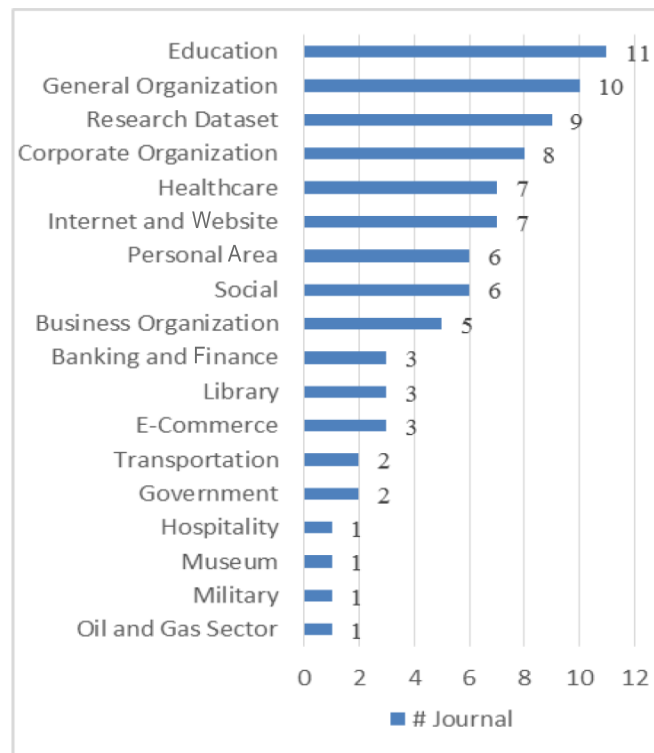


FIGURE 4. Research case areas in the IO topic

to the top three papers in the fields of Education, Public Organization, and Research Dataset.

The study set some parameters in finding the related works of inaccessible literature. Hence, the study recommends the research with an abundant database to achieve the fact of the IO resource solutions. This work was performed in the period of early 2018. It functionates as the future research reference for 5 to 10 years from now. The study requires further research to update with contemporary issue accordingly.

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