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Standing on the Shoulders of Giants: Challenges and Recommendations of Literature Search in Information Systems Research

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Abstract:

The "standing on the shoulders of giants" metaphor is often used to acknowledge the work of others when undertaking research and, in particular, stresses the importance of literature reviews in scientific inquiry. Though the significance of literature reviews has never been in doubt, researchers, especially novice researchers, still struggle with developing effective strategies for reviewing literature. An important reason for this difficulty is the rapidly increasing number of potentially relevant publications—not all of which necessarily add value to a literature review. As such, avoiding standing on the shoulders of dwarfs literature search emerges as a major issue in crafting an effective literature review. In this paper, we discuss challenges of literature searches in the increasingly dynamic context of information systems (IS) research and make recommendations for how to deal with them. We present practical guidelines and a checklist to help researchers with planning and organizing their literature searches.

Keywords: Literature Review, Literature Search, Systematic Literature Review, Dissertation Review, Information Systems.

1   Introduction

Literature reviews are essential in any type of research (Webster & Watson, 2002). They often lead to ideas for new studies because they help to identify research problems and gaps and justify the relevance and timeliness of addressing them. They serve as foundations and frameworks for research projects because they help to develop an understanding of a domain and explain the topic under study. Moreover, because they guide data collection and analysis, they also inform theory development and testing. Done correctly, they can significantly improve the outcome of research projects.

Innovations in IT and the Internet have provided researchers with new ways to collect and organize scholarly literature in crafting a literature review. The Internet and specialized online databases provide ready access to more publications than ever before, and several software products for managing bibliographies, citations, and references allow one to organize publications effectively. Based on these developments, researchers should be much better equipped to conduct literature reviews today than they were 20 years ago. At the same time, however, IT advances have made literature searches far more complex. While the Internet allows fast and easy access to publications, it has also led to a mushrooming of publication outlets. With only a few mouse clicks, researchers are able to retrieve more literature than anyone would be able to read and evaluate in a lifetime. For example, a straightforward search for "knowledge management" with Google Scholar produces more than 950,000 hits (Google Scholar, 2015). Where researchers 20 years ago had to spend considerable time just to compile a reasonably comprehensive bibliography, today they face the opposite problem of "literature overload". The challenge of performing literature reviews has shifted from collecting literature to interpreting it because our technical capacities to publish, distribute, find, and retrieve research information have outgrown our individual ability to read, evaluate, understand, and synthesize the resulting body of work.

As a result, today's researchers are required to develop new approaches to conducting and reporting their literature reviews, a task that inexperienced researchers in particular often find difficult, even overwhelming (Boell & Cecez-Kecmanovic, 2014). This is particularly the case for the literature search task, when the researcher must make several important decisions, including selecting databases and journals, defining search terms, selecting criteria for including and excluding papers, and developing strategies for citation analysis (Levy & Ellis, 2006). These and related decisions are neither straightforward nor easy, especially in the context of IS research.

First, IS research is a highly diverse discipline that covers a wide variety of research themes (Benbasat & Weber, 1996). Therefore, the search for IS studies typically requires one to use several databases and a combination of search strategies, which makes the process of identifying and collecting literature all the more complex and challenging. Second, IS research is a social science that deals with the phenomena of IT design, adoption, and use in various contexts. Researchers have argued that social phenomena are naturally tackled by different fields, which makes searches fragmented and challenging because they have to venture across disciplinary boundaries (Helmericks, Nelsen, & Unnithan, 1991). Third, the number of journals and conferences that publish IS research is rapidly increasing, as is the average length of research papers (Peffers & Hui, 2003). Because the number of academic books published every year is also growing quickly, IS researchers must deal with unprecedented amounts of research information in their reviews. Fourth, IS research often deals with concepts that emerge and disappear quickly ("buzzwords") and topics that are constantly evolving (Bandara, Miskon, & Fielt, 2011), so identifying related works is a special challenge in the IS field. Similar phenomena are often studied under different headings, so there is a risk of overlooking relevant literature.

Given these challenges, IS research has not invested much effort into developing guidelines for conducting literature reviews compared to the efforts that have gone into developing other research methods (Wolfswinkel, Furtmueller, & Wilderom, 2013). This paper addresses this gap by 1) identifying typical challenges that IS researchers are likely to experience in their literature searches and 2) providing recommendations in the form of detailed guidelines on how to deal with such challenges.

The paper is structured as follows. In Section 2, we explain a literature review's general nature and characteristics. In Section 3, we outline several approaches to searching for literature and the activities involved in this process. In Section 4, we address the challenges that typically confront IS researchers in their literature searches, and, in Section 5, we presents recommendations on how to deal with these challenges. In Section 6, we summarize the results in the form of a checklist, and, in Section 7, we conclude the paper.

2   Literature Review: Outcome and Method

The term literature review can refer to both an outcome and a method (Boell & Cecez-Kecmanovic, 2014). The outcome perspective refers to different kinds of literature reviews that serve different purposes, while the method perspective refers to the ways in which one actually reviews the literature.

2.1   Outcome Perspective

From an outcome perspective, literature reviews most often 1) frame and provide background for a research study, 2) review a field as a standalone paper, or 3) provide the review section for a research thesis (Boell & Cecez-Kecmanovic, 2014; Okoli & Schabram, 2010).

Background reviews are usually presented as parts of primary empirical papers, such as surveys and case studies (Okoli & Schabram, 2010). For example, background reviews typically inform the development of research questions and hypotheses in quantitative, theory-testing studies, while they provide an orienting framework for data collection and analysis in qualitative, theory-generating studies (Creswell, 2009). In design-oriented studies that deal with creating and evaluating IT artifacts (Hevner, March, Park, & Ram, 2004), background reviews help to justify the novelty of design ideas against related works and to identify existing methods and models that can inform the design process[1].

Standalone review papers are research publications that are not grounded in any original empirical data but exclusively draw from extant theoretical or empirical studies. This type of literature review is usually much longer than the background review—often longer even than primary empirical papers. Review papers typically develop new theory, identify potentially interesting avenues for future research, close research areas where enough has been done (Webster & Watson, 2002), and classify and categorize extant research studies to analyze the progress in a field (Okoli & Schabram, 2010).

Researchers have argued that background literature reviews often fail to display the same rigor and structure than the empirical parts of a research manuscript do because "authors have little motivation to push themselves to higher standards for the theoretical background literature review" and peer reviewers "rarely ask for any explanation of how the relevant articles in the review were identified, screened for quality, or analyzed" (Okoli & Schabram, 2010, p. 6). In contrast, standalone review papers tend to be much higher quality, which often makes them even more challenging to write compared with reports of empirical research (MISQ, n.d.).

Review sections of research theses are located somewhat between background reviews and review papers. They often have similar purposes as background reviews, but they are more like review papers when it comes to rigor and length. On the one hand, they review the literature in a field or subfield to provide a solid foundation for the research presented in the thesis and, therefore, strive for coverage. On the other hand, a review section's main purpose is to motivate the research study and establish and demonstrate clearly a research gap that allows the research candidate to claim and justify the originality of their work (Boell & Cecez-Kecmanovic, 2014).

2.2   Method Perspective

From a method perspective, two basic types of literature reviews are commonly distinguished: narrative reviews and systematic reviews (Collins & Fauser, 2005).

A narrative review, sometimes referred to as a "conventional" review (Kitchenham & Charters, 2007), typically draws from the reviewer's experience in a field. With a long tradition in IS research, these reviews are written from the vantage point of the author and, thus, provide a (sometimes critical) overview from the expert's point-of-view. Conversely, they have been criticized for not being comprehensive or balanced in their inclusion of source material or objective in their viewpoints (Boell & Cecez-Kecmanovic, forthcoming; Petticrew & Roberts, 2006).

A systematic literature review, on the other hand, takes a structured approach to identifying, evaluating, and synthesizing research (Kitchenham, 2004; Kitchenham et al., 2009). Such reviews address a specific research question that guides the data collection, extraction, and aggregation process (Turner,

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[1] The term "background review" might be misleading in that literature reviews can play diverse roles in empirical research studies. In grounded theory studies, for example, literature reviews are often conducted *after* the theory generation process to engage with existing theory (Glaser & Strauss, 1967).

Kitchenham, Budgen, & Brereton, 2008). Systematic reviews have gained momentum in IS research for offering an explicitly scripted and reproducible review process (e.g., Bandara et al., 2011; Levy & Ellis, 2006; Okoli & Schabram, 2010; Wolfswinkel et al., 2013). At the same time, systematic literature reviews have been criticized for being mechanistic and too focused on identifying literature at the expense of scholarship in performing the actual review (Boell & Cecez-Kecmanovic, 2014; Boell & Cecez-Kecmanovic, forthcoming).

While some researchers use the systematic review notion to refer narrowly to a specific method that has its roots in the cumulative knowledge-creation tradition of the medical disciplines (Boell & Cecez-Kecmanovic, 2014), others use the notion more widely as a qualitative attribute and consider all reviews as systematic to a certain extent (Okoli & Schabram, 2010). Between these views, this paper uses the systematic review notion to refer to a class of literature review that is more structured in its approach than conventional reviews but that does not advocate any specific method: if a literature review follows an explicit method, regardless of the kind of method, we consider it a systematic literature review; if not, we consider it a narrative literature review. This distinction is independent of the outcome, and we do not compare these approaches or argue in favor of one or the other. However, the narrative review style is more suited for experienced scholars who are able to synthesize the literature in a particular field based on their experience and expertise, while less experienced researchers are likely to benefit from more systematic, guided approaches.

Therefore, Fink's (2010, p. 3) definition of a research literature review as "a systematic, explicit, and reproducible method for identifying, evaluating, and synthesizing the existing body of completed and recorded work produced by researchers, scholars, and practitioners" corresponds to what we understand as a systematic literature review. This definition emphasizes the methodological part of literature reviews, the three key activities of searching, appraising, and synthesizing the literature, and the variety of potentially relevant publications with which researchers must deal in their reviews. It also suggests the need to describe the review method in sufficient detail to make reviews more explicit and reproducible for readers.

3   Searching the Literature: Role and Process

Literature reviews can serve many purposes. They help researchers to understand a domain, to uncover gaps in research and develop an agenda for their research project, to justify research problems by showing their importance, to learn about the evolution of ideas, to identify the research methods and strategies that are common in an area, to identify authors who are active in a field, to synthesize existing research, and to overcome conflicts in the literature (e.g., Hart, 1998; Helmericks et al., 1991; Levy & Ellis, 2006; Okoli & Schabram, 2010; Webster & Watson, 2002). The literature search contributes to achieving all of these goals.

One can broadly divide the process of conducting literature reviews into the literature search, selection, and synthesis phases. Each of these phases involves several detailed tasks, such as retrieving, reading, mapping, classifying, and interpreting publications and presenting and writing up the findings (Boell & Cecez-Kecmanovic, 2014; Fink, 2010; Levy & Ellis, 2006; Okoli & Schabram, 2010; Webster & Watson, 2002). Because many of these activities are intertwined, this tutorial focuses not only on the search process but also on the two closely related activities of selecting and retrieving publications to review.

The literature search is a salient part of any literature review but particularly of systematic literature reviews. The literature search refers to the process of collecting data in literature reviews, and, much like collecting empirical data for surveys and case studies, it is important to thoroughly plan the procedures for collecting data in the literature search. Failures in the activities related to the literature search (e.g., overlooking relevant publications, excluding relevant publications, and using flawed metadata in reference management) can have a considerable impact on the resulting review's quality.

Depending on whether the review process is organized sequentially or iteratively, the literature search's role will also be interpreted differently. The "sequential review approach" uses step-by-step processes, with the literature search among the first of these steps. Literature reviews of this type are basically three-phased processes of input (searching), processing (analyzing and synthesizing), and output (writing) (Levy & Ellis, 2006). There are many descriptions of sequentially organized review processes, each with its own focus and level of detail, but these models all expect the researcher to complete the literature search (to a greater or lesser degree) before analyzing and synthesizing the literature.

Literature reviews can also undertake an iterative process; that is, the intertwined activities of searching and reading literature. Boell and Cecez-Kecmanovic (2014) use hermeneutics to explain how the activities of searching/acquiring and analyzing/interpreting research studies engage with each other in a literature review. The "iterative review approach" expects researchers to start their reviews with a literature search, to learn about new themes and concepts during the reading process, refine and extend the initial search to collect additional related works, and repeat the process until the researcher is satisfied with what was learned.

Which review and search process is better suited for a particular literature review depends largely on the type of the review. Research review, research synthesis, literature analysis, meta-analysis, state-of-the-art-analysis, bibliometric analysis, and related terms are often used synonymously, although some of them carry a broader meaning than others. Perhaps most common is the distinction between the literature synthesis and the meta-analysis (e.g., Baumeister & Leary, 1997): while a literature synthesis describes, summarizes, and integrates academic literature conceptually (Webster & Watson, 2002), a meta-analysis uses more formal, statistical techniques to combine and aggregate data from various sources (Fink, 2010). Also, meta-analyses in IS research often collect publication metadata (e.g., publication year and outlet) and analyze and classify the literature in terms of the type of research performed (e.g., research strategies and methods) (e.g., Poeppelbuss, Niehaves, Simons, & Becker, 2011; Wareham, Zheng, & Straub, 2005).

No single approach to conducting a literature search for a specific type of review exists. However, literature reviews such as meta-analyses that take a quantitative stance often apply sequential procedures to collecting and analyzing the academic literature. In contrast, the iterative approach to searching and interpreting literature tends to guide theoretical, concept-centric reviews and syntheses.

In summary, literature reviews can be either an outcome, such as with review papers and background reviews, or a method. If the review method is emphasized and an explicit method (organized as either a sequential or an iterative process) is applied, we refer to it as a systematic review in this paper; otherwise, we call it a narrative review. Regardless of which process is chosen, the literature search is always an important activity even though there is no single approach to doing it. In more quantitative reviews, such as meta-analyses, the literature search is often a single activity at the outset of the review that is completed before the analysis begins, while the concept-centric literature synthesis often requires the researcher to search for literature several times and to engage with the literature in an iterative learning process.

4   Literature Search Challenges

Independent of the review type and method, several challenges can make literature reviews and searches in IS research difficult. Scholars in disciplines other than IS have developed guidelines, but, as a multi-paradigmatic and highly diverse discipline (Benbasat & Weber, 1996) that spans the boundaries of several academic areas and faculties and one that is located at the intersection of the social and the technical sciences, IS research poses unique challenges.

4.1   There is No One-Size-Fits-All Approach to Searching the Literature

Compared to other disciplines, IS researchers pursue differing research objectives in their studies, and delivering answers to these questions requires similarly differing research designs. Differing research designs, in turn, often involve differing forms of literature reviews, so the role and structure of the literature search also differs significantly. Just as there is no single approach to writing a review paper (Schwarz, Mehta, Johnson, & Chin, 2007), there is also not one approach for literature search.

For literature reviews, the focus of interest (e.g., research outcomes, research methods, or theories) and associated goals (e.g., integration or criticism) vary, as do coverage (e.g., representative or selective) and organization (e.g., conceptual or historical) (Cooper, 1988; Fettke, 2006). While there are only few guidelines for literature reviews and searches in IS research, the ones that exist are not universally applicable but must always be assessed for their applicability to a particular study because they rarely meet specific research objectives. Compared to primary empirical research methods, common standards for conducting literature reviews (and searches) are lacking, and the diverse nature of research studies in IS makes developing individual strategies for searching the literature particularly difficult.

4.2   The Number of Research Publications is Increasing Rapidly

IS research results are created and published at a higher rate than ever before (Peffers & Hui, 2003). The ever-increasing number of books and book chapters, journal papers, conference and workshop papers, and so on often prevent researchers from including all available sources in their literature reviews, even though the goal of systematic reviews has traditionally been "to comprehensively identify, appraise, and synthesize all the relevant studies on a given topic" (Petticrew & Roberts, 2006, p. 19; emphasis added).

Calls for comprehensive or exhaustive literature reviews cannot be answered in many of today's reviews; depending on the topic, much work has to be omitted from the review, which is why inexperienced researchers in particular tend to worry about the scope of their literature reviews. They often hope to use their literature reviews to understand and conceptualize the topic they plan to study, to find research ideas, and to refine them into research problems. However, knowing that there is much more literature available than they can ever include in their reviews, they often feel anxious and confused about the originality of their ideas and the conceptual completeness of their research.

4.3   Literature Searches Often Lead to Unexpected Results, so it is Difficult to Plan the Search

Conducting a literature review, no matter what type it is or which process it follows, requires the researcher to plan the search. However, developing a search strategy is not straightforward, especially not in IS research. Even strategies that are thoroughly thought out often do not work as expected. In particular, the number of publications that a predefined set of search terms will produce can hardly be estimated at the outset of a review. Certain search terms might sound promising in the beginning but, in the end, might lead to a limited number of publications that do not justify doing a review or to an overwhelming number of results that make a review virtually impossible. The number of retrieved publications can be small when new types of technologies ("buzzwords") are studied, which is not uncommon in an IT-oriented discipline such as IS, and it can be large when it turns out that these new technologies have already been already studied under different labels.

In addition, IS researchers have to collect their literature from various databases (Levy & Ellis, 2006), which further complicates how one selects search terms. It is sometimes difficult to know whether search terms are too broad or too narrow because they often do not work for all databases in the same way. While some databases might deliver only a few publications for a given set of terms, others may produce endless result lists. What's more, search terms are only one out of several parameters to be considered in a literature search, so it can be difficult to predict how many sources a search strategy will produce.

4.4   Online Databases Differ Regarding Coverage and Functionality, and They are Highly Volatile

Using several databases for retrieving literature leads to another issue. Depending on the review's scope and objectives, it can be time-consuming to decide which databases to use when considering that IS research currently has more than 700 active journals (Lamp, 2004). In addition, many of these journals are not indexed in the most common databases. However, even if a database offers access to a specific journal, it may not offer all of the journal's volumes and issues (as a matter of coverage) or the opportunity to browse and read the journal (as a matter of subscription). Moreover, in fast-moving fields such as IT and IS, conferences typically play an important role in the research dissemination process. Still, most databases only index journals, so any literature search that relies exclusively on databases (e.g., to ensure replicability) can be implicitly biased against conferences and, thus, more recent ideas and novel technologies.

Databases also differ in terms of their functionality, which includes not only basic features such as search operators (e.g., quotation marks) and search fields (e.g., publication types) but also the underlying search algorithms, which are often not so obvious. For example, some databases allow full-text searches even if one does not have a full-text subscription, while others do not. Even the use of stop words differs significantly, and many keywords in IS research involve terms such as "IS" and "IT" that are often treated as stop words. Therefore, using several databases in a literature search can require the researcher to conduct the same search in more than one way, and, considering the high volatility of databases in terms of their coverage and functionality and the many available subscription models, the same search can produce different results if it is conducted at different points in time and/or place.

4.5   It can be Difficult to Evaluate the Quality and Relevance of Publications

Based on an analysis of 37 literature reviews including meta-analyses, Allen and Olkin (1999) calculate that completing a systematic review takes an average of 1,139 hours (as cited in Petticrew & Roberts, 2006, p. 49). Since the number of publications that may be relevant to a review is usually high, it is easy to find an enormous number of relevant publications in very little time via the Internet. However, one must wonder about the usefulness of having hundreds of publications if there is not enough time to read. As time typically becomes a serious issue in the later stages of the review, the up-front screening of publications retrieved from the literature search is key to effective time management.

Screening the literature for applicability requires identifying publications that would not add value to the review and excluding them from further analysis. Such screening is usually done by reading the publications' abstracts, which can save time in the later phases of the review that require thorough reading of the full text. However, even the screening phase can be time-consuming, which is why searching and screening the literature are deeply intertwined activities: search parameters that are too broad produce exhaustive results, so selecting the literature for the review is likely to take considerable time, while search parameters that are too narrow can save time but risk overlooking relevant literature.

However, IS research does not provide common guidelines for screening literature. The criteria that are most often used are quality and practical relevance (Okoli & Schabram, 2010), but it can be difficult, especially for inexperienced researchers, to assess the relevance and quality of research papers at the outset of a study. What's more, quality criteria from other disciplines (some of which prefer quantitative over qualitative approaches, for example) are often not applicable to IS research due to its multi-paradigmatic nature, and practical criteria are typically arbitrary (Okoli & Schabram, 2010).

4.6   The Retrieval and Storage of Research Literature is Often Messy and Time-Consuming

Not too long ago, researchers had to physically travel between libraries and archives to collect literature to build their studies' bibliographies. Today, the Internet allows researchers to search for and retrieve publications quickly and easily. Even so, acquiring some publications can still be challenging. Since database subscription costs can be expensive, a researcher's local library might not provide access to all of the sources that carry IS research, and, even if it does, it still can be difficult to access papers published in less popular journals, papers presented at conferences or workshops, or books and book chapters free of charge. Some universities offer a central point of access for the literature search, a "meta-search" or "cross-search" (Boell & Cecez-Kecmanovic, 2014). While using such portals is convenient, it risks overlooking relevant literature. Inexperienced researchers in particular are often unaware of their university's online libraries' coverage.

Storing and managing retrieved publications has its pitfalls, too. Reference management software helps to collect publication metadata quickly and to assign file names automatically, but metadata downloaded from the Internet is often not standardized and can be inconsistent. As a result, retrieving and storing literature for review might be both time consuming and lead to citation errors in later publications.

4.7   It is Not Easy to Tell When a Literature Search is Finished

A literature review can quickly become massively complex, and the same is true for the literature search. While it has to stop at some point, it is not easy to tell exactly when the search is finished. IS researchers typically strive for a certain level of saturation before they conclude their reviews (e.g., Helmericks et al., 1991), but it is not easy to achieve or even to measure saturation, which depends on the review type. In a review paper, saturation often means that including more publications would not reveal any new concepts, ideas, or arguments that add value to the review (Levy & Ellis, 2006; Webster & Watson, 2002), while the saturation level of a background review is often determined by the degree to which it establishes confidence in the novelty and importance of the research problems, questions, and hypotheses (Boell & Cecez-Kecmanovic, 2014).

A literature search usually reaches saturation if it does not produce any new citations that are of potential relevance, or, in other words, if further searches either deliver only irrelevant publications or publications that have been found already or those that do not add to what is known from the ones already found (Levy & Ellis, 2006). However, it requires considerable knowledge and understanding of the subject matter to determine whether the coverage of a literature search is satisfactory, which also depends on how

"coverage" is understood. Since it is often the review's objective to establish just such knowledge and understanding of a domain, measuring saturation is especially challenging if the search and review process is sequentially organized and does not follow an iterative process of searching, reading, and learning.

4.8   Search Results Often Differ, so Teamwork can be Challenging

Although there are exceptions, such as dissertation reviews, most of the literature reviews in IS research are crafted in teams because literature reviews require various methodological and subject-related skills and take considerable time, which makes effectively dividing labor and coordinating work an important reviewing skill. Since researchers' readings and interpretations of research literature can vary, teamwork is another challenge in compiling literature reviews (Okoli & Schabram, 2010; Turner et al., 2008).

During the literature search, reviewers might share the work and take responsibility for individual tasks according to mutually agreed-on procedures and criteria to ensure consistent and replicable search results. However, even a well-defined search strategy can come with collaboration issues that may compromise the results of the literature search. For example, databases or publications are often assigned to individual researchers to save time, but databases differ in functionality, so the reviewers often have to adjust predefined search strategies. Some search fields may not be available and the search strings may even have to be changed (e.g., regarding the use of stop words).

In addition, screening publications for relevance is necessarily a subjective task, especially if no appropriate evaluation criteria are in place, so dividing the screening work can lead to inconsistent results. Collaboration issues can also arise when reviewers conduct their searches from different locations (e.g., jurisdictions that are serviced under differing licensing conditions by publishers) or under different subscription levels or if they manage the references differently or name and store the retrieved files differently. Working on search engines with different coverage of the search space can be confusing for team members and hamper any claims of coverage and the decision concerning when to stop the search process.

5   Recommendations for Conducting Effective Literature Searches

Although literature reviews come with several challenges, many of which are clearly IS related, the literature review method has not received as much attention in IS research as other research methods have (Wolfswinkel et al., 2013), and the few approaches that have received attention tend to focus on activities other than the search process (Boell & Cecez-Kecmanovic, 2014). As Bandara et al. (2011, p. 1) point out, "While the importance of literature studies in the IS discipline is well recognized, little attention has been paid to the underlying structure and method of conducting effective literature reviews". For their part, Okoli and Schabram (2010, p. 1) observe "an abundance of guides to conducting such reviews in other research fields, (but) none entirely meet the unique needs of IS researchers". As a result, IS researchers lack guidelines and often have difficulty searching the literature in a way that suits their research objectives.

The following guidelines address the identified challenges to support IS researchers in planning and conducting their literature searches.

5.1   Develop an Understanding of the Subject Matter at the Outset of the Search

Researchers often face a dilemma at the start of a literature review. In many cases, they conduct literature reviews to develop an understanding of a subject matter or domain, especially at the outset of larger research projects such as dissertations, but conducting the search requires the researcher to understand the subject area to a degree, especially if the review process is organized sequentially. For example, defining keywords, evaluating publications' relevance, and assessing the literature search's coverage require solid domain knowledge.

While novice researchers especially face the task of developing a thorough foundation for the review before it starts, examples of high-quality literature reviews in IS demonstrate this issue is a common one. For instance, Leidner and Kayworth (2006) grounded their review of culture in IS research in non-empirical manuscripts and leading books to broaden their understanding of the empirical studies in the field, Melville, Kraemer, and Gurbaxani (2004) collected studies on IT and organizational performance based on keywords from a definition of IT business value they developed at the outset of their review, and

Glass, Ramesh, and Vessey (2004) began analyzing the computing science literature by developing a classification scheme that later guided their coding process.

These examples demonstrate that researchers can employ any of several strategies to build a foundation for a review and to increase their familiarity with a subject area in a review's early phases. Thus, novice researchers will find it useful to begin a review by reading sources that are likely to provide topic summaries and overviews of the key issues in the area they wish to research (Baker, 2000), such as extant review papers in their own or adjacent areas (Boell & Cecez-Kecmanovic, 2014). Review papers are among the most frequently cited papers in most fields, so finding them is not usually difficult, and most databases allow researchers to search for publications of a specific type, including literature reviews.

Other sources that help a researcher engage with a topic are encyclopedias, textbooks, and edited books if they are sufficiently current. These sources provide good introductions and list a field's most important publications. IS research does not yet have an online encyclopedia, but there are encyclopedias in book form (e.g., Khosrow-Pour, 2014). Another good way to gain an overview of the current status of a field or subject area is to follow the calls for papers for journals' special issues and for conference tracks and workshops. This approach is particularly helpful in identifying relevant search terms that cover one's subject area. Of course, recommendations from supervisors also help novice researchers understand a subject before they start their reviews.

5.2   Justify the Literature Review and Literature Search

Students at the graduate and undergraduate levels in particular often lack a proper understanding of a literature review's role. As with any research, literature reviews do not present an end in themselves but are conducted to serve a certain purpose (Okoli & Schabram, 2010). A literature review is both an outcome and a method, and, from a method perspective, literature reviews are guided by research problems, which provide their justification.

Research problems take diverse forms, and, while many of them require empirical modes of inquiry, some require literature reviews. For example, developing new theory often requires one to conceptually synthesize the literature, and research agendas can hardly be developed without engaging with existing literature (Webster & Watson, 2002). Moreover, quantitative literature studies such as meta-analyses are often conducted if large numbers of publications on a subject have made developing an orienting framework necessary to categorize past studies and guide future research (Okoli & Schabram, 2010) or if the quantitative aggregation of past results allows an increase in statistical power (Cohn & Becker, 2003).

For example, Ahuja (2002) explores the role of women in the IT profession based on an integrative literature synthesis because a number of contemporary drivers had made it necessary to explore barriers to promoting women in IT. Gerwin and Barrowman (2002) conducted a meta-analysis on the characteristics of integrated product development based on a substantial critique of empirical studies in the field. Wareham et al.'s (2005) meta-analysis explored the major domains, themes, and methods in the e-commerce literature because the sheer number of e-commerce publications had made a survey of the research field necessary. Each of these authors' justifications for their reviews differed from the others, and their literature search processes differed as well. While Gerwin and Barrowman (2002) grounded their meta-analysis in a database search, a search in fifteen journals from a variety of disciplines, and a review of the reference lists of papers retrieved from these searches, Wareham et al. (2005) searched in the mainstream academic and professional journals in the IS area to track divergences between research and practice.

Therefore, the reasons for carrying out a literature review directly affect the literature search, which is why quantitative literature studies often have more references than qualitative, conceptual literature syntheses do. For instance, Glass et al.'s (2004) analysis of the computing science literature covered 1,485 publications, and Wareham et al.'s (2005) meta-analysis on e-commerce research was grounded in 582 studies. In contrast, Eierman, Niederman, and Adams (1995) conducted a conceptual literature synthesis to develop a theoretical framework of decision support systems research based on a review of only 15 carefully selected papers, and Pateli and Giaglis (2004) developed a conceptual research framework for analyzing e-business models based on 29 available studies in the field. In fact, classifying and categorizing papers usually takes less time than reading, interpreting, and summarizing them does.

Researchers should also be aware of a background review's purpose because it substantially affects the review's structure and presentation. For example, in design-oriented studies, background reviews can help to illustrate the novelty and practical relevance of design ideas or they can identify related works that

can inform the design process—two reasons for conducting the review that also affect how it will be organized and written up. Therefore, researchers should make clear why they conduct the literature review before they start their literature search.

5.3   Define the Search Scope

While justifying a review provides a clear account of why it needs to be conducted, it is similarly important to clarify what will be done. Defining the search scope helps determine the basic features of the literature search before it begins, so it provides an orienting framework for the search and helps the researcher make the decisions that will determine the structure and organization of the search process. Cooper (1988) developed a taxonomy for categorizing literature reviews, an idea we adapt to clarify the search scope (Figure 1). Each of the rows of the framework guide researchers in specifying the nature of the search process.

1	Process	Sequential		Iterative
2	Sources	Citation indexing services	Bibliographic databases	Publications
3	Coverage	Comprehensive	Representative	Seminal works
4	Techniques	Keyword search	Backward search	Forward search

Figure 1. Definition of the Search Scope

1. Process: the search process is based on the literature-review goals. Just as a review can be organized either iteratively or sequentially, so can a literature search. In a sequential review, the literature search is a defined step at the beginning of the reviewing process, although it often has to be refined and updated during the course of the review. Iterative reviews require the researcher to search for literature in a continuous, repeated process that is intertwined with reviewing and synthesizing the literature.

2. Sources: the sources of the search refer to the origins of the data included in the study. Literature searches can draw on databases, publication outlets such as journals, and citation indexing services. Again, the choice to base a search on one or more sources depends on the purpose and goals of the literature review. For example, a review might include only conference publications if the researcher's intent is to uncover the emergence of new issues and trends. Examples of available integrated sources include free services such as CiteSeerX, getCITED, and Google Scholar and subscription-based services such as Elsevier's Scopus and Thomson Reuter's Web of Science (Bandara et al., 2011). There are also other sources for literature searches, such as the search portals that many university libraries offer.

3. Coverage: literature searches can either be comprehensive to collect as many relevant publications as possible or focused to center on the seminal works in a field or subfield. However, it is usually impracticable and sometimes even impossible to collect all publications on a subject area in a comprehensive literature search, so the coverage of a search must be justified. Researchers might also claim that their literature searches are representative by collecting a small number of papers that typify a larger body of publications (Cooper, 1988). For example, a literature review might explore how a certain subject is covered in IS research in particular and so collect publications from only a small sample of top IS journals that represent the discipline.

4. Techniques: finally, the most common techniques of a literature search are keyword searches and backward and forward searches. Backward searching basically refers to collecting appropriate publications by screening the reference lists of the papers retrieved from the keyword search ("going backward in time"), while forward searching refers to collecting appropriate publications that have cited these papers ("going forward in time") (Levy & Ellis, 2006; Webster & Watson, 2002).

Researchers can use this framework to position and plan their literature searches and to organize how they write about what they have done. To provide an example for illustration, we highlight some fields in gray in order to categorize an exemplary literature search from IS research (see Figure 1). Gerwin and Barrowman's (2002) literature search was part of a review paper on integrated product development.

Their search followed a (1) largely sequential process and (2) was grounded in the ABI/INFORM online database and fifteen academic journals (sources). The search resulted in 28 publications on integrated product development, so its coverage (3) was of the seminal works on the subject. The results from the (4) keyword search were complemented with reference-based backward searches (techniques).

5.4 Test and Apply Combinations of Search Parameters

Defining search parameters involves selecting search terms, combining them with the help of search operators, and using appropriate search fields (see Boell and Cecez-Kecmanovic (2014) for a more detailed account of how literature searches are conducted online).

- Search terms and research concepts are not the same thing. Searching by search terms is inherently limited because many terms can be used to describe the same concept. Consequently, defining search terms can be difficult unless one has established a solid understanding of the subject area. A preliminary search for seminal publications can help researchers to identify and select search terms. Reading the seminal papers on a subject helps researchers to learn about the topic and related fields, and the keywords these papers contain will often be applicable to their own searches. In addition, some databases support a thesaurus that can contribute to defining search terms.

- Several search operators can be used to improve results from the use of the search terms by, for example, combining them with Boolean operators into search phrases (e.g., AND, OR). While the exact use and interpretation of search phrases can be determined with the help of brackets, the precision of the search can be influenced with quotation marks (for exact phrase searching) and truncations (for less restrictive searches). Proximity operators (e.g., NEAR, ADJ) can be used to search for terms that are closely related, although they must not appear adjacent to each other as quotation marks would require.

- The search fields are the parts of papers or publication metadata that are searched for the defined search phrases. The most frequently used fields are publication titles, key words, abstracts, and full texts. Selecting search fields has a considerable impact on the search results; for example, a title search will retrieve far fewer publications than a full-text search. Many other search fields can be used that require search terms that are not subject related, such as author names, publication types, and publication years.

Most literature reviews in the IS discipline are conducted with the help of search phrases, which can be broad or narrow depending on the review's scope and objectives. Gerwin and Barrowman's (2002) review on integrated product development, for example, used a comparatively specific search string ("(performance OR schedules OR speed OR time) AND (projects OR sample OR teams OR tests) AND (product)"), while Ngai and Gunasekaran (2007) applied broader descriptors in their review of mobile commerce research ("mobile commerce", "m-commerce"), as did Leidner and Kayworth (2006) ("IT culture", "information systems culture", "IT values") and Wareham et al. (2005) ("eCommerce", "electronic commerce", "electronic business", "e-Business").

Defining and using the search parameters has a significant impact on the search results, so researchers often have to experiment with combinations of search terms and operators (Kitchenham, 2004). Tests of search phrases and their application to various databases also help the researchers to improve their feeling for their subjects. Such tests can also help them refine their search strategy because it can be difficult to predict the results a keyword search will produce. As such, testing the search phrases helps the researcher assess the feasibility and relevance of the literature review and search.

5.5 Use Seminal Sources to Build the Backbone of the Literature Review

Techniques other than keyword searches for finding the publications required for a literature review include backward and forward searches. Researchers should evaluate these techniques' applicability and usefulness against their research objectives and, if they are applicable, use them in combination. The coverage of literature searches can vary, but every literature search should at least cover the most important publications on a topic, for which purpose backward and forward searches are especially helpful (Webster & Watson, 2002). Backward and forward searches help to uncover the seminal publications on a subject because these publications are usually heavily cited by other studies in the field.

Backward and forward searching can be reference based or author based and can be conducted at any of several levels (e.g., second-level or third-level searches) (Levy & Ellis, 2006). For example, a search for "knowledge management" using Google Scholar shows that Alavi and Leidner's (2001) literature review is an authoritative source in the field. The papers provides a suitable foundation for a backward search because its bibliography covers several other relevant knowledge-management studies and for a forward search because it has more than 7,000 citations. Some of these citations are themselves important, heavily cited studies in the knowledge management field, so they may be useful sources for further rounds of backward/forward searching. However, if Alavi and Leidner recently published another paper on knowledge management, it would probably not be on top of the Google Scholar results list because it would not yet have many citations. (Google does not reveal how it sorts its results.) Therefore, neither backward nor forward searches would reveal this more recent work if they are grounded only in citations, while searching for the authors in bibliographic databases or screening their webpages would reveal the new publication. This approach is an author-based approach to backward and forward searching (Levy & Ellis, 2006).

As backward and forward searches are key to identifying the seminal papers on a subject, they have been part of several literature reviews in IS research. For example, Melville et al. (2004) used the citations of papers they identified in their keyword search as sources for their review on IT and organizational performance, and Piccoli and Ives (2005) collected—as part of their review on IT-dependent strategic initiatives—a large number of papers from journals other than those they searched with keywords in a citation-based backward search.

Backward and forward searches help to identify publications that the keyword search did not retrieve, and they can also be used to assess the extent to which the coverage of a literature search is satisfactory because researchers can compare their search results with the bibliographies of the seminal papers in the field. What's more, citation analyses help the researcher to identify important contributions published in outlets other than journals, such as books, which are not covered by many online databases. For example, Alavi and Leidner's (2001) review cites several important knowledge-management books that are not indexed in many bibliographic databases.

Finally, colleagues' recommendations can substantially inform the literature search process. Sharing the search results and resulting bibliographies with colleagues early in the process helps the researcher to collect feedback on the coverage of the literature search and often leads to including other important publications that may have slipped through the net of the keyword search. For example, Krishnan and Ulrich's (2001) review on product-development decisions involved an electronic mail survey of approximately fifty researchers to identify the most influential papers in the field. Contacting colleagues and other experts may also help to identify yet unpublished sources (Kitchenham, 2004). A common mistake of inexperienced researchers is to adhere stubbornly to a defined search strategy and to disregard other potentially relevant publications, but there is no reason to exclude a relevant publication from a literature review if the researcher came across it by means other than the keyword search, even by chance.

5.6   Weigh Feasibility Against Coverage

With the help of techniques such as keyword searches and backward/forward searches, researchers can collect large numbers of research publications for their literature reviews. Still, they may not be satisfied with their search results when an overwhelming number of publications causes them concern that they have overlooked important contributions (Boell & Cecez-Kecmanovic, 2014). It is difficult for new researchers to understand that it is often impossible to collect and read all of the publications on a subject. With the ever-increasing numbers of publications, coverage—not exhaustiveness—has become the relevant measure of saturation.

Some literature reviews in IS research have managed to collect and analyze large numbers of studies. For example, the meta-analyses by Wareham et al. (2005) and Glass et al. (2004) included 582 and 1,485 publications, respectively. There are also examples of conceptual literature syntheses with high levels of coverage. Fjermestad and Hiltz (1998) analyzed 200 studies in their review of experimental research on group support systems, and Melville et al. (2004) and Krishnan and Ulrich (2001) each collected and analyzed around 200 publications for their literature reviews on IT business value and product development decisions. However, because it is virtually impossible to collect all publications on a topic, even the coverage of these reviews was not exhaustive. For example, Wareham et al. (2005) had to restrict their analysis to a set of 28 IS journals due to the breadth of the e-commerce field, and Glass et al.

(2004) also selected a representative set of journals for their analysis of research in the computing disciplines.

Coverage is always a matter of relevance, so researchers should not focus on collecting everything that exists so much as a reasonable number of relevant publications (Petticrew & Roberts, 2006). However coverage is judged or measured, it is likely to increase as the researcher invests more time, but researchers must weigh coverage against decreasing returns on the investment of time. A search with general search parameters retrieves most of the relevant studies but also many irrelevant ones, while a focused search retrieves few irrelevant studies but comes at the risk of missing important publications. Petticrew and Roberts (2006) used "sensitivity" (a high proportion of relevant studies) and "specificity" (a low proportion of irrelevant studies) as measures of relevance, so the more specific a search is, the less time-consuming the later tasks of selecting and retrieving the publications (there is typically a trade-off between specificity and sensitivity). In their review of the decision support systems literature, Eierman et al. (1995) reduced 200 potentially relevant publications to a set of 15 papers that finally become part of their review on decision support systems.

Balancing available time with an appropriate level of coverage can be a challenge. Okoli and Schabram (2010, p. 6) observe that "experienced researchers are familiar with a frequent tendency during the research process to quickly finish the theoretical background section, and then 'go on to the good stuff,' meaning the data collection and analysis", yet even researchers who are willing to spend more time on their reviews may not have the opportunity to do so. In fact, many literature searches, including those that are parts of review papers, are conducted under time pressure (Bandara et al., 2011). Accordingly, researchers who conduct their reviews in a restricted period of time must weigh coverage against feasibility in their literature searches.

5.7 Justify all Decisions Made During the Literature Search Process

A literature search requires the researcher to make several important decisions that concern the selection, combination, and application of search parameters during the keyword search; the scope of citation tracking and analysis; and the appraisal and selection of publications for the review. These and related decisions must be justified and documented to establish confidence in the search results.

Although the choice of search terms should be grounded in a clear understanding of the subject, keywords from other papers may also be used. Existing frameworks and concept mapping can further justify how one selects keywords (Rowley & Slack, 2004). However, using parameters other than search terms, such as publication years and types, should be justified as well; that is, a review must explain the reasons for restricting a literature search to a certain time period or for considering only papers published in certain outlets. For example, Wareham et al. (2005) set the starting date of their meta-analysis of e-commerce research to 1997 because they wanted to have a representative sample of literature from the years before and after the dot.com market crash of 2000, while Ngai and Gunasekaran (2007) consider only studies published between 2000 and 2003 because most of the research in their field (m-commerce) began during that period.

While certain events can justify the time horizon for a literature search, it is more difficult to explain why a search is so narrow as to include only a small number of publication outlets. As an anonymous reviewer cited by Webster and Watson (2002, p. xvi), observes, "studies of the IS literature have consistently been limited by drawing from a small sample of journals. …I just can't see the justification for searching by journal instead of searching by topic across all relevant journals". Books, book chapters, and conference papers are promising sources for literature searches, so there is no reason for excluding them from reviews. (There are several examples of literature reviews in IS that draw from sources other than journals (e.g., Pateli & Giaglis, 2004).) Even so, if a topic must be studied specifically from an IS perspective, the literature search can be grounded in a justifiable set of IS journals and conferences (Bandara et al., 2011). Studies on the core and boundaries of the IS discipline (e.g., Sidorova, Evangelopoulos, Valacich, & Ramakrishnan, 2008), such as many meta-analyses in IS research (e.g., King & He, 2006; Poeppelbuss et al., 2011; Wareham et al., 2005), are good examples.

In such cases, especially in concept-centric literature syntheses, backward and forward searches, which are based on citations rather than on publication outlets, become even more essential to finding relevant literature that the keyword search did not produce. The structure and organization of citation analysis and tracking should be justified not only by explaining which publications provided the foundation for the

backward/forward searches and why, but also by justifying the search range and explaining the reasons for including or excluding papers retrieved from the secondary searches.

Finally, the screening process must be justified and documented. Some general criteria are usually used to exclude papers (e.g., language, availability), and many searches also exclude non-research publications such as editorials and comments. However, it is more difficult to evaluate the quality of publications, especially for inexperienced researchers, and relevance assessments depend largely on the subject. For example, Eierman et al. (1995) included studies of group decision support systems, executive information systems, and expert systems and excluded from the resulting sample papers that did not have a sound theoretical basis and/or the goal of testing or extending existing theory in the field. Lin, Standing, and Liu (2008) initially included in their review a set of 251 virtual-teams studies that discussed the factors that affect virtual teams' effectiveness, compared face-to-face-communication and computer-mediated-communication, or discussed decision support systems in that context. Then they excluded publications that did not provide correlation coefficients and those that used dependent/independent variables that did not relate to the terms identified in the literature.

Several criteria can be used to evaluate the quality of publications (e.g., data collection, analysis, and interpretation) and their relevance (e.g., research method, study context, participants) (Okoli & Schabram, 2010), but the applicability of these criteria varies from review to review, so this search activity is often a highly contextual task, which makes justification even more important. Many scholars suggest using journal rankings to judge the quality of publications (e.g., Levy & Ellis, 2006), but there are many examples of seminal literature that are not published in highly ranked journals. Researchers should keep in mind that a paper's relevance or quality cannot be directly inferred from the ranking of the journal in which it appears.

5.8   Develop a Protocol to Guide and Document the Search Process

A search protocol is a useful way to guide and organize the literature search and to document the decisions made in the process. Several authors have suggested using protocols for systematic literature reviews (Brereton, Kitchenham, Budgen, Turner, & Khalil, 2007; Kitchenham et al., 2009; Okoli & Schabram, 2010), but all types of reviews can benefit from protocols, and they can also support the literature search. A search protocol, as part of the review protocol, should cover all activities involved in a literature search, including selecting and retrieving publications.

As such, search protocols can provide a background and justification for the literature search and describe the search scope, including its objectives. The protocol should also explain how the keyword search will be performed, including the search phrases, databases, and publications involved; whether and how backward and forward searches will be used; how the literature retrieved will be screened for relevance and quality; and how the relevant publications will be acquired and stored. Search protocols also describe when these activities will be performed and, in the case of collaborative reviews, who is in charge of what parts of performing the search. Search protocols should also reveal which software tools are used in the process (e.g., for reference management).

As part of a literature review on systematic literature reviews in the software engineering field, Kitchenham and Charters (2007) provide an example of a protocol that demonstrates how the search process can be described and documented. Their protocol shows who searched which journals and conferences (e.g., Information and Software Technology, Journal of Systems and Software); explains the criteria of inclusion (e.g., systematic literature reviews, meta-analyses) and exclusion (e.g., informal reviews, no peer review), measures for quality assessment (e.g., description of inclusion and exclusion criteria), and the procedures for data extraction (e.g., source, publication year, research question) and analysis (e.g., publication activity, research topics); and identifies the researchers who were contacted in the search and review process.

Search protocols can help researchers plan the literature search in advance, so they should be created as early in the review as possible. However, literature search strategies often change, such as when search terms do not work as expected. Therefore, version management, which documents changes to the literature search and tracks revisions and updates of the search protocol, helps to ensure the search is explicit and reproducible (Okoli & Schabram, 2010). Anonymized search protocols can be submitted with literature reviews to demonstrate academic rigor in the review process, and they can be provided in the appendix of review papers or shared online.

If more than one researcher contributes to the review, the protocol helps to clarify responsibilities and supports research training (Okoli & Schabram, 2010). For example, the protocol explains and defines what criteria will be used for including and excluding papers, so it helps to ensure that all researchers have a common level of understanding for the analysis. In addition, the protocol defines the databases, techniques, and software tools that will be used during the search, which can also indicate the need for training. Even naming files and using basic metadata (e.g., abbreviation of author names) can cause inconsistencies, so a search protocol should explain how to store publications in a standardized way.

6   Conclusion

Researchers face several challenges in planning and conducting their literature searches that range from a lack of guidelines to collaboration issues. Some of these challenges are especially important in the context of IS research, yet most can emerge in any type of literature search, although their significance will differ with the procedures applied. As a response to these challenges, we presented eight recommendations that researchers may find helpful when planning and organizing their literature searches.

We do not present these guidelines as a "step-by-step recipe", nor do we advocate one approach to literature searches, but the guidelines address the identified challenges that are associated with literature searches in the IS field. For example, the recommendation to define the search scope considers that there is no common, standardized approach to conducting a literature search in IS research, and the recommendation to assess coverage and feasibility helps researchers deal with potentially overwhelming numbers of publications. The recommendation to test alternative search techniques can support researchers in dealing with unpredictable search results and in consistently using databases that differ in terms of functionality and coverage. The recommendation to create search protocols supports collaboration, helps researchers define the criteria used to include and exclude publications, and sets standards for storage and retrieval. For their parts, the recommendations to justify decisions made during the literature search and to collect seminal publications through backward and forward searching help researchers proceed to higher levels of saturation and to have confidence in the decision to finish the search. Finally, the recommendations to develop an understanding of the subject at the outset of a literature review and to justify it are important preconditions for a literature search and contribute to overcoming many of the challenges identified.

Identifying the challenges and developing guidelines are grounded in several other IS research publications (e.g., Bandara et al., 2011; Boell & Cecez-Kecmanovic, 2014; Brereton et al., 2007; Kitchenham, 2004; Levy & Ellis, 2006; Okoli & Schabram, 2010; Turner et al., 2008; Webster & Watson, 2002; Wolfswinkel et al., 2013). These and related sources discuss additional issues, but our account presents a fair representation of the challenges that IS researchers typically face in any literature search, regardless of the specific method. We focused on the search process as a specific early-stage element of a literature review because of the increasing number of potentially relevant publications. As Pateli and Giaglis (2004, p. 304) explain, "the selection phase is critical, since decisions made at this stage undoubtedly have a considerable impact on the validity of the literature review results". While there are exceptions (e.g., Boell & Cecez-Kecmanovic, 2014), the literature search has not yet received much attention from IS researchers, so this tutorial can support researchers in their endeavors to conduct effective literature reviews and searches.

Table 1 presents the challenges and guidelines in checklist format.

Table 1. Literature Search Checklist

1. Before the literature search, did I…	
…develop an understanding of the topic?	☑
…justify why the literature review is necessary?	☑
…define an appropriate search scope?	☑
…assess the feasibility and coverage of the search?	☑

Table 1. Literature Search Checklist

2. During the literature search, did I…	
…test alternative approaches to searching the literature?	☑
…use justifiable search techniques and parameters?	☑
…apply appropriate criteria for inclusion and exclusion?	☑
…discuss my search strategies in the team?	☑
3. After the literature search, did I…	
…assess the sensitivity and specificity of my search?	☑
…rigorously document the search process and results?	☑
…compare my results with those of other literature reviews?	☑
…collect feedback from colleagues?	☑

As with the challenges and guidelines, the checklist in Table 1 does not cover all of the issues that are relevant to literature searches, and some of the questions may not apply to all reviews (e.g., "did I discuss my search strategies in the team?"). However, researchers may find the checklist helpful in ensuring that they continuously reflect on their search strategies in terms of assessing and describing whether they addressed these issues and how they did so.

7   Summary

A thoroughly planned literature search can help novice researchers make their way through the increasingly dense publication jungle. It can increase researchers' awareness of the available literature and help them create an orienting map of promising research directions to ensure that they visit areas that are worth studying and avoid less promising ones. The literature search process is important because it determines the coverage of the literature review. Just as surveys require the researcher to calculate sample sizes based on population, the literature search helps researchers define the boundaries in which their review is conducted and position it in the increasingly vast landscape of research publications.

Few publications in IS research have discussed the structure and process of literature reviews. Today's researchers face several challenges in performing literature searches. The search for literature often produces overwhelming numbers of potentially relevant publications, the screening of literature can cause serious collaboration issues, and managing references can be difficult when it comes to storing and retrieving documents. We present several such challenges and recommendations for dealing with them in the course of a literature search. A checklist developed from the challenges and guidelines can help researchers in carrying out their literature searches.

There are several approaches to conducting literature reviews and many possible review outcomes, and the role of the literature search varies in IS research. Because there is no standardized approach to crafting a literature review and search in the IS field, researchers must evaluate the applicability and completeness of the guidelines presented here against their individual research objectives. However, the challenges we discuss are relevant to most literature reviews, so the guidelines should be applicable to most as well

Acknowledgments

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