A Guide to Conducting a Standalone Systematic Literature Review

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Abstract:

Many scholars are not well trained in conducting a standalone literature review, a scholarly paper that in its entirety summarizes and synthesizes knowledge from a prior body of research. Numerous guides that exist for information systems (IS) research mainly concentrate on only certain parts of the process; few span the entire process. This paper introduces the rigorous, standardized methodology for the systematic literature review (also called systematic review) to IS scholars. This comprehensive guide extends the base methodology from the health sciences and other fields with numerous adaptations to meet the needs of methodologically diverse fields such as IS research, especially those that involve including and synthesizing both quantitative and qualitative studies. Moreover, this guide provides many examples from IS research and provides references to guides with further helpful details for conducting a rigorous and valuable literature review. Although tailored to IS research, it is sufficiently broad to be applicable and valuable to scholars from any social science field.

Keywords: Literature Reviews, Systematic Reviews, Systematic Literature Reviews, Information Systems Research.

1   Introduction

Scholars who attempt to write standalone literature reviews for the first time face a paradox. On one hand, the literature review is probably the single most widely employed research methodology since virtually all researchers have to prepare one for almost any work they publish. Thus, they often have a false sense of preparedness for the considerable task at hand until they start and realize the enormity of the project. On the other hand, graduate student training on writing literature reviews is quite sparse beyond perhaps one or two seminar sessions that might briefly address the topic (Boote & Beile, 2005; Hüttner, 2008; Maxwell, 2006; Rempel & Davidson, 2008). Although graduate students' first major literature review project—their doctoral dissertation—gives them some experience, the standards are typically quite low, and what is acceptable for a dissertation is rarely acceptable for a standalone published research paper (Boote & Beile, 2005). In this tutorial paper, I fill this need of better knowledge for conducting a high-quality standalone literature review by providing a clear, detailed guide using the rigorous systematic literature review (SLR) methodology.

In the information systems (IS) field, the past decade has seen a solid stream of research papers dedicated to helping improve the field's quality of literature reviews (Bandara et al., 2015; Levy & Ellis, 2006; Okoli, 2012; Sylvester, Tate, & Johnstone, 2011; Vom Brocke et al., 2009, 2015; Webster & Watson, 2002; Wolfswinkel, Furtmueller, & Wilderom, 2011). Whereas each of these guides presents uniquely valuable contributions—which I summarize shortly—none of them employs the rigorous, standardized methodology for the systematic literature review that has developed from the health sciences (Fink, 2005; Pope, Mays, & Popay, 2007) and other fields (Kitchenham & Charters, 2007; Pawson, Greenhalgh, Harvey, & Walshe, 2005; Petticrew & Roberts, 2006). Thus, the IS literature review guides fall short of the numerous advantages of the state-of-the-art SLR methodology; I explain these in detail shortly. Though one can find an abundance of sources in other research fields, none entirely meet the general needs of information systems researchers. Information systems is a methodologically diverse field, and guides that focus on only quantitative studies or only qualitative studies cannot adequately synthesize our literature. In response to this shortage of appropriate guides, I have compiled this guide to conducting a systematic literature review and particularly tailored it for the diverse needs of information systems research. This diversity is by no means limited to IS research, and so this guide is quite appropriate for all social sciences, especially those that employ mixed methodologies.

In this paper, I adapt Fink's (2005) definition of a research literature review as my operative definition of a systematic literature review: "a systematic, explicit, [comprehensive,] and reproducible method for identifying, evaluating, and synthesizing the existing body of completed and recorded work produced by researchers, scholars, and practitioners" (pp. 3, 17). A rigorous standalone literature review must be *systematic* in following a methodological approach, *explicit* in explaining the procedures by which it was conducted, *comprehensive* in its scope of including all relevant material, and, hence, *reproducible* by others who would follow the same approach in reviewing the topic. While Fink's book is itself a guide to producing such reviews, its close focus on the health sciences and rather superficial treatment of qualitative studies significantly limits its applicability for researchers in business and the social sciences. Fink's call for a structured approach is echoed by Rousseau, Manning, and Denyer (2008), who argue that literature reviews should be "comprehensive accumulation, transparent analysis, and reflective interpretation of all empirical studies pertinent to a specific question" (p. 7). When writing that "reality exists independent of human condition...and that all facts, observations and data are theory laden" (p. 20), Rousseau et al. do so to state that research reviews are no more free from the impact of human subjectivity than other research and that they require equal effort to ensure their objectivity. Thus, rather than being purely subjective exercises, literature reviews do have objective principles to assure their rigor.

1.1   Literature Review Guides for Information Systems Research

In this paper, I join the developing stream of research that seeks to improve the quality of IS research's literature reviews. All of these past works make valuable contributions, and I refer often to them as appropriate in this paper. However, this guide goes significantly beyond what has been done thus far, which I demonstrate here by summarizing the contributions of past related work and highlighting our further contributions. Webster and Watson (2002) lament the fact that IS scholars tend to be unaware of the need for structure in reviews. Their brief yet seminal guide is particularly notable for arguing that reviews should not merely be extended bibliographies that list a sequence of papers but focus squarely on theoretical concepts and develop a coherent theoretical story from them. Whereas Webster and Watson's

editorial only relatively briefly outlines valuable pointers, this current guide comprehensively describes all the necessary steps of a review.

Levy and Ellis (2006) produce a step-by-step guide that is particularly helpful in identifying sources for literature specific to IS, their detailed synthesis methodology, and guidance from argumentation theory in writing the review report. The current guide presents much more detail on the input side: I go beyond their treatment to describe a rigorous practical screen, development of a protocol, training of reviewers[1], and quality appraisal. These elements are critical to have high-quality primary studies as input for the actual analysis of the review. Moreover, my treatment is not only "systematic" in the sense of a step-by-step guide but also "scientific" in the sense of its being designed to generate reproducible (that is, scientifically reliable) reviews—I discuss the meaning of "systematic" in SLRs in Section 1.6.

Vom Brocke et al. (2009) argue in detail for the need for rigor in documenting the literature review process. I wholeheartedly endorse their call and go further to detail the many steps where rigor is called for and specify detailed principles for achieving such rigor.

Bandara et al. (2015) demonstrate how to use electronic tools—in particular, grounded-theory coding tools—to support the literature review process. Their greatest contributions are in the data extraction stage, whose detail exceeds what is normally covered. Moreover, their content analysis approach to synthesis ties in well with their data-extraction methodology. However, the current guide is much more general both in that it covers all steps of a literature review in more detail and that it covers many synthesis approaches other than just content analysis.

Sylvester et al. (2011) describe and illustrate a synthesis approach that, rather than synthesizes a single summative "true" perspective of a body of literature, purposely discerns different stories and presents them in a rigorous and enlightening way. Similarly, although Wolfswinkel et al. (2011) briefly outline all steps of the literature review process, their primary contribution is a novel synthesis approach that uses grounded theory techniques. In contrast, the current guide covers the entire review process in detail and covers many more synthesis approaches than those two studies present.

Okoli (2012) employs an outline based on the SLR methodology to provide guidelines for developing theory in literature reviews. Although he provides details on each of the steps I discuss in this paper, his treatment is not complete for any of the steps. Rather than discussing the procedure for conducting the review, he restricts his discussion to points relevant to theory building. While valuable, such a treatment is inadequate to guide reviewers who are not familiar with the SLR methodology.

I focus here on standalone literature reviews as opposed to literature reviews that set the theoretical background for a work of primary research or for a graduate student thesis. While I focus on the needs of information systems researchers, the principles I outline here are readily applicable to a very broad range of domains, which is only natural given the broad range of domains from which I draw these principles. Although I have thoroughly studied dozens of papers and books in preparing this guide (the citations are sprinkled throughout the paper), I have drawn the major points in the guide from six source guides: Kitchenham and Charters' (2007) guide to SLRs in software engineering, Petticrew and Roberts' (2006) book on SLRs in the social sciences, Fink's (2005) book on SLRs in health sciences, Rousseau, Manning, and Denyer's (2008) paper on SLRs in management and organization science, Levy and Ellis' (2006) paper on conducting literature reviews in information systems, and Webster and Watson's (2002) paper on writing up literature reviews in information systems.

As such, I believe that this guide provides several uniquely valuable contributions beyond what otherwise similar research has thus far accomplished. First, this is the first guide that introduces the formal systematic literature review methodology to the IS research stream of literature review methodology. Information systems combines social science, business, and computing science, whose research methods are different from those of the health sciences from which the systematic review methodology has largely been developed. One primary characteristic of information systems research that this guide responds to is the IS field's balance of quantitative and qualitative methodologies. Some of the field's reference guides are excellent in treating quantitative research, but only cover qualitative research superficially (Fink, 2005), failing to recognize the fundamental epistemological differences between these methodologies. Thus, one needs to treat these approaches in a balanced way with a guide that is equally comfortable with either kind of research, which particularly plays out in the quality appraisal and synthesis

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[1] Throughout this paper, "reviewer" refers to a researcher who is carrying out a literature review rather than someone who reviews a paper to consider its fitness for publication; in this paper, I refer to this other common usage as a "peer reviewer".

sections. By incorporating Kitchenham and Charters' (2007) recommendations from software engineering, this guide incorporates the review of primary studies that use methodologies such as design science, which is not found in social sciences. Moreover, although I could not find any examples of SLRs in information systems, I do reference several exemplar IS reviews to illustrate best examples of parts of the review if not of the whole. With such a perspective, I introduce the methodology of the systematic literature review to of the IS and related fields. Again, I do not claim that IS research is unique in its diversity; rather, I argue that my approach here is sufficiently broad to meet the needs of IS research.

Second, this paper also serves as a gateway to locating various helpful sources for conducting a systematic literature review. Most of the principles I present here are not completely new; however, I provide them in one place. Thus I present here a rigorous scientific approach to conducting a literature review in an accessible, step-by-step format. I believe that this comprehensive compilation and presentation of these SLR steps is a new and valuable contribution. Although I have striven to write a comprehensive guide to writing a standalone literature review, it is impossible for a single journal paper to be an all-inclusive exhaustive guide. Thus, rather than trying to include every detail of every procedure needed, most of the discussion in this paper focuses on items that either have not been adequately discussed in the sources I examine or that exist mainly in bits and pieces so fragmented that it is difficult for review writers to see the big picture. Along the way, others have thoroughly and adequately explained many aspects of writing a literature review. In these cases, after explaining each necessary step clearly and discussing its key elements, I refer to helpful sources that explain and illustrate these steps in more detail in practicable ways.

Third, I cite examples of high-quality research (usually from information systems and management research) that illustrate the steps in actual published literature reviews. Thus, while the sources might not be systematic reviews, they often contain sections that provide good examples of certain systematic review steps.

1.2   When a Systematic Literature Review Might Be Useful, and When It Might Not

A detailed methodological approach is necessary in any kind of literature review. I distinguish between three general kinds of literature reviews. The most common I call a "theoretical background": the section of a journal paper that gives the theoretical foundations and context of a research question and helps to bring the question into focus. In a paper, this section is most commonly labeled "literature review", "theoretical background", or something similar. Second is the literature review as a chapter of a graduate thesis. I designate this as a "thesis literature review". The third kind is a "standalone literature review", a journal-length paper that reviews the literature in a field without the author's collecting or analyzing any primary data (i.e., new or original).

Numerous motivations for conducting a systematic standalone literature review exist: they can be undertaken to describe available knowledge for professional practice, to identify effective research projects and techniques, to identify experts within a given field, and to identify unpublished sources (Fink, 2005). Although these motivations are largely shared by the other two literature review categories, a standalone review is distinguished by its scope and rigor. In its best form, it becomes a much cited piece of work that researchers seek out as a first clear outline of the literature when undertaking a new investigation. Such free-standing reviews summarize existence evidence, identify gaps in current research, and provide a framework for positioning research endeavors. They are also valuable in informing policy and supporting practice (Petticrew & Roberts, 2006). Though they are certainly not easy to undertake, the commitment to complete a standalone review provides the academic community a valuable service: such reviews can, and have in the past, been true "paradigm shifters" (Petticrew & Roberts, 2006).

Conducting a SLR such as I describe here is a non-trivial exercise. It is not reasonable—nor even advisable—to expect that, whenever a scholarly paper is written, its "theoretical background" section would involve a SLR. While these guidelines can certainly help one to identify the literature (see Sections 4 and 5 in particular), the effort involved to conduct a full SLR would be overkill for the purpose of supporting a scholarly paper with a primary contribution other than presenting the literature. However, I consider that a SLR is quite appropriate for the literature review chapter of a graduate thesis; indeed, I specifically address this topic in Section 10.2.

However, even for standalone literature reviews, it would be inappropriate to require or to expect that every literature review must be carried out to the degree of rigor required of a SLR. In discussing a SLR's

purpose, Petticrew and Roberts (Petticrew & Roberts, 2006) explain that the systematic review is essentially a tool; hence, one needs to ask whether it is right for a given job. Before ever embarking on the task of conducting a SLR, they recommended first searching for any existing systematic reviews. In particular, they suggest that the review consider the current evolutionary state of the research field: a systematic review is not very valuable early on when limited studies might be available because they might not represent the best knowledge that more time might give. A systematic review would be inappropriate if the research question is too vague or broad (which would yield hundreds of very different studies) but also if the question is too narrow (which would yield too few studies to be helpful). One very practical consideration is whether one can justify the amount of time, energy, and financial cost required for conducting the systematic review (see their Table 2.3 in particular for an estimate of the time spent on systematic reviews based on 27 meta-analyses). For cases when a systematic review might be inappropriate or infeasible, they suggest numerous alternate kinds of less ambitious literature reviews, such as scoping reviews or "state-of-the-art" reviews.

1.3   A Case for Rigor in Literature Reviewing

Standalone literature reviews can and are conducted with varying standards of rigor that range from little more than an annotated bibliography to scientifically rigorous syntheses of a body of primary research. It is the more rigorous approach to conducting a standalone literature review that I refer to as a systematic literature review and is the subject of this paper.

Although most scholars conduct literature reviews primarily for their own learning and benefit, a published review primarily benefits the scholarly community. Any published literature review attempts to save other scholars the intensive time and effort expended in searching for and synthesizing a large body of literature. However, for other scholars to be assured that they do not need to repeat such an effort, the published review should instill confidence in the readers that it satisfactorily does the work that they would otherwise have had to do themselves. Thus, I concur with vom Brocke et al. (2009, p. 2) that:

> the process of excluding sources (and including respectively) has to be made as transparent as possible in order for the review to proof credibility. Only then are readers able to assess the exhaustiveness of a review and other scholars in the field can more confidently (re)use the results in their own research.

Reviewers should be transparent about how and why they chose the topic, about how the review's focus may have changed over time, and about how the review serves a potential role in supporting their subsequent work (Hart, 1998). A published review should even be somewhat "vulnerable" by publishing its procedures because such vulnerable transparency helps advance scholarly knowledge by admitting possible limitations in the procedure that could affect the review's result. Thus, not only do I call for more rigor in how reviewers execute literature reviews, but I also join vom Brocke et al. (2009, p. 10) in calling for more rigor in how they report on that execution:

> We appeal to the authors of IS articles…as well as to the editors of IS journals…to not only conduct and write (or support the writing of) literature reviews that are of high quality, …but also to allow for adequate documenting of the review process, including the specifics of the search process.

In calling for a rigorous review process, it would not suffice to merely compile a simple collection or summary of other papers; there must also be an element of analytical criticism (Hart, 1998). As an academic piece, the review cannot simply regurgitate the subject matter: it should contribute to the work in its dual approach of synthesizing the available material and offering a scholarly critique of theory (Kekäle, Weerd-Nederhof, Cervai, & Borelli, 2009). Only in completing both functions does it meet the requirement of scholarly rigor. Thus, although I focus on the procedure of executing a review in this paper, I cannot overemphasize that merely mechanically following a set of guidelines as I present here is insufficient to yield contributions that would be valuable to other scholars. In the final step on writing the review (Section 9), I return to this point and provide specific pointers to uplifting the review from merely a set of steps to a valuable scholarly work.

1.4   An Eight-Step Guide to Conducting a Systematic Literature Review

The guide I present here has eight major steps (see Figure 1) that one needs to take to conduct a systematic literature review. Indeed, these steps are very valuable for any kind of literature review; however, for a review to be scientifically rigorous, all of the following steps are essential.

1. **Identify the purpose:** the first step in any review requires the reviewers to clearly identify the review's purpose and intended goals, which is necessary for the review to be explicit to its readers.

2. **Draft protocol and train the team:** for any review that employs more than one reviewer, reviewers need to be completely clear and in agreement about the procedure they will follow, which requires both a written, detailed protocol document and training for all reviewers to ensure consistency in how they execute the review.

3. **Apply practical screen:** also called screening for inclusion, this step requires that the reviewers be explicit about what studies they considered for review and which ones they eliminated without further examination (a very necessary part of any literature review). For excluded studies, the reviewers must state their practical reasons for not considering them and justify how the resulting review can still be comprehensive given the practical exclusion criteria.

4. **Search for literature:** the reviewers need to be explicit in describing the details of the literature search and need to explain and justify how they assured the search's comprehensiveness.

5. **Extract data:** after reviewers have identified all the studies that should be included in the review, they need to systematically extract the applicable information from each study.

6. **Appraise quality:** also called screening for exclusion, the reviewers need to explicitly spell out the criteria they use to judge which papers they will exclude for insufficient quality. Researchers need to score all included papers, depending on the research methodologies they employ, for their quality.

7. **Synthesize studies:** also known as analysis, this step involves combining the facts extracted from the studies by using appropriate techniques, whether quantitative, qualitative, or both.

8. **Write the review:** in addition to the standard principles to be followed in writing research papers, the process of a systematic literature review needs to be reported in sufficient detail such that other researchers can independently reproduce the review's results.

1.5   Exemplars of Model Literature Reviews in Information Systems

In this guide to writing a literature reviews, I do not make a concerted attempt to apply all the items here specifically to the IS field. Rather, I keep the guidelines as general as possible to apply to various fields. However, because my own research background is in information systems and management, I selected SLR guides from social sciences, management, and software engineering—fields that are pertinent to IS researchers. Moreover, I refer to exemplars of quality research mostly from IS publications. With this approach, this guide is general enough to be useful to researchers in many fields while uniquely helpful to IS research.

Although I know of no exemplars in IS research that explicitly follows the rigorous methodology of the systematic literature review, I searched several widely-read IS journals for exemplars of high-quality literature reviews to demonstrate examples of best practice in various aspects of the review process. Specifically, I searched *Information Systems Research*, the *Journal of Management Information Systems*, the *Journal of the Association of Information Systems*, and *MIS Quarterly*. In addition, I searched the *Academy of Management Review*. Although it is not an IS research journal, I believe that the neighboring management field is sufficiently close for IS researchers to learn from these exemplar reviews. In these journals, I selected a total of 23 exemplars from 1976 to 2008 (see Table 1)[2]. Of these 23, three were meta-analyses, two contained both meta-analytic and narrative components, and the rest employed exclusively qualitative discussion. Papers included detailed construct development of topics such as computer self-efficacy (Marakas, Yi, & Johnson, 1998), negotiation support systems (Lim & Benbasat, 1992), interorganizational systems (Robey, Im, & Wareham, 2008), technology adoption (Venkatesh, Davis, & Morris, 2007), information technology-dependent strategic initiatives (Piccoli & Ives, 2005), and the resource-based view (Wade & Hulland, 2004). They included reviews of existing research on particular phenomena such as employee turnover (Cotton & Tuttle, 1986), shift work (Dunham, 1977), human resources management in international joint ventures (Shenkar & Zeira, 1987), and the impact that technological or societal changes have on the future development of organizational structure and strategy (Melville, Kraemer, & Gurbaxani, 2004; Winter & Taylor, 1996).

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[2] I did not use a systematic methodology in selecting these exemplars because selecting illustrative examples is not an appropriate application for the SLR methodology that I describe in this paper.

Planning

1. Identify the Purpose

2. Draft Protocol & Train the Team

Explicit
Comprehensive
Reproducible

Selection

3. Apply Practical Screen

4. Search for Literature

Explicit
Comprehensive

Extraction

5. Extract Data

Quantitative   Qualitative

6. Appraise Quality

Explicit

Quantitative   Qualitative

Execution

7. Synthesize Studies

Quantitative   Qualitative

Quantitative & Qualitative

Explicit
Reproducible

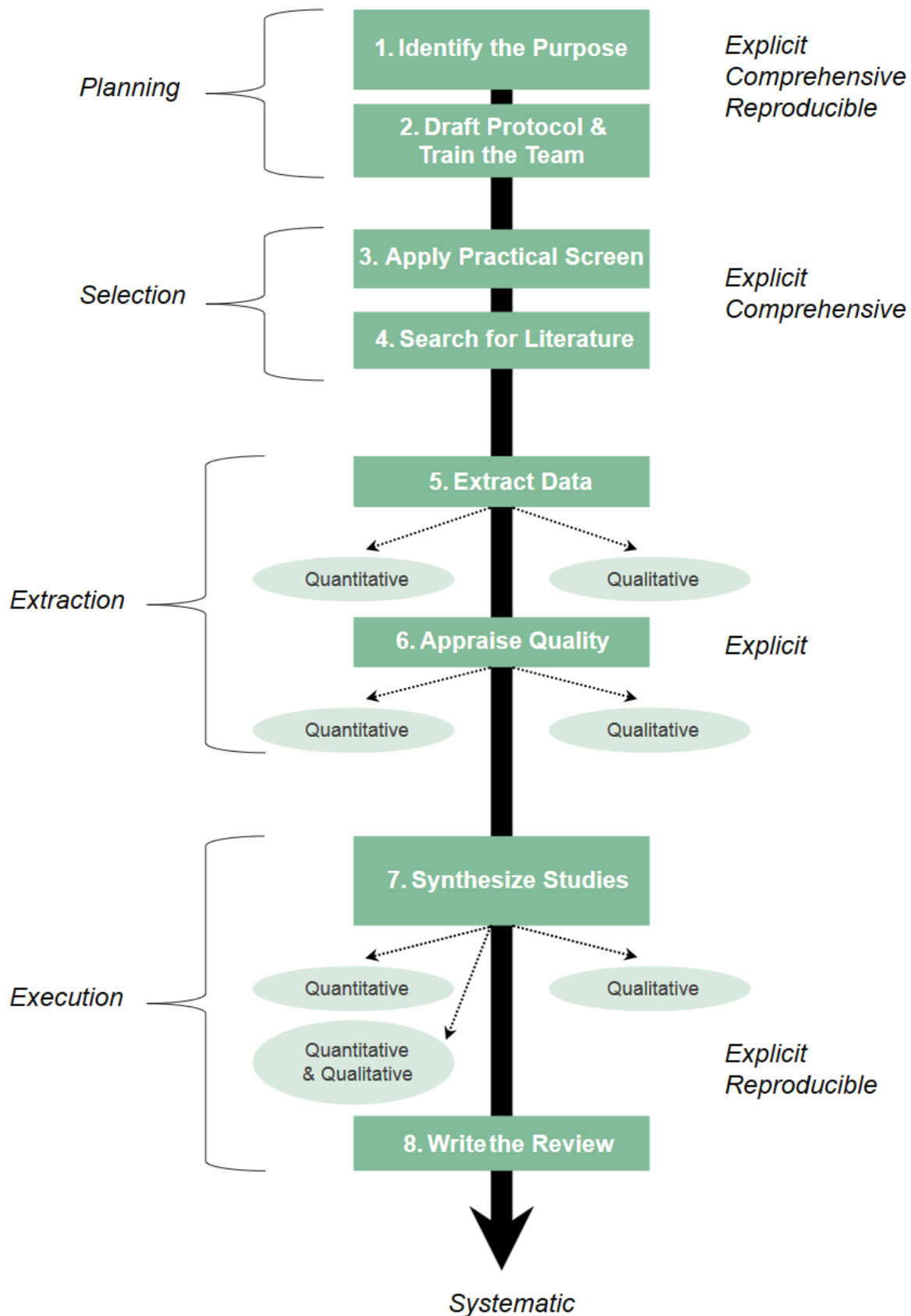8. Write the Review

Systematic

Figure 1. A Systematic Guide to Literature Review Development

Table 1. Literature Review Practices in 23 Exemplar Reviews from IS and Management

Citation	Synthesis type	Step 1	Step 2	Step 3	Step 4	Step 5	Step 6	Step 7	Step 8
Robey, Im, & Wareham (2008)	Qualitative	◉	◉	◉	◉	◉	◉	◉	
Joseph, Ng, Koh, & Ang (2007)	Both	◉			◉		◉	◉	◉
Venkatesh et al. (2007)	Qualitative	◉							◉
Leidner & Kayworth (2006)	Qualitative	◉	◉	◉	◉	◉	◉	◉	◉
Piccoli & Ives (2005)	Qualitative	◉	◉		◉	◉		◉	◉
Wade & Hulland (2004)	Qualitative	◉			◉				◉
Melville et al. (2004)	Qualitative	◉						◉	◉
Dubé & Paré (2003)	Qualitative	◉	◉	◉	◉	◉	◉	◉	◉
Jasperson et al. (2002)	Qualitative	◉			◉			◉	◉
Alavi & Leidner (2001)	Qualitative	◉							◉
Te'eni (2001)	Qualitative	◉		◉				◉	◉
Marakas et al. (1998)	Qualitative	◉		◉	◉	◉		◉	◉
Winter & Taylor (1996)	Qualitative	◉							◉
Alavi & Carlson (1992)	Qualitative	◉	◉	◉	◉	◉		◉	
Alavi & Joachimsthaler (1992)	Meta-analysis	◉		◉	◉	◉		◉	◉
Lim & Benbasat (1992)	Qualitative	◉							
Morrison & Bies (1991)	Qualitative	◉						◉	◉
Shenkar & Zeira (1987)	Qualitative	◉		◉	◉			◉	◉
Cotton & Tuttle (1986)	Meta-analysis	◉		◉	◉	◉		◉	◉
Petty, McGee, & Cavender (1984)	Meta-analysis	◉		◉	◉		◉	◉	◉
Griffin, Welsh, & Moorhead (1981)	Qualitative	◉		◉	◉			◉	
Dunham (1977)		◉							◉
Pierce & Dunham (1976)		◉		◉				◉	

As I note above, there is an important distinction between the scholarly value of conducting a literature review and the rigor required in documenting its procedures. I selected the exemplars in Figure 1 because they are all of the highest scholarly quality. However, as vom Brocke et al (2009) found from explicitly investigating the degree to which IS literature reviewers document rigor, even exemplar papers often do not do so adequately. Thus, in keeping with my arguments about the importance of documenting review procedures as an inalienable aspect of rigor, I critique the quality of their documentation throughout this paper.

Notably, no uniformity in methodology or structure among these studies exist, even between those published in the same journal. Authors of 15 of the 23 exemplars explicitly describe how they searched for the literature. These authors generally state the name of journals and the procedure they used to retrieve these journals through specific databases. They also tended to specify whether they relied heavily on electronic sources and whether they always retrieved papers through computer searches (Alavi & Joachimsthaler, 1992; Alavi & Leidner, 2001; Cotton & Tuttle, 1986; Dubé & Paré, 2003; Griffin et al., 1981; Joseph et al., 2007; Leidner & Kayworth, 2006; Marakas et al., 1998; Petty et al., 1984). Piccoli and Ives (2005) only briefly mention in the conclusion section that they reviewed abstracts for 648 papers from IS, strategic management, and the marketing literature. Similarly, Jasperson et al. (2001), Shenkar and Zeira (1987) and Wade and Hulland (2004) do not explain how they located papers; instead, they only list how many papers they found. In Wade and Hulland's (2004) case, they listed these papers in the appendix. However, such abbreviated reporting makes it difficult to replicate any findings.

In this guide, as I present our eight steps in detail, I demonstrate from high-quality published research that most of these steps are not new; I use the existing literature to illustrate the best examples of each step and guide reviewers in combining them to produce high-quality reviews themselves.

1.6   A Note on Terminology: Systematic as a Qualitative Rather Than a Classifying Adjective

In their guide to SLRs, Kitchenham and Charters (2007) use the term "systematic review" to refer to a different type of literature review from what they call a "traditional" or "conventional" literature review. However, I consider the "systematic" in "systematic literature review" to be a qualitative adjective. A qualitative adjective is one that describes the nature of a thing in a way that can be qualified by "greater" or "less"; that is, we can speak of a review as being more systematic or less systematic or very systematic. However, Kitchenham and Charters seem to use the term as a classifying adjective; that is, an adjective that classifies things into a certain category. Thus, they contrast a systematic review from a traditional or conventional review.

In contrast, Rousseau et al. (2008, p. 5, emphasis added) say:

> This chapter's subject, the systematic research synthesis, is not to be confused with a conventional literature review, its less systematic, non-representative counterpart. Systematic research syntheses assemble, analyze and interpret a comprehensive body of evidence in a highly reflective fashion according to six evidentiary criteria we describe.

Thus, Rousseau et al. (2008) clearly use the term "less systematic", which is clearly the use of systematic as a qualitative adjective.

The problem with using "systematic" as a classifying adjective is that it dichotomizes literature reviews into two kinds: systematic and traditional (or conventional). However, I don't see this as a useful distinction since it can evoke artificial attempts to set up a cut-off point where a review might be considered systematic or not systematic. Rather, I find it more useful to speak of a review as being more or less systematic. Thus, when I speak of a systematic review, I refer to a review that has the explicit intention of being conducted systematically. In contrast to Kitchenham and Charters, who seem to imply that conventional reviews hardly merit the designation "systematic", I prefer to consider "systematic" as a spectrum on which literature reviews might lie to more or less a degree.

Now having clearly explained what I mean by a systematic literature review and having argued its value, I proceed to the major part of this paper: in eight consecutive sections, I describe in detail the eight major steps of conducting a SLR as Figure 1 shows. Before concluding the paper, I discuss various issues concerning publishing a SLR that follows the methodology that I describe, including implications for literature review publications that are not normally considered standalone reviews.

2   Identify the Purpose

Though one can classify literature reviews in various ways, we can generally categorize them as one of three kinds: an introductory section of most scholarly work used to theoretically support the rest of the paper, a major introductory section of an academic thesis or dissertation (which is a special case of the first category), or a free-standing paper that specifically and wholly reviews research on a subject. Although I specifically look at only the third kind, it is important to discuss the other kinds of literature reviews so that readers may have an equal understanding of their purpose.

The first step to conduct a literature review is clearly defining its purpose. Strictly speaking, this first step is not so much a part of the active procedure as it is a consideration of one's prospective technique. As in all empirical work, the first step of a project should be to consider whether the prospective methodology is the most appropriate one. In this case, determining a literature review's purpose should answer the question "Why do a literature review?". In Section 1, I address this question in arguing for the need of systematic literature reviews and so do not repeat it here. However, I do discuss here the need to consider dissemination targets from the beginning of the review-conception process.

2.1   Determination of Dissemination Targets

Part and parcel of deciding on conducting a systematic literature review should be to consider the audience that is expected to read and use the finished review's results. Kitchenham and Charters (2007)

emphasizes the development of a dissemination strategy as an important step in the SLR procedure—in fact, they insist that the dissemination strategy should be determined as part of the research protocol even before the study begins. Beyond academic publications, dissemination targets include practitioner-oriented journals, media releases, short-summary leaflets, posters, websites, and direct communication; Kitchenham and Charters offer formatting and design lessons for each type. Petticrew and Roberts (2006) also offer a helpful guide for disseminating one's review. They discuss the possibility of getting research into policy and practice where the information will be actively used and they offer pointers for effective dissemination. Among their suggestions are engaging users early, disseminating to the media, publishing in academic journals, and appreciating the impact of presentation and timing.

2.2   Guides and Exemplars of Defining the Literature Review's Purpose

Whereas literature review guides always begin by explaining and justifying the literature review, what is most pertinent here is being clear about the purpose of conducting a systematic literature review. As such, I recommend five sources that provide such clarification. Fink (2005) do not use the term "systematic", but what she calls "research literature review" is a systematic literature review in every sense. What she presents is the best practice for conducting literature reviews as developed in the health sciences. Three sources are probably more relevant to IS researchers, directed specifically to some of its more important reference disciplines of social sciences, software engineering and management. Petticrew and Roberts (2006) focus on SLRs in the social sciences in general. In addition to presenting clear arguments and justifications for SLRs, they devote an entire chapter to dispelling myths about SLRs and clarifying what they are not. In discussing literature reviews, they bring up the notion of bias in traditional reviews, information overload, opportunities lost (and sometimes regained) in such reviews, and reviews' variations in quality. Of particular help are their appendixes that offer examples of questions to ask before the review process (Appendix 1), a flow diagram from a systematic review, and examples of reviews' variations in quality. Kitchenham and Charters (2007) focus on SLRs in software engineering, a field that has a lot of overlap with information systems. In particular, they recommend SLRs as a means to assure reliable software development and application. They also describe systematic mapping studies as a special case of systematic literature review. Rousseau et al. (2008) focus on SLRs in management and organization science; strictly speaking, their study focuses primarily on "research synthesis" (i.e., synthesizing study results obtained in a SLR) more than on the rest of the process. Whereas Fink (2005) and Kitchenham and Charters (2007) focus on reviewing quantitative primary studies, Petticrew and Roberts (2006) and Rousseau et al. (2008) focus on reviews of both quantitative and qualitative primary studies. Okoli (2012) restricts his focus to reviews that seek to build and contribute to theory, and so he distinguishes three such types of reviews: theory-landscaping, theory-contending, and theory-testing reviews. Furthermore, he discusses developing theory-oriented research questions for systematic reviews and identifying theory-oriented dissemination targets.

Every one of the 23 exemplars that I reviewed for this guide specifically address this step—indeed, it is the only one of the eight steps that every paper followed. Generally speaking, the authors conducted a literature review:

1. To analyze the progress of a specific research stream (Alavi & Joachimsthaler, 1992; Alavi & Leidner, 2001; Piccoli & Ives, 2005; Venkatesh et al., 2007)

2. To make recommendations for future research (Venkatesh et al., 2007)

3. To review the application of one theoretical model in the IS literature (Alavi & Carlson, 1992; Wade & Hulland, 2004)

4. To review the application of one methodological approach in the IS literature (Dubé & Paré, 2003)

5. To develop a model or framework (Joseph et al., 2007; Melville et al., 2004; Morrison & Bies, 1991; Te'eni, 2001), or

6. To answer a specific research question (Cotton & Tuttle, 1986; Dunham, 1977; Griffin et al., 1981; Jasperson et al., 2002; Petty et al., 1984; Shenkar & Zeira, 1987).

3   Draft Protocol and Train the Team

Once the reviewers are clear about their SLR's purpose and scope, they need to perform another critical step in the planning stage before the work of the review can start in earnest. One of Kitchenham and Charter's (2007) most important recommendations is that a protocol be developed in advance of actually

conducting the study and that the protocol be externally validated to verify its rigor. A protocol is "a plan that describes the conduct of a proposed systematic literature review" (Kitchenham & Charters, 2007, p. vi). In addition to drafting the protocol, which details the specific steps and procedures to follow in the particular review being conducted, reviewers should also thoroughly train all members of the review team according to the drafted protocol to ensure that everyone is on the same page concerning what is being carried out (Fink, 2005).

The initial protocol can only be called a draft until after training is completed because the training process will doubtlessly uncover problems that will need to be corrected before the final protocol is completed. Even then, as with any research endeavor, the process of conducting the literature review will certainly bring up limitations and issues with this initial protocol; nonetheless, the researchers need to agree on and write down their strategy before commencing. The course of action may certainly change (Fink, 2005), but only by documenting the protocol changes can the researchers assure the comprehensive, explicit, and reproducible nature of their work and, subsequently, a high level of quality. The details of carrying out this step involve drafting the research question, creating a research protocol, and training the reviewers.

3.1   Drafting the Research Question

As with any research study, the reviewers must have a clear, concise research question. Rousseau et al. (2008) note that formulating the question requires reflection, debate, and reformulation. The research question can be seen as the conclusion of the first step that identifies the purpose of the literature review. Ultimately, the research question should result in a one-to-two sentence statement that defines the review's audience (e.g., scholars, practitioners, policy makers, etc.), purpose, and end use. I do not cover how to develop an appropriate research question because it is a well-covered topic, particularly in doctoral student training (e.g., see Jaccard & Jacoby, 2010). However, an SLR answers only a very specific category of research question. Specifically, since literature reviews are secondary studies that depend on primary research having previously been conducted, a SLR is not applicable when no one has previously investigated the topic of investigation. In this vein, please see discussion in Section 1 concerning the need for the SLR methodology and the first step on defining a literature review's purpose are relevant for drafting the question.

3.2   Drafting the Protocol

Once a question has been formulated, the research protocol serves as the road map towards its answer. However, only three of the literature review guides that I identified address the issue of defining a research protocol in any way. Some speak about the information that should be included in a protocol but do not describe the need for an explicit protocol. Furthermore, only five of the 23 exemplars I studied mention any form of an agreed-on protocol. The others may have followed protocols but not report them in their published studies. However, even if this is the case, I consider the protocol such an important quality assurance step of a SLR that I am surprised that so few studies refer to it.

I consider that creating a prior protocol is an absolutely crucial step in the process of conducting and reporting a high-quality literature review. It defines whether the review will be narrow or broad (Petticrew & Roberts, 2006). It defines the locations to be searched for literature and the various screens each paper will need to pass through to be considered for inclusion. Without it, there is no consensus on work to be carried out not just between various researchers but even in the work of one researcher over time. Turner, Kitchenham, Budgen, and Brereton (2008) offer valuable insights on their personal struggles to collect information for their literature review, and their lessons learned through mistakes serves as a good lesson for future reviewers. The need of a prior protocol emerged as one of their top recommendations.

Just as constructing a house can only begin after an architect has drawn up explicit blueprints and coordinated with the contractor, the protocol blueprint guides the rest of the review process. Of course, as more subject matter is discovered, a literature review's focus may change. However, to create strong reliability and consistency throughout the process, the actual search procedure should be carefully documented so that the reviewers can report in explicit detail how they conducted the search. Moreover, the search needs to be conducted systematically to assure that the results obtained are comprehensive; that is, that they span all existing material in the practical screen's scope (Helmericks, Nelsen, & Unnithan, 1991). The majority of the review checklist should be sufficiently specific about the practical screening criteria to remain intact, whereas the commentary section may leave enough room for subjective interpretations. That said, reviewers should have established the major keywords by the time of the protocol, which dictate what material is retrieved (Bacharach, 1989; Thornley & Gibb, 2009).

In practice, the protocol comprises an outline that is organized according to the steps followed for the review. If a protocol were written using this guide, it would be organized according to the eight steps of this guide. The details of the protocol would comprise the specific steps that would actually be followed according to the specific research question being investigated. At the end of this section, I give some examples of published protocols for SLRs.

3.3   Training the Reviewers

The third step in developing the review protocol is to train the reviewers. Among our major sources, only Fink (2005) truly discusses this issue. A single researcher cannot conduct most research literature reviews because of their broad scope. Both in the case of rapidly expanding academic fields and fields that have been in existence for long periods of time, it is impractical to comb through the entire literature single-handedly. Even if it were possible, the long period of time it would take would most certainly lead to changes and, hence, inconsistencies, in the reviewers' interpretation. Finally, researchers have often advocated collaboration on academic work as leading to more concentrated and prominent work (Figg et al., 2006). For all these reasons, all reviewers involved in conducting a literature review should be thoroughly trained in both note-taking and reviewing techniques. This step is critical for the review to be executed at a consistent level of quality. (Note that, although I often refer to the person conducting the study as "the reviewer" in this paper, in practice there will almost always be multiple "reviewers" actually doing the work of the literature review.)

3.3.1   Note-taking Techniques

Ridley (2012) explains in detail various reading and note-taking techniques currently in use (e.g., survey, question, read, recall, review, p. 63) to allow the reviewers to handle large amounts of work, draw connections, and remember content for future inclusion. She notes the necessity of formal note-taking strategies that assist in avoiding accidental plagiarism. Reviewers should agree on one method of note-taking. Annotating printed paper copies is a method once popular that has predominantly been replaced by other methods such as pattern notes, which use visual representations that cluster comments around a main idea, or linear notes, which "use headings and subheadings to distinguish between the main ideas and the subsidiary information" (Ridley, 2012, p. 69). Consensus among reviewers, reading speed, and amount of assigned work will also have an impact on uniformity. Reviewers could, for example, be trained in phenomenological reading techniques that would allow them to share core skills in their ability to integrate theory and method (Hart, 1998). Even the decision about whether to take handwritten or computer notes can have significant impact on the amount of information being recorded and the agreement between reviewers (Ridley, 2012); thus, they should discuss it.

3.3.2   Reviewing Techniques

Because of the vast number of decisions that need to be made, researchers have created and applied training manuals or rubrics (Green & Bowser, 2006) and continue to suggest reviewers do so as well (Fink, 2005; Hart, 1998; Ridley, 2012). Beyond basic rules on how to read and take notes, reviewers would refer to the manual when deciding on what content might warrant note-taking. The guideline would dictate whether reviewers could only make objective decisions (such as "Is the paper in English: yes or no") or whether there is room for personal discretion. Reviewers can summarize entire paper or extract specific, direct sections (Ridley, 2012). The reviewer training session and manual should include a carefully crafted checklist to record the practical screening qualifications of each paper and a set of standards for note-taking (Fink, 2005, pp. 166-172).

With trained reviewers, it is meaningful to test a review for reliability. Fink (2005, pp. 176-177) provides guidelines on measuring the validity of reviewers' output. Individuals can re-evaluate a sample of their assigned paper with a time lapse in between reviews to establish intra-reviewer (test-retest) reliability. At least some papers should be reviewed by more than one collaborator to establish inter-reviewer reliability. Fink also advocates that reviewers use a "gold standard", such as the project leader, to resolve disagreements. While it is always better to have more reviewers—as long as they are properly trained— the number is subject to the review project's budgetary (or other) constraints.

As I mention above, the process of training the reviewers will doubtlessly uncover some problems, inconsistencies, and impracticalities in the original protocol and even in the research questions. Thus, both developing the protocol and training the reviewers are iterative processes: revising the protocol require updates in training, which could uncover problems in the protocol that need to be adjusted, which

require further refinement of the protocol. The actual work of conducting the literature review is ready to begin only when the final, stable version of the protocol is created and when the reviewers have been trained according to this final version.

3.4 Guides and Exemplars of Protocols and Reviewer Training

As I mention above, review protocols and reviewer training, although crucial for assuring a review's quality, are not widely mentioned or practiced. However, some key sources that provide excellent guidance on this step do exist. Kitchenham and Charters (2007) strongly advocate the need for review protocols, and they provide examples of such protocols from some of their own research. Brereton et al. (2007) give examples from the field that illustrate the value of using a protocol in conducting a review. Okoli (2012) points out that the "correct" order in arranging the sections of a systematic review is different for drafting the protocol, for actually executing the review, and for reporting the final result. Regarding training reviewers, Fink (2005) is the only author who goes into detail about the procedure and steps to follow, including how to test for inter-rater reliability. However, Ridley (2012) provides practical tips for reading papers and taking notes when reviewing them. In addition, Brereton et al. (2007) provide field tips on reviewer training related to developing the protocol.

Of the 23 studies I reviewed, five explicitly refer to the fact that they conducted their study using a protocol that they explicitly defined before the study actually began. Alavi and Carlson (1992) specifically list the keywords they used to retrieve the literature and the classification system they used to code the journal paper they included in their review. Robey et al. (2008) spell out the procedure through which two authors read and coded the 104 papers they reviewed. Piccoli and Ives (2005) present a shorter protocol than the other reviews but nonetheless confirm that they reviewed 117 relevant papers; however, they do not go into much detail beyond this description. Leidner and Kayworth (1992) describe how they found and coded 82 papers. Finally, Dubé and Paré (2003), who most explicitly describe their protocol, both describe their procedure and offer an example in their appendix.

4 Apply Practical Screen

With the planning stage of the literature review concluded by the protocol and training step, the next step is the practical screen (Fink, 2005). The practical screen involves deciding which studies should even be considered for the review. The goal of the practical screen is to reduce the number of studies to be analyzed to a number that can be practically handled by the reviewers. I particularly note that this determination is not based on careful evaluation of the papers' quality (that is a subsequent step: appraise quality (Section 7)) but rather on pragmatic considerations to determine whether or not, for the purposes of the review, they are worth reading further.

4.1 Criteria for the Practical Screen

Hundreds or even thousands of papers may cover a topic of interest, and it is not practical to read and analyze all of them in depth. The importance of the practical screen is that the reviewers must explicitly decide on and explain the criteria for selecting or excluding papers from the review. To that end, the reviewers must make several critical decisions about what kind of work they should include or exclude (Sterne, Egger, & Smith, 2001). For example, depending on the field and topic, reviewers may choose to include only experimental studies or may extend the scope to include other kinds of research. Reviewers will only be able to collect data uniformly by strictly establishing specific inclusion criteria for what type of works may be considered useful and applicable.

Beyond establishing which work to include, the reviewers should at this point also consider how they will find such work (see Section 5)) (Barbour, 2001). This step's critical point does not involve determining perfectly suitable criteria for including papers for consideration—though the criteria should be reasonably broad if the study is to be comprehensive—but rather being explicit about these criteria so that the resulting literature review is reproducible. Fink (2005, pp. 55-56) lists several criteria reviewers can use to reasonably exclude studies from consideration to limit their review's scope to what is practically manageable:

- **Content (topics or variables):** the review must always be practically limited to studies that have bearing on its specific research question (Dawson & Ferdig, 2006).

- **Publication language:** reviewers can only review studies written in languages they can read or for which they have access to scholarly databases.

- **Journals:** the review's scope might limit itself to a select set of high-quality journals or include only journals in a particularly field of study (Singh, Haddad, & Chow, 2007).

- **Authors:** the review might be restricted to works by certain prominent or key authors (potentially including the reviewer). Hyland's (2003) extensive study on self-citation in academic publication points to the prevalence of self-reference in the social sciences to establish authority.

- **Setting:** the review might consider only those studies conducted in certain settings, such as healthcare institutions or the financial services industry.

- **Participants or subjects:** the review might be restricted to works that study subjects of a certain gender, work situation (e.g., full-time professionals as opposed to students), age, or other pertinent criteria.

- **Program or intervention:** the review might distinguish between the intervention type studies use (e.g., self-reported data vs. researched-measured data) or whether subjects selected themselves into groups.

- **Research design or sampling methodology:** the review may restrict studies based on whether they use a particular research design. Note that there are significant differences between these judgments between health sciences (Fink, 2005) and management (Rousseau et al., 2008) and computing sciences (Kitchenham & Charters, 2007) (see Section 7).

- **Date of publication/data collection or duration of data collection:** reviews will often focus on studies in certain date ranges.

- **Source of financial support:** reviews might focus on studies that received public funds (e.g., if there was concern that this might be a source of bias in the results as is sometimes the case in healthcare research) (Fink, 2005).

Petticrew and Roberts (2006) and Kitchenham and Charters (2007) also offer lists for this step. They subdivide considerations according to population, intervention, comparison, outcomes, and context (Kitchenham and Charters add experimental design). Petticrew and Roberts (2006) even address the question of which papers to obtain in hard copy. Although this last point may be less of a consideration in this era of electronic journal access, it might still be relevant when reviewers can only obtain a paper by requesting it throughout inter-library loan.

The practical screen is a rather subjective part of the literature review. There are no absolute rights and wrongs here; however, there are considerations of what is reasonable and justifiable. On one hand, the screen must be broad enough to include a sufficient number of studies that can satisfactorily answer the research question. On the other hand, the review must be practically manageable and consider the reviewers' constraints of time, money, and personnel. To a large extent, it is the decisions made here that make the difference between a comprehensive and trustworthy literature review and an unsatisfactory one.

4.2   Practical Tips for the Practical Screen

Kitchenham and Charters (2007) give helpful guidance for actually executing a practical screen. The key terms in the literature review should leave the reviewers with a large number of papers that meet the search criteria. When using referencing software, I recommend creating individual folders for every literature source (each database, expert recommendations, etc.). Once reviewers collect all papers in the software, they can distribute the databases randomly among them. Each reviewer will skim through their allotted papers and decide whether each one does or does not meet inclusion criteria established during the protocol. Be aware that, in this step, one should not judge quality or assess information found in the studies. Criteria should be simple enough to be determined merely by reviewing the title and the abstract; only occasionally would the full text need to be examined to make the decision. From past experience, the practical screen determines inclusion based on criteria such as papers' language (e.g., should non-English papers be filtered out or kept for later translation) (Petticrew & Roberts, 2006), type of publication (such as whether to include peer-reviewed conference proceedings or only journals (Levy & Ellis, 2006), or date range (e.g., including only papers published after 2002) (Kitchenham & Charters, 2007).

Reviewers can set aside and save (i.e., not delete) papers that don't meet these specific inclusion criteria. I recommend creating "delete" subfolders in each of the source folders in which one can place papers that

don't meet the inclusion criteria. Better yet, rather than a single "delete" subfolder for each database folder, there could be several "delete subfolders" that each specify the reason for their papers' exclusion. While this might seem onerous, it becomes crucial when the reviewers reassess each reviewer's work to control the review process's quality. Such reassessment will normally uncover inconsistencies in reviewers' judgments, and the original papers should be readily accessible for reinclusion if needed. This procedure permits the reviewers to explicitly document how they executed a uniform methodology. This procedure serves two purposes: 1) it maintains the study's explicitness and replicability, which permits reviewers to backtrack and re-evaluate their inclusion criteria and protocol at any point during the review; and 2) it permits the reviewers to assess and establish inter-rater reliability (Fink, 2005).

Because of the subjectivity of the practical screen, I recommend testing for inter-rater reliability during a pilot test of the practical screen. After all literature source folders have been sorted, a portion of folders should be randomly assigned to another reviewer. In the best-case scenario, results will establish a case for uniformity and show that both reviewers included or excluded the same papers. In the worst-case scenario, both reviewers will have chosen to include very different papers and combing through the "delete" subfolder will clarify whether the discrepancy lies in individual judgment or ambiguity in the search protocol. Most likely, every review, including those from my own experience, will fall somewhere in the middle and will both give the authors confidence in their work up to that point and give them an early opportunity to discuss potential changes to the protocol.

4.3 Guides and Exemplars of the Practical Screen

Surprisingly, although the practical screen is an implicit step in every literature review, few guides address it explicitly. The principle ones I have identified are Fink (2005) and Kitchenham and Charters (2007), though Petticrew and Roberts (2006) do give some helpful tips on this subject as well. Fink (2005) is particularly helpful for her comments on testing for inter-rater reliability. Okoli (2012) presents an extensive list of practical screen criteria and specifically focuses on how practical screen decisions aid or compromise a review's ability to develop a theoretical contribution.

Several of the exemplar studies I examined explicitly report their practical screen criteria. These studies are notably thorough in their description of decision criteria (Alavi & Carlson, 1992; Alavi & Joachimsthaler, 1992; Robey et al., 2008; Te'eni, 2001) or in their summing up what research methodology would be included (Cotton & Tuttle, 1986; Dubé & Paré, 2003; Griffin et al., 1981; Leidner & Kayworth, 2006; Petty et al., 1984; Pierce & Dunham, 1976). A good example of concise reporting is Marakas et al. (1998, p. 130), who spelt out that all papers needed to "(1) include a material focus on the CSE construct, (2) [develop] a measure or evaluated the construct as an independent variable (IV) or dependent variable (DV) of interest, and (3) [be] published in a recognized academic journal or compendium".

5 Search for Literature

The next step in conducting a SLR involves actually searching the literature. This stage is analogous to seine fishing, where one uses a seine (dragnet) to capture a large number of fish, such as a school of tuna (searching the literature), and remove those undesired species, such as dolphins, that were also caught (applying the practical screen). This step should strictly follow the pre-defined protocol and, thus, be fairly straightforward. In this paper, I focus mostly on locations for source material.

The traditional sources of literature are journal papers and books (including reference books and, in some instances, textbooks). Traditionally, one accessed these sources mainly via lengthy visits to libraries, but, today, these sources are widely available on the Internet (with the exception of books, which are still not as electronically accessible as papers) (Fink, 2005). (However, massive cataloguing operations such as Google Books are trying to change that.) In addition, "grey literature" (Anonymous, 1998; Petticrew & Roberts, 2006) has become increasingly accessible, mainly through the Internet: this literature includes non-peer-reviewed sources such as reports, theses and dissertations, conference literature, popular media, monographs, work-in-progress reports, specialist literature, and primary data sources (Ridley, 2012).

Ridley (2012) recommend that the reviewers begin by getting to know their library and librarian. Although this might seem traditionalist, Petticrew and Roberts (2006) argue that the mass volume of information available in today's information society necessitates that a high-quality SLR always involve consulting a qualified information scientist such as a librarian. They do note, though, that, with today's technological

capabilities, reviewers can perform a systematic review without experienced library support as long as they follow a rigorous plan (i.e., the protocol).

From the librarian, the reviewers may move on to electronic resources, which are now the predominant source of literature collection. Online Public Access Catalogues (OPACs), such as COPAC in the UK, "provide the bibliographical details and locations of all the publications held within a particular library" (Ridley, 2012, p. 49), while publisher and bookseller catalogues offer lists and content information of most of their publications. Today, open access databases (such as Google Scholar and the Directory of Open Access Journals) and specific subject databases (such as ProQuest, Scopus, EBSCO, IEEE Xplore and the ACM Digital Library) offer electronic access to most published literature (Norris, Oppenheim, & Rowland, 2008). One needs to understand how to correctly use Boolean operators to take particular advantage of these databases (Fink, 2005). Though certainly not yet prominently employed, the academic world should also see an increase in the use of computer-assisted data mining for literature reviews in the coming years with potential hazards and glitches (Bragge, Relander, Sunikka, & Mannonen, 2007; Jacsó, 2007; Lee, Kang, Mitra, Giles, & On, 2007). With the Internet's increased dominance, reviewers should heed Fink's (2005) caution about the need to carefully discern the quality of any information obtained from websites, which, while "published" on the Web, has often not passed any sort of quality standards checks.

After completing library and online review, reviewers should supplement the search further to assure that they have found and exhausted all sources. Studying the reference section of landmark or particularly relevant pieces permits a "backward search" of other pertinent papers (Levy & Ellis, 2006b). Certain resources, such as Google Scholar and the ISI Citation Index, also allow a "forward search" to find all papers that have since cited papers the reviewers may find particularly relevant (Levy & Ellis, 2006). Finally, Petticrew and Roberts (2006) and Fink (2005) mention the importance of contacting experts in the field to receive their assessment of the search's completeness after compiling the list of papers. This step in supplementing electronic searches is particularly crucial when a subject matter is not yet strictly defined, when information may come from various fields, or if the reviewers suspect that much relevant work might not yet be publicly available. Some guides have stressed that researching merely the Internet is insufficient; such searches need to be supplemented by manually thumbing through printed journals. However, I believe that this advice is no longer necessary in today's level of Internet development; I believe that contacting experts (such as referenced authors) to inquire about a search's completeness is sufficient (but necessary), especially for identifying materials not readily available through Internet sources.

The next pertinent issue concerns when the literature search is finally completed: when repeated searches provide no new results. Levy and Ellis (2006) points out that the protocol not only guides the review process but also establishes when the review is completed. For example, without a protocol clearly stating the date range of prospective papers, reviewers would need to continually review the literature for new additions or at least remain ambiguous about inclusion periods. Levy and Ellis (2006) suggest that one should stop searching when searches result in the same references with no new results. However, notwithstanding the point at which the reviewers have to go on to the next step, new research is continually published. One reason why it is crucial to record the search string and procedures is so that they can be periodically repeated on the same databases and sources to see if new materials have shown up since the initial search. This is a common occurrence as frustrating as it might be; however, despite Levy and Ellis' comments to the contrary, I believe that a comprehensive literature review should include all available evidence up to the time it is submitted to publication (at least). Finding the subject matter may be one of the longest and most strenuous parts of the literature review and may often include searching through hundreds of papers; however, a rigorous literature review is impossible without a thorough and careful study of the entire subject matter.

After finding all applicable subject matter, reviewers also need to consider how to manage references, which includes everything from managing information and keeping records to deciding on a reference-citation mechanism (Hart, 1998). Fink (2005, p. 40) recommends using electronic tools such as reference managing software to create a "virtual filing cabinet", while Ridley (2012) recommends keeping ongoing records on not only the reference information of each paper but also the date of retrieval, keywords that led to retrieval, and notes on any other pertinent information. In terms of bibliographical software packages, she provides a brief tutorial on EndNote (http://www.endnote.com) as a reference library, which allows the user to save searches, import references, manually type in data, and access all information from any computer. An open source and free equivalent with similar functionality is Zotero (http://www.zotero.org). Levy and Ellis (2006) give guidelines on organizing both electronic- and paper-

based reference-management systems. Regardless the system used, the important point is to have a systematic means for recording and storing references and abstracts, annotating them, and even storing and organizing electronic versions of papers.

5.1 Guides and Exemplars of Searching the Literature

While all the guides I reviewed mention something about searching the literature, the most detailed and helpful guides I found are book chapters devoted to this topic. Petticrew and Roberts (2006) answer several practical questions including rules for stopping the search, how many databases should be consulted, and when to search "by hand". They also offer an example of their recommendations in action and discuss a comprehensive literature search on experiments in reducing crime. Fink (2005) and Ridley (2012) delineate various types of database sources and give guides on search rules, including brief tutorials on Boolean search strategies. In addition to these books, Levy and Ellis (2006) give guides specific to IS research, which include identifying literature databases pertinent to IS researchers. For reference management, some sources with practical guidance are Ridley (2012) and Levy and Ellis (2006).

Among the exemplars that I studied, several exceled in demonstrating how to conduct and report a review's literature search section. Alavi and Carlson (1992), Leidner and Kayworth (1992), and Petty et al. (1984) quite explicitly detail which journals they searched and justify why they chose them. They also fairly clearly detail their keywords and the bounds of their searches.

6 Extract Data

Extracting data represents a crucial step in the systematic review procedure. In this step, after obtaining a list of papers from the literature search, reviewers systematically take information from each paper to serve as the raw material for the synthesis step. The type of data to extract is based on the research question established during the protocol phase. I recommend that reviewers use a data extraction form that includes spaces to store the details required by the research question and a general comment section. Reviewers combine the information from this form with information collected from the practical screen and from the subsequent quality appraisal as a full record for each study to synthesize it in the synthesis step (step 8).

6.1 Guides and Exemplars of Data Extraction

Of the 23 studies I reviewed, the majority do not discuss data extraction at all and, thus, apparently take for granted that it occurred. However, some notable exceptions to this trend exist. First, Kitchenham and Charters (2007) devote an entire section of their paper to data extraction. They present the data extraction form used in Maxwell's (2006) systematic review as an example. That data collection form included information on cross-company models, within-company models, the measures used to determine statistical significance, measures for prediction accuracy, measures used to compare results, and the results of the tests. Kitchenham and Charters cover data extraction procedures, what to do with multiple publications of the same data, how to handle unpublished or missing data, and comments on data manipulation. They also offer insightful "lessons learned" to help reviewers avoid certain pitfalls. We find a second, albeit rather cursory treatment with Petticrew and Roberts (2006), who offer an example of a data extraction form (their Appendix 4) and briefly discuss the reliability of critical appraisal and data extraction and the differential effects of interventions.

A third notable treatment of data extraction is Bandara et al.'s (2015) methodology guide. Their most unique and valuable contribution is their electronic tool-based approach to coding and extracting data from literature reviews. Their approach is a form of qualitative content analysis and is heavily influenced by grounded theory coding techniques. Of the 23 studies, theirs is the only detailed treatment of data extraction that focuses on qualitative primary data—the others almost exclusively use quantitative data. Finally, Okoli (2012) focuses exclusively on extracting the elements of theory (i.e., theoretical concepts, relationships, explanations, and boundary conditions) from primary studies.

Six of the exemplar studies explicitly mention how they extracted data. Some thoroughly dedicate a section of their methodology to touching back on the initial protocol and how they applied it when extracting data (Alavi & Carlson, 1992; Cotton & Tuttle, 1986; Dubé & Paré, 2003; Robey et al., 2008). Piccoli and Ives (2005) and Leidner and Kayworth (1992) briefly address how they examined and coded the papers in their studies.

7   Appraise Quality

The practical screen excludes papers from a review without even considering their quality to either ensure that only relevant papers are considered in the review or, more pragmatically, reduce the pool of prospective papers to a manageable number. Once all potentially eligible papers have been collected, reviewers should then examine the papers more closely to evaluate their quality. Not all primary studies are of equal quality; thus, reviewers need to rate studies according to the extent to which they meet various quality standards.

Two related yet distinct purposes exist for this quality appraisal: to prioritize papers according to their quality and to exclude certain papers deemed not useful due to inferior methodological quality. Although scoring papers (rating papers according to quality criteria) differs from screening them for methodology (eliminating papers for deficiencies in quality), the two steps are obviously related. Thus, practically speaking, it makes sense for reviewers to rate papers' quality by using the same criteria they use to screen them for methodology. However, the key difference is that, once reviewers find a paper to not meet the minimal methodological standards, they do not need to score it any further—they would immediately eliminate it from further consideration. On a cautionary note, puritanically excluding presumably low-quality papers has led to serious problems in past literature reviews (Rodgers & Hunter, 1994). Not all literature reviews need to eliminate studies based on their quality. Regardless, reviewers need to appraise or score the quality of papers that remain in the study as a basis for confidence in the final results. Though I certainly do not advocate keeping dubious papers when in doubt, reviewers should be aware of the implications of all their choices and explicitly report them.

Generally, the process of collecting primary papers will have already given the reviewers a basic idea of the quality and type of papers available. They must now establish stricter criteria to determine which papers they should consider for the literature review. Because each systematic review varies, I cannot give a definitive guide to conducting the quality appraisal or even specify minimum quality standards. Instead, I outline the various criteria for assessing papers' quality that various authors have recommended. Reviewers can consider these recommendations in developing their quality appraisal standards in the literature review protocol.

To appraise papers' quality, reviewers should develop and distribute among themselves a standard form for assessing each paper. Fink (2005) offers an example of such a form (in this case, a grid) that phrases each quality criterion as a yes or no answer. If a paper does not meet one of the pre-determined quality criteria, then the reviewers have finished assessing it and they can exclude it from further assessment. If using such a grid, reviewers should also ensure it has space to write additional notes and comments for both included and excluded papers. As with the practical screen, I recommend that, rather than actually deleting papers, authors place those papers that do not meet the standards of the methodological screen in a separate subfolder categorized by what specific quality standard they failed to meet. As a result, reviewers can verify their screening judgments and test inter-rater reliability. After clarifying the protocol, the reviewers should pilot-test the appraisal process to work out any problems. This pilot test involves applying the previously mentioned checklist to several papers to establish whether the format suits itself to them or if it needs revision.

Perhaps the most significant distinction between classes of quality appraisal methods is whether the primary studies are quantitative (i.e., they obtain knowledge by measuring numbers) or qualitative (i.e., use text or other non-numeric data with discussion and argumentation to understand the phenomenon); hence, I treat these categories of studies separately.

7.1   Quality Appraisal: Quantitative

Studies that appraise the quality of quantitative primary studies have almost universally employed what is known as a "hierarchy of evidence"—a ranking of research designs in the order of their results' relative generalizability and validity. The SLR guides that I studied all refer to the hierarchy of evidence in some manner or the other. For example, Petticrew and Roberts (2006) present a typical hierarchy of evidence that ranks studies as follows (ranked from best to worst):

1.   Studies that measure effectiveness with randomized controls.
2.   Studies that use quasi-experimental designs.
3.   Uncontrolled studies.

4. Studies that assess etiological relationships such as case control and prospective cohort studies.

5. Cohort studies.

To quantitatively assess papers, Fink (2005) stresses that reviewers need to judge papers' data-collection methodology, interventions, analysis, results, and conclusions in depth. She recommends that reviewers first establish the study's reliability. Does the study hold up to test-retest reliability? Does it report inter- or intra-rater reliability, homogeneity of data, and equivalence or alternate forms of reliability? What is the paper's degree of content, face, criterion, predictive, concurrent, or construct validity? Whenever possible, reviewers should decide whether interventions or programs applied in a particular paper are appropriate. Does a paper apply acceptable statistical methods? In particular, does it employ reliable and valid independent and dependent variables? What kinds of scales—categorical, ordinal, or continuous—does the paper use (if applicable)? Does the statistical analysis correspond to the nature of those scales? What kind of confidence level would the reviewers judge acceptable to qualify a study for inclusion? For most of the above questions, no hard or fixed answer exists. Acceptable standards for different methodological tests sometimes vary from field to field. Moreover, work in newer and emerging areas of research might call for more lenient methodological standards for including it in a literature review to not prematurely exclude work in areas that are not yet well understood. Ultimately, reviewers need to establish their own inclusion and exclusion criteria. I emphasize not what criteria should be used but rather stress that reviewers must thoroughly understand their criteria for inclusion and make these criteria explicit so that other researchers can reproduce the resulting literature review.

Health science research is more likely to establish strict methodological screens—in that field, researchers often consider SLRs whose primary studies are nothing but randomized control trials to be of the highest quality (Fink, 2005). However, social science studies such as those in information systems often did not have the luxury of identical treatments (medications and other health interventions) given to sufficiently large number of people as to yield sufficient statistical power (Kitchenham & Charters, 2007). Thus, it is not surprising that Petticrew and Roberts (2006), writing on SLRs in social science research, advocate a more lenient usage of the hierarchy of evidence. Unlike Fink, they do not advocate strict yes-or-no cut-offs for including studies based on their methodology; they rather recommend ranking studies and generally being aware of their differences in quality. Although they disagree that systematic reviews should include only randomized controlled trials, they do caution against incorporating any papers whose context (implementation decision, treatment integrity, etc.) do not meet a certain standard. They also recommend a more sophisticated assessment of papers that goes beyond information found on the printed page and assesses their authors' subjective influence. Their discussion of author bias and its effects is particularly enlightening and includes a section on non-reporting (titled "When no news isn't always good news") and on critical appraisal (titled "Too much criticism, not enough appraisals").

Other SLR guides outside the health sciences domain are similar to Petticrew and Roberts (2006) in assessing quality without strict methodological cut-offs. Kitchenham and Charters (2007) argue that reviewers must develop quality instruments that incorporate the subjective predispositions and objective criteria that researchers have set. In particular, reviewers who develop instruments must consciously consider human bias. They provide two examples of quality checklists but warn that quality assessment has its limitations. Rousseau et al. (2008) identify six general categories of quality assessment criteria: construct validity, internal validity, effect size, generalizability, intervention compliance, and contextualization.

7.2 Quality Appraisal: Qualitative

Fink (2005) does not distinguish at all between setting quality standards for quantitative and qualitative studies: she claims that the same criteria could be used for both categories. In extreme contrast, Petticrew and Roberts (2006) question whether systematic reviews are even possible with qualitative work or whether using a systematic procedure negates one's ability to analyze qualitative work. They worry about the harmful effect of checklists and generalizations. In contrast, Rousseau et al. (2008) take an intermediary approach: whereas they apply the same six general criteria that they used for quantitative studies, they carefully note the differences in applying these criteria to qualitative studies.

I believe that qualitative work lends itself just as much as quantitative work to the rigorous empirical methodology of systematic reviews. Only through this structure can reviewers meet the four mandates of explicit, comprehensive, systematic, and reproducibility. Like Fink (2005) and Rousseau et al. (2008), I

believe that reviewers can and should appraise qualitative papers, but, unlike Fink, I believe such studies require a different set of procedures.

Klein and Myers (1999) provide a detailed guide for conducting and evaluating interpretive case and ethnographic studies in information systems. Furthermore, Myers (2008) provides a guide that spans some of the major categories of qualitative research: action research, case studies, ethnography, and grounded theory. For each kind of study, he includes specific guides for evaluating the quality of such studies. Myers writes generally for business and management researchers, but his information systems background assures his evaluations' applicability to IS research.

More generally, literature review guides exist for evaluating qualitative primary studies. Although Hart (1998) and Ridley (2012) design their guides for doctoral thesis literature reviews, their quality appraisal sections for qualitative studies are still helpful for standalone reviews. Analyzing a paper's qualitative merit is the first necessary step when going beyond its basic design structure and dissecting its logical arguments. This qualitative scoring is "the difference between critical reading and critical writing" (Ridley, 2012, p. 141). Hart (1998) highlights the importance of analyzing papers' arguments. Reviewers should identify whether a paper's argumentation is based on inference, assertion, or supposition. That is, how did the authors build the argument? For theoretical papers that exclusively rely on theory or model-building without an empirical component, one needs to discover whether they rely on deductive or inductive reasoning. Using Alec Fisher's method of critical reading—using structural words such as "thus" and prepositions to understand the logic of a piece (Hart, 1998, p. 93)—and Stephen Toulimin's method of argumentation analysis—a mapping device that breaks arguments into basic elements and draws their interrelations (Hart, 1998, p. 88)—every paper should be screened for four items: what claims they make, what evidence they provide to support these claims, if the evidence is warranted, and how the they back the evidence. Fallacies in arguments at this point could lead to seriously downgrading a paper's quality score. Hart's discussion of argumentation analysis is extensive, but Levy and Ellis (2006) concisely yet completely summarize his discussion.

7.3   Guides and Exemplars of Quality Appraisal

Most guides on quality appraisal for primary studies for literature reviews restrict their focus to either quantitative studies or to qualitative studies but not both. An exception is Okoli's (2012) classification of quality appraisal guides. While he does not himself explain how to appraise studies, he clearly distinguishes between the different appraisal criteria needed for quantitative, qualitative, and conceptual studies and provides references to papers and books that give detailed appraisal instructions for each.

For appraising the quality of quantitative primary studies, Fink (2005) presents the rigorous standards used in health sciences research, where research quality is literally a matter of life or death. Whether or not reviewers choose to exclude studies based on the hierarchy of evidence presented in that field, the quality appraisal principles are helpful. Petticrew and Roberts (2006) also present a hierarchy of research evidence, but one that is more tailored to social science research. Their Table 5.1 is a well-laid out overview of quality appraisal and caps a section that discusses using tools, scales, and checklists in the review process. In detail, their review addresses the quality assessment criteria in randomized controlled trials, observational studies, case control studies, interrupted time series studies, and cross-sectional surveys. Kitchenham and Charters (2007) present valuable hierarchies of evidence assembled from still other SLR guides.

For qualitative primary studies, IS researchers are fortunate to have the native studies of Klein and Myers (1999) and Myers (2008). While applicable to many business and social science fields, their assessments take the particularities of IS research into careful consideration. More generally, Hart (1998) takes a more philosophical approach to assessing papers' quality by emphasizing that reviewers analyze studies' critical arguments.

Only five of the exemplars I reviewed address quality appraisal. Dubé and Paré (2003) and Joseph et al. (1996) thoroughly describe what constitutes quality and why they excluded the papers they did. Robey et al. (2008) explain how they limited the 53 papers from the practical screen to 51 based on methodological quality. Leidner and Kayworth (1992) state that they sorted papers based on methodology but do not state how many, if any, they excluded. Finally, Petty et al. (1984) make a passing comment that they made attempts to correct measurement error.

8   Synthesize Studies

When reviewers have screened, selected, and scored the papers for their review, they next need to combine them to make comprehensive sense out of their (often large) number. At this stage, the reviewers aggregate, discuss, organized, and compare. At the end of this stage, reviewers should have a complete, polished synthesis of information, and they should be able to write up the review (step 8) relatively straightforwardly. As with the quality appraisal, the procedures involved in this step depend on whether the studies to be synthesized are quantitative, qualitative, or contain both kinds of elements. Whereas only quantitative studies can be analyzed quantitatively, both quantitative and qualitative studies need to be analyzed qualitatively.

Rousseau et al. (2008) present a classification of different kinds of research synthesis based on the nature of the primary studies and on the philosophical approach to analyzing these studies. They call the quantitative, positivist synthesis of quantitative primary studies "synthesis by aggregation"—commonly called meta-analysis. They call the positivist synthesis of primary studies of different natures (such as qualitative and quantitative) synthesis by "integration"—commonly called triangulation. Their other two categories of synthesis apply to qualitative primary studies based on different philosophical approaches to analyses. When an interpretivist approach is adopted, they called this synthesis by "interpretation"; with a critical realist approach, they call this synthesis by "explanation". In my treatment here, although I consider Rousseau et al.'s classifications, I consider synthesis approaches based on the quantitative or qualitative natures of the primary studies and of the review itself rather than on the philosophical approach taken to synthesis.

8.1   Quantitative Synthesis of Quantitative Studies: Meta-analysis

A quantitative synthesis of reviewed studies involves considering each study as a case that has certain independent variables that are hypothesized to have an effect or non-effect on a given dependent variable (Green & Hall, 1984). When each of these cases (individual studies) is quantitatively analyzed to derive a composite result, such a synthesis is called a meta-analysis. Because meta-analysis involves quantitative analysis based on the same quantitative criteria as the primary studies, one can only conduct a meta-analysis on quantitative primary studies—it makes no sense in the context of qualitative primary studies. It is beyond my scope here to explain the procedure for conducting a meta-analysis (however, I refer to some helpful guides below). Instead, I consider meta-analysis as one synthesis approach in the larger context of carrying out systematic literature reviews.

Rousseau et al. (2008) call meta-analysis "synthesis by aggregation". They note that a key limitation of this approach in management and organization science is that primary studies in that field are rarely homogenous. Information systems has a similar issue in contrast to the health sciences (the leading domain where meta-analysis is practiced), where replicating studies is a scientific norm and necessity, which facilitates meta-analyses. In such fields, conducting a meta-analysis in the context of systematic literature reviews is considered to be research of the highest quality—in fact, meta-analytical systematic literature reviews of randomized controlled studies are the crème de la crème of the hierarchy of evidence. Without disputing the exaltation of one particular research approach far above all others, I mainly note here that, in information systems and related social sciences, the lack of circumstances for randomized control trials and other highly replicable studies limits the availability of circumstances for individuals to conduct robust meta-analyses. Hence, SLRs in non-health science fields tend to not exalt meta-analyses to such a high degree.

Rousseau et al. (2008) argue that no single consensus exists about the best evidence to include, and reviewer bias might have seeped into the selected studies. To fully synthesize knowledge, they argue that interpretation certainly does not need to stop at meta-analysis but can include other modes of synthesis. Similarly, Petticrew and Roberts (2006) do not believe that meta-analysis is the end all and be all of synthesis but instead strongly advocate for triangulation (what Rousseau et al. call "integration"). They begin their section on quantitative synthesis by discussing narrative synthesis, which includes tabulating included studies and explicitly sorting studies' quality. We can equate how they treat quantitative synthesis with the synthesis section of any experimental study where the first discussion of analyzed data broadly overviews and describes the study sample. Their treatment is similar to that of Kitchenham and Charters (2007), who advocate beginning synthesis with narrative synthesis (regardless of paper type) followed by quantitative synthesis. Next, one should synthesize the best evidence as a conclusion drawn from "vote counting"; only then would meta-analysis follow. Even then, Pettigrew and Roberts are cautionary about

meta-analysis: they begin with the question of whether it even works, criticize the technique as an academic "sausage machine" (in the sense that junk meat produces junk sausage), and offer concrete ideas for improvement. However, they do not denigrate meta-analysis but rather clearly define its limits before describing the approach in detail.

8.2   Qualitative Synthesis of Quantitative or Qualitative Studies

Although information systems was initially a research field with primarily quantitative analysis, qualitative research has now established equal regard, if not yet equal frequency, of application. Quoting William Bruce Cameron, "Not everything that can be counted counts, and not everything that counts can be counted"[3]. Thus, the importance of qualitative synthesis is well established in not only information systems but also other social sciences.

Webster and Watson (2002) describe the synthesis stage as transitioning from an author- to a concept-centric focus. They recommend mapping all provided information to best evaluate the data, fit it in the review's theory, and structure that review.

Rousseau et al. (2008) refer to the analysis of qualitative material as synthesis by interpretation and synthesis by explanation. Such interpretative and critical realist approaches are associated with relativist epistemologies such as phenomenology or social construction. They outline how to use meta-ethnography and develop theoretical models of how interventions work, why, and for whom. Thus, one can derive a preliminary synthesis and explore relationships in and across the data. A final step is then assessing the robustness of the synthesized output. As in their discussion of meta-analysis, Rousseau et al. note that no consensus exists about what is the best evidence and that a systematic review will always be shaped by subjective interpretation. What the systematic review does offer to combat this, however, is an explicit description of methodological procedure to allow future researchers to replicate or amend the process.

Petticrew and Roberts (2006) offer a simple three-step guide to tabulating included studies in a narrative synthesis. Of particular interest is their Table 6.1, which offers an example of descriptive synthesis. They advocate that reviewers describe within-study synthesis first and then use these various threads to begin a qualitative description of mixed-methods research.

For guidelines on a review's qualitative analysis, Hart (1998) is particularly helpful. He states that reviewers should first qualitatively classify all material. Then, after judging if each paper matches the relative standards previously established, reviewers should begin mapping relations (Alias, Zurinah, Reiska, Åhlberg, & Novak, 2008) between papers according to standards such as the methodological tradition they fall under, or their particular design features. Based on the analysis of each paper, reviewers should consider how they may be synthesized. Hart offers a thorough list of such rhetorical devices such as metaphor, tropes, synecdoche, irony, metonymy, and so on that reviewers may consider which devices predominate in a paper. Often, a paper's style offers clear insight into its author's voice. The easiest way to proceed to the final writing process is to create a visual map of the ideas and of the review layout. Potentially useful strategies include feature maps, tree constructions, content maps, taxonomic maps, and concept maps (Wu & Weld, 2008); Hart offers appropriate visual representations of each form (1998, pp. 146-157). In related work, Erduran, Simon, and Osborne (2004) are particularly provocative in their promoting argumentation in scientific thought.

8.3   Combined Synthesis of Quantitative and Qualitative Studies

A third, rarer approach to synthesizing studies exists for synthesizing a mix of both quantitative and qualitative studies. Generally referred to as triangulation, many scholars have called for such reviews, but few have done them. Rousseau et al. (2008) recommend approaching these unique papers through combining synthesis by integration and synthesis by explanation. Synthesis by integration involves collecting and comparing evidence from two collection methods and typically employs pre-determined questions and selection criteria. Synthesis by explanation focuses on identifying causal mechanisms and how they operate while recognizing the hierarchy of evidence. As in the previous sections, reviewers must acknowledge their own subjectivity in both approaches.

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[3] http://quoteinvestigator.com/2010/05/26/everything-counts-einstein/

8.4   Guides and Exemplars of Synthesis

Two notable papers provide helpful frameworks for understanding the wide diversity of approaches for synthesizing studies for a literature review. Rousseau et al. (2008) classify approaches at a high level depending on whether the primary studies are quantitative or qualitative and depending on the reviewers' own epistemological approach. Okoli (2012) categorizes and briefly describes numerous synthesis approaches depending on whether the primary studies are quantitative or qualitative and depending on whether their synthesis methodology was quantitative, qualitative, or mixed. Both frameworks effectively incorporate quantitative and qualitative approaches and assess the pros and cons of each.

Fink (2005) and Petticrew and Roberts (2006) provide clear introductions for reviewers seeking to conduct a meta-analysis that are sufficient for reviewers to determine whether or not to take the approach. However, for actually implementing meta-analysis, these overviews are insufficient. For details of how to actually carry out a meta-analysis, Borenstein, Hedges, Higgins, and Rothstein (2009) provide a good introduction with state-of-the-art recommendations. Rosenthal (1995), Rosenthal and DiMatteo (2001), and Rosenthal (1991) are also helpful and authoritative works on meta-analysis. For qualitative synthesis, Hart (1998) provides detailed guidance on a variety of synthesis approaches and techniques. In the context of a full literature review methodology guide for information systems, Levy and Ellis (2006b) provide techniques for qualitative synthesis that includes many pointers taken from Hart. Their "tips from the field" and "when is the review completed' sections may be particularly helpful.

Some scholars have developed literature review methodologies particularly tailored for the particularities of IS research yet sufficiently general to be broadly applicable. The three that I mention here all attempt to cover the entire literature-review process. However, their most unique contributions are in the novel synthesis approaches that they propose. First, I earlier note Bandara et al.'s (2015) data-extraction methodology. They present a corresponding synthesis approach, heavily supported by software tools, based on content analysis suitable for qualitative primary data. Next, Sylvester et al. (2011) argue that it is not always feasible nor even desirable to try to adopt a neutral viewpoint on diverse literature and try to force a common story to explain it all. Rather, they advocate and demonstrate with a detailed example a historiographical approach to research synthesis that identifies and highlights various and even conflicting viewpoints to present multiple stories to present a rich and diverse multi-lens perspective into a phenomenon of interest. Finally, Wolfswinkel et al. (2011) elaborate on a grounded theory approach to synthesizing literature by employing open coding, axial coding, and selective coding to distill theoretical concepts that reviewers can extract from a body of literature to inductively develop a new theory that can effectively explain the body of studies. Although data coding would normally be considered a procedure in the data-extraction stage, grounded theory coding is multi-level and heavily iterative such that one could consider that data extraction is subsumed into the synthesis stage.

Six of the exemplars I consulted explain their approaches to synthesis. Marakas et al. (1998) and Dubé and Paré (2003) are particularly thorough in their descriptions and specifically detail the data-extraction procedure they used for the different study methodologies they encountered. Robey et al. (2008) are less specific but mention that they accessed the theoretical underpinnings from each study in accordance with earlier literature reviews. Other than these, those studies that followed a standardized synthesis approach (notably, meta-analysis (Alavi & Joachimsthaler, 1992; Cotton & Tuttle, 1986; Joseph et al., 2007; Petty et al., 1984) and meta-triangulation (Jasperson et al., 2002)) explicitly say so.

9   Write the Review

The final step of developing a research literature review is reporting the findings and actually writing the review. Though it should be clear by now how time- and energy-intensive this process can be, assuming all the previous steps have been followed in order, it can be done systematically and smoothly (Kitchenham et al., 2009).

As I emphasize in Section 1, a rigorous systematic review has two important aspects: it clearly documents the steps followed and makes a valuable scholarly contribution. In this paper, I explicitly focus on the first aspect—the rigor of the process. While the second aspect is extremely important, it is beyond my scope here. However, Okoli (2012) addresses it in detail and focuses particularly on how to make a theoretical contribution using a systematic review. In Section 9.1, I highlight some papers and books that provide more detailed guidance on creating scholarly value in writing a literature review.

In reporting the findings, reviewers should document the process of the literature review in sufficient detail such that other researchers can reproduce entire procedure in the scientific sense; that is, other researchers wishing to replicate the results of the review should be able to follow the same steps described and arrive at the same results. Beyond simply reporting the procedures, the literature review should conclude by highlighting any novel findings. Does the literature support a particular existing theory or do the reviewers establish a new model that builds on existing theory and contribute to future research? In particular, reviewers should highlight unexpected results. Many literature reviews are poorly conceptualized and written (Boote & Beile, 2005). Though the average reviewer may not have an affinity for this final step, it needs as much effort as the others. Without a clear and understandable write-up of the findings, the chances of the review being widely disseminated decrease. As with any other research, it would be a shame for results to not receive the attention they deserve because of poor presentation.

It is beyond my scope here to provide a general guide to writing a paper, but various sources that address writing issues that are particularly pertinent to writing a literature review exist. Ridley (2012) and Hart (1998) devote several chapters to various writing issues particular to literature reviews, such as principles of pre-writing, being critical, supporting claims with evidence, maintaining legitimacy, verb use, writer's voice, and many other pertinent issues. Other helpful resources help authors to write in a way that prioritizes the ultimate audience (Donovan, 2007; Keen, 2007), lay out the review while considering their preconceived expectations for each section (Maxwell, 2006), ensuring the text's structure and consistency (Hartley, Pennebaker, & Fox, 2003), and setting a definite voice for the review, especially in the case of multiple collaborators (Allen, Atkinson, Morgan, Moore, & Snow, 1987).

Webster and Watson (2002) give general guidance about the writing stage of developing a literature review. They talk about identifying the topic, defining terms, clarifying the study's scope, and writing the discussion and conclusions. They also offer helpful guidance on the tone and verbal tense to adopt in writing.

9.1   Guides and Exemplars for Writing a Literature Review

Kitchenham and Charters (2007) give a clear model outline of the structure of a published systematic literature review and indicate what one should report. For writing style tips particular to literature reviews, Bem (1995) and Webster and Watson (2002) give practical guidance. Hart (1998) and Ridley (2012) also present lengthy treatments of writing reviews, but their guides are targeted to literature reviews in graduate theses. Concerning the rigor of literature reviews, Vom Brocke et al. (2009) call for explicitness in documenting the methodological details of a review paper. They argue that it is not sufficient to merely be invisibly rigorous but that any rigor in a review should bear witness in its published documentation. As I mention earlier, Okoli (2012) focuses specifically on how to craft and argue a theoretical contribution in a systematic review.

Of course, the best guide to how to report a literature review is an actual published review. Although none of the 23 exemplars I analyzed specifically state how they would engage in the write-up phase, we can assume their doing so since the write-up is an implicit step in any publication. Among the 23 papers, the write-ups take a variety of forms and indicate that no single acceptable procedure for outlining findings exists. Marakas et al. (1998) create tables to classify studies and clearly explains all variables identified. Winter and Taylor (2002) sort their reviewed papers in chronological order. Venkatesh et al. (2007) chart their expectations for future developments around a historical discussion of the process of technology adoption research over the prior two decades. Piccoli and Ives (2005) first explain the three principal contributions of their framework and then organize their literature review around this framework. Wade and Hulland (2004) state their review's three research purposes and then answer the respective questions. Melville et al. (2002) build their review around a set of propositions and research questions. Similarly, Leidner and Kayworth (1992) propose six themes around which to organize papers and build propositions. Jasperson et al. (2001) discuss meta-triangulation at length. Joseph et al. (2007) begin with a narrative review, moves into a meta-analysis, and, finally, tests a proposed model. Cotton and Tuttle (1986) limit themselves to only presenting the quantitative results of their meta-analysis. Other authors, however, present their discussion through a series of headings and subjects but without any clear framework outlining the structure of their write-up.

10 Thoughts on Publishability of Systematic Literature Reviews

In this guide, I describe a much more rigorous approach to conduct literature reviews than most researchers are familiar with. Those who have already published literature reviews (whether for their theses or as a standalone publication) might wonder if the systematic approach I advocate is worth all the trouble. I certainly believe it is. Although this approach does require more work than is normally spent in writing a literature review, because I present such a detailed step-by-step guide, it does not entail an inordinate amount of extra work; in fact, the detailed guidelines help researchers to not waste time floundering in wondering what to do or wondering if they have done enough. The reward of this extra effort is twofold: first, the researcher can readily produce high-quality work that is more valuable for their own and for others' subsequent research; and second, the researcher can expect their work to result in higher-quality publications with direct career benefits. In this section, I comment on the potential publication outlets that result from adopting such a systematic approach.

A reward for conducting a SLR, other than the intrinsic reward of producing a truly valuable work of research, is that well-executed literature reviews on emerging or perennial areas of interest often yield many more citations than would most primary studies because authors of primary studies in the topic area tend to refer to the same base studies. A well-executed literature review does a lot of their work for them and analyzes the primary studies in ways that help other researchers focus and frame their own work. The benefits of high citations include promotion and tenure, research awards and grants, and other related professional benefits.

10.1 Publishing the Protocol

Creating a literature review protocol before conducting the review is one element that reviewers rarely practice, and, thus, it might seem particularly onerous. However, I have argued that this practices greatly enhances a review's overall quality because it forces reviewers to lay out the plan beforehand and, thus, to explicitly think through the process before they begin. A review protocol is ideal for being presented at a conference. Actually, the primary reason for presenting a review protocol at a conference is to obtain external validation by the peer-reviewers of the submission and, hopefully, to obtain helpful feedback from the audience; this external input can be helpful in refining the review's design. Moreover, it gives the reviewers a publication before the review even begins, which can hardly be considered a waste of time.

Doctoral students, in addition to getting an early conference publication before graduation, can employ the protocol directly in their dissertation proposal as part of its methodology section. However, when doctoral students conduct their entire dissertation literature review with the SLR methodology, they accrue significant benefits (see Section 10.2).

10.2 Systematic Literature Reviews as Part of Doctoral Dissertations

Although thesis literature reviews (especially for doctoral dissertations) ought to be held to high standards of rigor, they typically are not held to the same standards as standalone reviews. The first reason for this is the same as for theoretical background reviews—the literature review is not the main focus of the study; if the student is ever to graduate, their supervisor has to let them "get on to the good stuff"; that is, progress to collecting and analyzing data for the primary study. The second reason for lower standards is related to the first: student theses are not held to the same standards as scholarly papers in leading journals produced by researchers many years beyond their PhDs. In the case of master's theses in particular, most supervisors would consider a rigorous literature review such as is proposed here overly onerous for the student. (The notable exception is when the dissertation analysis is a meta-analysis; in such a case, the rigorous SLR methodology would be expected. However, many dissertation supervisors distinctly prefer that students demonstrate their ability to conduct a primary study.) Similarly, doctoral supervisors and committee members would rarely hold their students to a higher standard than that held by leading journals' peer-reviewers.

However, although I do understand these pragmatic considerations, I offer one pragmatic argument for holding doctoral students to the standards of a standalone literature review in their dissertation's literature review. From the perspective of the student's career, the doctoral dissertation has two purposes. First, the best dissertation is a finished dissertation—its primary goal is to obtain a PhD. Common though controversial advice is that the best strategy for a doctoral dissertation is to do the minimum required to quickly get the dissertation and then, with a PhD and professorial or post-doc position in hand, begin to work on one's scholarly masterpieces. This advice would tend to de-emphasize a highly rigorous literature

review. Paradoxically, a dissertation's second purpose is to provide one or more rapid journal publications after its completion. A minimalist dissertation would result in minimalist publications; thus, this second purpose balances the first, which motivates the student to push themselves for higher quality than what their committee might let them get away with. (Of course, students who intend to work in an industry where research publications are not highly valued would normally aim for the minimum required to post the letters "PhD" behind their name with little extrinsic incentive to push themselves for higher quality in the dissertation.)

Following a procedure as outlined here for a literature review could help a doctoral student achieve both ends. Although the standards for a doctoral literature review are not normally as rigorous as presented here, dissertation literature reviews are normally expected to be significantly longer and more comprehensive than theoretical backgrounds to standard journal papers. Dissertation literature reviews normally must demonstrate a broad knowledge of related literature and a thorough understanding of the theory that underlies the dissertation topic. However, Boote and Beile (2005) lament the low standards of doctoral dissertation literature reviews, which they attribute to the low priority assigned to this aspect of doctoral training. Although they speak about doctoral dissertations in the education field, their arguments are widely applicable to many fields. Without a systematic guide, many doctoral students flounder in creating a quality literature review; for this reason, several books are dedicated to this one section of a dissertation (Hart, 1998; Ridley, 2012). While helpful, these guides generally lead to dissertation literature reviews that would eventually be chopped to pieces to become the theoretical background of an eventual journal paper submission.

In my view, an incredible amount of scholarly waste exists in the academic industry that results from the inefficient way that doctoral students typically conduct doctoral literature reviews. Thousands of doctoral students every year spend hundreds of hours on their dissertation literature review. Most of this time is spent aimlessly floundering since most students don't know what they are doing, and most supervisors don't have a model for guiding them to proceed in a systematic manner. Thus, their hundreds of hours result, inefficiently, in literature reviews of perhaps 40 to 80 pages in their final accepted form. However, few of these literature reviews are performed with sufficient rigor that they could be published as standalone literature reviews. Thus, when publication time arrives, these literature reviews are often reduced to no more than two to five pages of a journal paper. Thus, the lack of a system results in considerable scholarly waste.

The methodology I present here would help a doctoral student structure their literature review sufficiently rigorously to satisfy the demands of a dissertation proposal and, at the same time, be sufficiently rigorous and structured to be published as a standalone review, distinct from the main research question of the paper. On one hand, adopting a rigorous approach might require more work than is typically involved in creating a dissertation literature review, especially in the planning and paper-collection stages. On the other hand, by giving students a detailed system, they might actually spend much less time floundering and all the time they spent would be much more efficient and effective. Thus, the student could reap significant benefits towards producing a high-quality dissertation and, at the same time, produce a paper ready for submission to a journal before the rest of the dissertation is even completed.

Some doctoral programs require students to write a synthesis examination, which is typically a general literature review covering theory and methodology in their general area of interest. The value of this approach is that students are guided toward a specific research question and a specific research methodology for their dissertation. As long as they know their general area of interest, this synthesis exposes them to what research has been done (and what hasn't) and the methods that have been used to conduct research in that area (and potentially fruitful methods that might not yet have been employed). The SLR methodology is again helpful in conducting such a study. Specifically, what is involved here is what Kitchenham and Charters (2007) describe as a "systematic mapping" or "scoping study". The methodology is the same as that of the SLR; the difference is that, instead of aggregating primary studies' responses to a common research question, a systematic mapping collects and classifies studies that treat a subject of interest, often with different research questions. The SLR methodology gives focus and direction to the preparation for a synthesis examination and, likewise, results in a publishable study from an exercise that is often otherwise a throw-away endeavor.

10.3 Standalone Systematic Literature Review as the Initiation to a Research Program

In carrying out a research program that involves more than just one study, one should first be aware of what studies have been conducted in that area or in related areas. For this purpose, it is helpful for the

initial study in the program to be a scoping study that maps out the various areas and questions involved in the program. Such a study is similar to that described in Section 10.2 for a doctoral synthesis examination. Many standalone literature reviews are of this nature: rather than investigating the aggregated response to a specific research question, they classify and compare studies that treat the same general subject of interest. The value of such an initial study is that it helps to map out the areas that have been treated well and those that lack coverage. Well-treated areas, if overwhelming conclusive, might not need further research. However, if findings are contradictory or otherwise inconclusive despite the presence of several empirical primary studies, a regular, formal systematic literature review might be called for. On the other hand, if there is a shortage of studies in an area, the scoping study would highlight this dearth and would guide the researchers in designing primary studies that fill the identified gaps.

Such a strategy is ideal for developing research grant proposals. Most major governmental grant-funding bodies seek to fund not individual research studies but rather broader research programs. An initial scoping study as I describe here could be used to develop the literature review of the grant application, identify important unanswered questions in the topic area, and propose specific research questions and studies to further insight on the phenomenon of interest.

11 Conclusion

In this paper, I present a detailed guide to developing a systematic literature review. I delineate the steps to assure a rigorous review—one that comprehensively sums up and discusses the existing literature on a research question of interest. I emphasize the need for such a review to be explicit in describing the procedures followed to the extent that independent researchers carrying out the same review process could reproduce the results.

This guide presents a step-by-step approach to carrying out the rigorous, scientific methodology of a systematic literature review. While written generally enough to be applicable to a broad range of fields, this guide has a focus specific to information systems: it incorporates SLR guides from related fields—social sciences, management, and software engineering; it covers synthesis of both quantitative and qualitative primary studies; and it uses exemplar literature reviews from information systems as illustrative examples. Moreover, for each step of the process, it provides references to helpful resources that provide further detail on conducting each step of the SLR.

While reproducibility is an important mark of a rigorous study, a study's value depends mainly on it being comprehensive in incorporating all relevant literature. To assure this, the practical screen must be careful not to unreasonably exclude studies that could be significant to the general body of knowledge on the topic. In addition, the search for literature must be thorough and far-reaching to miss any potentially important studies.

While I describe each step in fair detail, it is impossible to elaborate on all the particulars necessary to create a literature review in one paper. The cited studies go into more detail on specific procedures, considerations, and judgments that must be made along each step. I hope that, in conjunction with these additional sources, this guide may serve its purpose in aiding the development of rigorous and valuable literature reviews.

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