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## Achieving Rigor in Literature Reviews: Insights from Qualitative Data Analysis and Tool-Support

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## Achieving Rigor in Literature Reviews: Insights from Qualitative Data Analysis and Tool-Support

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### Abstract:

It is important for researchers to efficiently conduct quality literature studies. Hence, a structured and efficient approach is essential. We overview work that has demonstrated the potential for using software tools in literature reviews. We highlight the untapped opportunities in using an end-to-end tool-supported literature review methodology. Qualitative data-analysis tools such as NVivo are immensely useful as a means to analyze, synthesize, and write up literature reviews. In this paper, we describe how to organize and prepare papers for analysis and provide detailed guidelines for actually coding and analyzing papers, including detailed illustrative strategies to effectively write up and present the results. We present a detailed case study as an illustrative example of the proposed approach put into practice. We discuss the means, value, and also pitfalls of applying tool-supported literature review approaches. We contribute to the literature by proposing a four-phased tool-supported methodology that serves as best practice in conducting literature reviews in IS. By viewing the literature review process as a qualitative study and treating the literature as the “data set”, we address the complex puzzle of how best to extract relevant literature and justify its scope, relevance, and quality. We provide systematic guidelines for novice IS researchers seeking to conduct a robust literature review.

**Keywords:** Qualitative Literature Reviewing Methods, Rigorous Review, IS Literature, Research Integration, NVivo, Coding Scheme.

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## 1 Introduction

Reviewing previous literature is a crucial element in every academic field. A successful literature review creates a firm foundation for advancing knowledge, facilitates theory development, closes areas where a plethora of research exists, and uncovers areas where research is needed (Webster & Watson, 2002). Rigorously reviewing literature is an important scientific task and constitutes the foundation for planning and conducting empirical studies; it is the essential “first step”. Science is cumulative, and “new knowledge is often created in the process of interpreting and combining existing knowledge” (vom Brocke et al., 2009, p. 2). However, “a literature review is much like a jigsaw puzzle” (Beekhuyzen, 2008, p. 1). It is not an easy task to piece together the seemingly endless volumes of published prior research and create a logical story with a clear and finished picture (Beekhuyzen, 2008). Furthermore, searching for literature in a deeply interdisciplinary and widely dispersed field such as information systems (IS) is a complicated and challenging task.

The rapid diffusion of IS literature has been accompanied by an increasing body of research. Given IS’s ever-evolving nature, researchers in this field must find a way to overcome the challenge this presents to quickly collect and synthesize the extant knowledge, build on existing knowledge, and address relevant gaps on topics of interest. A comprehensive research synthesis enables attentive readers to find out what we know and don’t know and what works well and what does not. However, unlike for empirical studies, there are only a few explicit methods or standardized guidelines for crafting a solid literature review despite its importance as a fundamentally scientific activity (Mulrow, 1995).

Part of the problem is that many IS scholars seemingly pay little attention to the method of their literature reviews: they present only the results with little evidence for how they formed their insights. The literature review process in IS has been criticized; for instance, some researchers have claimed that IS scholars have been “unaware of the need for structure in literature reviews” (Okoli & Schabram, 2010, p. 2). Reviewing the literature is almost always taken for granted as being just one step in empirical research projects rather than constituting a topic of study per se (Onwuegbuzie, Leech, & Collins, 2012). This is perhaps due to unfamiliarity, inexperience with the structure, format and methods essential to developing effective literature reviews, or lack of perceived value in emphasizing the literature review as a critical phase of a research study.

The value of IS literature reviews and, indeed, literature reviews in any field can thus be significantly enhanced through greater accuracy and comprehensiveness in the review process and through better justification and legitimization of choices. The review becomes not only more useful to the field but also more replicable and transparent. Here, systematic reviewing methods and tool-support techniques can provide vital guidance (Bandara, Miskon, & Fieft, 2011). Despite these opportunities for improvement, practical information on how to conduct a literature review and, in particular, how to use a range of qualitative tool-supported techniques for rigorous literature synthesis is still very scarce. This paper addresses this gap by presenting step-by-step guidelines for conducting literature reviews supported by various tools. We illustrate how to define the scope and goals of a literature review, identify relevant papers to review in a reasonable range, extract relevant content from identified papers, analyze and synthesize literature, and effectively present the results. We integrate previously disparate IS literature review guidelines into a set of consolidated and lean guidelines and show how various tools can be used during the different phases of the reviewing process. We hope to encourage IS scholars to accomplish more systematic and thorough literature reviews with efficiency. We emphasize that qualitative reviewing approaches have the advantage of providing a deeper understanding of the contextual dimensions of IS literature and can contribute to more comprehensive research integration. The guidelines we present go beyond merely summarizing and critically analyzing research findings; instead, we focus on achieving more rigorous theory integration and advancement. We demonstrate the application of qualitative tool-supported literature reviewing by presenting an extensive case example in detail and show excerpts for presenting the results of a review.

This paper is organized as follows. In Section 2, we overview and discuss prior tool-supported literature reviews. In Section 3, we present a rigorous, integrative, and systematic literature review approach using qualitative tool-support techniques. In Section 4, we outline the sequential steps and recommended tools for effective reviewing using examples from the illustrative case. Lastly, in Section 5, we conclude the paper by discussing lessons learnt, limitations, and our outlook for future research.

## 2 An Overview of Prior Work: Literature Reviews Using Tool-Support

Literature can be reviewed in many different ways. Booth, Papaioannou, and Sutton (2012) identify types, approaches, terms, and philosophical lenses commonly used for reviews. Table 1 summarizes the six different types of reviews they outline. Most literature reviews will include content that can belong to several of these categories; thus, the categories are not mutually exclusive. For example, category 1 (literature review) is the most generic category. At the same time, while doing a generic literature review, one can choose to use a critical lens (category 2) for examining recent literature, map the citations (category 4) to illustrate the evolution of the area of focus, and/or bring meta data into the analysis and reporting (category 5 to, for example, illustrate trends.

**Table 1. Types of Reviews (Adapted from Booth et al., 2012, p. 26)**

Type of review	Description
<b>Literature review</b>	Examines recent or current literature. Can cover a wide range of subjects at various levels of completeness and comprehensiveness. May include research findings.
<b>Critical review</b>	Demonstrates extensive research and critical evaluation of quality. Goes beyond merely describing to include degree of analysis and conceptual innovation. Typically results in hypothesis or model.
<b>Integrative review</b>	Includes both experimental and non-experimental research for a more comprehensive understanding of a phenomenon. Integrative reviews may combine data from theoretical and empirical literature.
<b>Mapping review/ systematic map</b>	Identifies gaps in research literature by mapping and categorizing existing literature to commission further reviews and/ or primary research.
<b>Meta-analysis</b>	Statistically combines results of prior quantitative studies.
<b>Mixed studies review/ mixed methods review</b>	Combines methods that include the review component (usually systematic). Specifically, the combination of review approaches (e.g., quantitative with qualitative research or outcome with process studies).

In our view, literature reviews can report results across these different categories and will be either inductive, deductive, or a mixture of the two (as in the case study we present in Section 4). The difference lies in the analysis approach used and the nature of the information to be reported on. In an inductive analysis, the literature review explores what past studies have reported on. It is focused on extracting and synthesizing the voices of past scholars from a data-driven approach (where data here means the reported texts of the prior studies). In an inductive approach, one should not be influenced by preconceived themes or agendas; instead, the resulting review is interpretative (bottom-up) in nature. In contrast, another common and valid approach is to commence a literature review with specified themes and sub-themes that a researcher seeks to extract from a research context and then synthesize evidence of what has been said in the past. These reviews are deductive in nature: one reads and analyzes papers while specifically looking for evidence of the predetermined themes. These themes can be qualitative (i.e., definitions of key concepts, arguments made) or quantitative (i.e., meta data such as year of publication). Literature reviews also commonly apply a mixed approach in which some aspects of what to look for are already decided on when one commences the literature review process and other aspects are allowed or encouraged to emerge iteratively over multiple cycles of the literature review as the researchers develop their understanding and appreciation of what is in the literature and, hence, what is worthy of being reported.

Reviewing literature, regardless of the kind of review conducted, often becomes an overwhelming task when trying to organize information from a vast and diverse range of sources. As such, it is natural that researchers turn to software tools to aid them in this process, but this quest for help has rarely been discussed in a consolidated way. The universe of such aids includes qualitative data-analysis software (e.g., NVivo, ATLAS.ti, MAXQDA, QDA Miner, Leximancer), reference management and note-taking tools (e.g., ENDNOTE, Mendeley, Evernote), citation-analysis tools (e.g., CiteSpace), and literature-sharing tools (e.g., Dropbox, OneNote, OneDrive).

As part of our overarching research, we explored and captured how tools have been used to support literature reviews in the past. In particular, in what phase(s) of the literature review (see Section 3 below) they were used in and what kind of tool features were applied. Appendix A shows the preliminary results

of a comprehensive review of a prior tool-supported literature review. Table A-1 illustrates how several different tools (and their features) have been used to support different phases of the literature review process.

Traditionally, researchers have used qualitative software tools to grapple with empirical data collected in fieldwork such as interviews and participant observation. We argue in this paper that literature can be treated as qualitative secondary evidence, and researchers may use software to help the analysis process and manage the literature (the “data set”). As Table A-1 (in Appendix A) shows, this is not an uncommon practice and is already performed in many different fields. Tool-supported literature reviews are not only valuable for the sake of the literature review phase itself, but also for other stages of research, such as for triangulation purposes (where empirical evidence from the literature can be revisited at a later stage). Yet, the majority of researchers still ignore this aspect and opportunity. While we promote the value of tools in a literature review process, we also wish to strongly emphasize that software is only an aid to the organization of the material and is not in itself an interpretive device. Hence, while the transparency, completeness, presentation, and reliability of one’s literature review can be supported and enhanced by using tools, one’s own synthesis and interpretation efforts will still be the most significant key to a successful literature review.

NVivo, Atlas.ti, and MAXQDA are well-established qualitative data-analysis tools with many embedded features to support qualitative data analysis. Other newer tools such as QDA Miner have also emerged. As we argue in this paper, there is value in treating literature as qualitative data and the features of these tools (see Table A-1, column 2) can be applied to support the analysis process. These tools enable papers to be stored with their maintained meta-attributes (i.e., source, authors, year, etc.), which can be directly exported from reference management tools (such as Endnote) in case the papers are already stored and linked in such a tool. There are advance search features to query these attributes and the content of the papers. The analysis is supported by the ability to extract and synthesize aspects from the data (either bottom-up (inductive) or top-down (deductive)) while maintaining a trail of evidence because the outcomes are always linked back to the original data. Tools can promote and support features for note taking (i.e., annotations and memos in NVivo). These features can also be linked to the data, which can help with the coding and reporting phases. The above tools also have inbuilt features such as inter-coder reliability reporting, which enables researchers to reliably check their coding and coding corroboration procedures. The primary advantage of these tools is that they strongly link findings to evidence, which can be revisited on multiple levels. Appendixes B and C together with the case study in Section 4 describe the set of features of one such qualitative tool, NVivo. Most of NVivo’s features are commonly available in other qualitative data-analysis tools, which may be referred to in different terms but are fundamentally the same. This similarity makes it unimportant which of these tools to apply as long as it is done appropriately and is well documented.

NVivo is a popular tool used in much previous research. Table A-1 provides only a small subset of recent examples from a range of fields. Di Gregorio (2000) was one of the first to promote NVivo (Version 2) to support researching and writing a literature review, and many others have followed since then. In comparison to other tools, NVivo has many self-training support resources and case examples on how to use it specifically for literature reviews (see sample references to such resources in Appendixes B and C). These could be other factors influencing the growing use of NVivo for qualitative literature reviews.

Leximancer is another software tool that focuses on analyzing text and enables one to identify themes along with presenting visual representations of the qualitative data. Researchers (see Table A-1 for some examples) have used Leximancer as a tool to support the content analysis of papers, which is especially applicable when there is a large pool of papers to explore and the primary goal is to derive the key concepts reported across these papers (because one can run a Leximancer query to extract concepts across a large paper pool fairly quickly). It performs a full text analysis both systematically and graphically by creating a map of the concepts and apparent themes re-appearing in the texts. These concepts are displayed in a way that allows one to subsequently explore links to related subtexts. As Indulska and Recker (2008, p. 295) note: “Each of the identified concepts is placed on the map in proximity (to the others) through a derived combination of the direct and indirect relationships between those concepts”.

Leximancer is a useful tool to use when one seeks to identify the centrality of concepts and visually explore textual information for related themes. It is fully automated and employs a machine-learning technique based on the Bayesian approach to prediction. This automation means it is fast and the results are purely data driven; thus, the data are useful for inductively driven literature reviews with exploratory goals. However, using only Leximancer to compile a literature review would be limiting. Literature reviews



often require more subjective interpretation and codification than what a simple concept map can provide. Cameron (2007) notes Leximancer's limitations as being less valuable for data sets that could produce "false positives" as a result of simplifying complex original data through machine analysis. Others (e.g., Hepworth & Paxton, 2007; Liu, 2004) instead argue for Leximancer's objectivity, face validity, and reliability and say that these features outweigh the possible risk of simplification in an exploratory study. We see value in the use of Leximancer as a support tool in an initial exploratory phase but also see the need to compliment the results with thematic analysis and interpretations beyond mere content analysis through text-mining and keyword identification.

CiteSpace, developed by Chaomei Chan at Drexel University (US), is visualization freeware for co-citation analysis. It is a powerful information visualization tool to help one uncover the structural and temporal patterns of various co-citation networks, and it was originally meant as an instrument for analyzing paradigmatic shifts in scientific specialties. Typically the program is adopted as a tool to visualize the emerging trends and citation patterns in a comprehensive literature review. As Table A-1 presents with some examples, it has been used to examine a large range of variables such as citing authors, cited authors, and papers published in a selected domain or source. Tools such as CiteSpace have been used in both the analysis phase (phase 3, see Section 3 for details) to report on trends in and the evolution of a selected topic area and also in the paper-extraction process (phase 1) to assist researchers in checking for relevance and quality before deciding which papers to include or exclude in the scope of their literature reviews. It is also a fully automated tool and comes with the strengths and weaknesses common to such tools. The analysis results it presents are specific to citations and, therefore, any further analysis on the content of the papers extracted will need to be done outside CiteSpace—either manually or with the support of other tools.

Microsoft Excel has been widely used as a tool to help researchers analyze papers and write up the results (phases 3 and 4, see Section 3 for details). Spread sheets are set up (on consensus about what to extract from the papers), filled out, and either reported on directly as summary matrices from the literature or used as a first level of coding to then do further analysis on. Sometimes, statistical outcomes from prior studies are extracted and analyzed as overarching statistical reports on the status of study outcomes (i.e., result reliability over a period of time) (e.g., Johannson et al., 2011). Though not a qualitative analysis tool, Excel is popular as a tool for literature reviews, which perhaps can be explained by the comparatively minor learning curve involved in its use (because most authors would be familiar and/or experienced Microsoft Office software users). One disadvantage with Excel is that the entire analysis is manual and the tool is simply a repository to capture the final results; it is not able to keep track of evidence and the synthesis process. One can manage this to some extent with the use of comments and memos/notes in the analysis process, but, since these are also "separate" from the data/ literature, the evidence trail and ability to go back and forth to the original data set is limited (unlike in a database supported qualitative data analysis software such as NVivo, Atlas.ti, or MAXQDA).

Choosing qualitative software is not an easy decision. The particular data-analysis tool used by scholars often depends on local circumstances, such as software availability at their institution. For example, at German universities, Atlas.ti is frequently used, while, in Australia, NVivo is more popular. Some researchers argue that Atlas.ti runs faster, while others favor NVivo as a feature-rich, interactive, and user-friendly analytical tool. Researchers can use either (or some other) program as the features offered are common across many tools. MAXQDA is known to support interrelationships among data and memos well. Understanding the strengths and weaknesses of the different options available and selecting a combination of tools that will complement each other is the best way to proceed.

Though many studies claim to use tools, few authors describe how they chose the tool they used, something we recommend to become a good practice. Kromidha and Cordoba-Pachon (2014) and Indulska and Recker (2008) are good examples that present their tool choice options and final selection: they describe their study goals, what tool options they considered to fulfil them, and why they selected a specific tool.

A critical aspect to consider, especially for a novice researcher, is the learning curve involved in understanding how to use a tool and apply it to literature reviews. As we mention at the beginning of this section, literature reviews can be conducted for different purposes, and it depends on the broader goals (i.e., what will be reported and in what way) as to what tool offers the most benefits vs. costs and whether it is worthwhile to use a tool. One must be clear about the literature review's goals and the broader research design and first decide if the investments required for a tool-supported literature review process is a worthwhile effort. Study goals, and particularly the goals and target outcomes of the literature review,

will also direct the tool one uses (please see Section 3 and Section 4 for further details on how to determine and articulate the goals of a literature review and how these goals become an input to the entire end-to-end design of a systematic literature review). One can achieve a lot through using tags, search, and macros in Word, Excel, and other popular software, which are much easier to learn. A tool's cost and reliability are additional factors to consider. While the low or no cost of freeware is a benefit, there is an accompanying risk of corruption, loss of data, and service availability problems when using it. For example, in May 2014, Dedoose, freeware for qualitative data analysis, encountered a major system failure that led to loss of significant amounts of data and service interruptions (Lieber, 2014).

Regardless of what tool researchers use, we strongly recommend that they describe in detail the overall literature review method and how they used the tool. This is especially important for papers that report specifically on a literature review. In the majority of the literature studies we found to date, the overall approach and how tools (if any) have been used are seldom described. Instead, the results are presented as the core of the paper with a few lines mentioning that a tool was used to support their derivation. In any empirical study, we should expect to see transparency regarding the approach used; as scholars, we see such transparency as essential to "trust" the results presented and be able to build on them in the future. A published literature review should be no different.

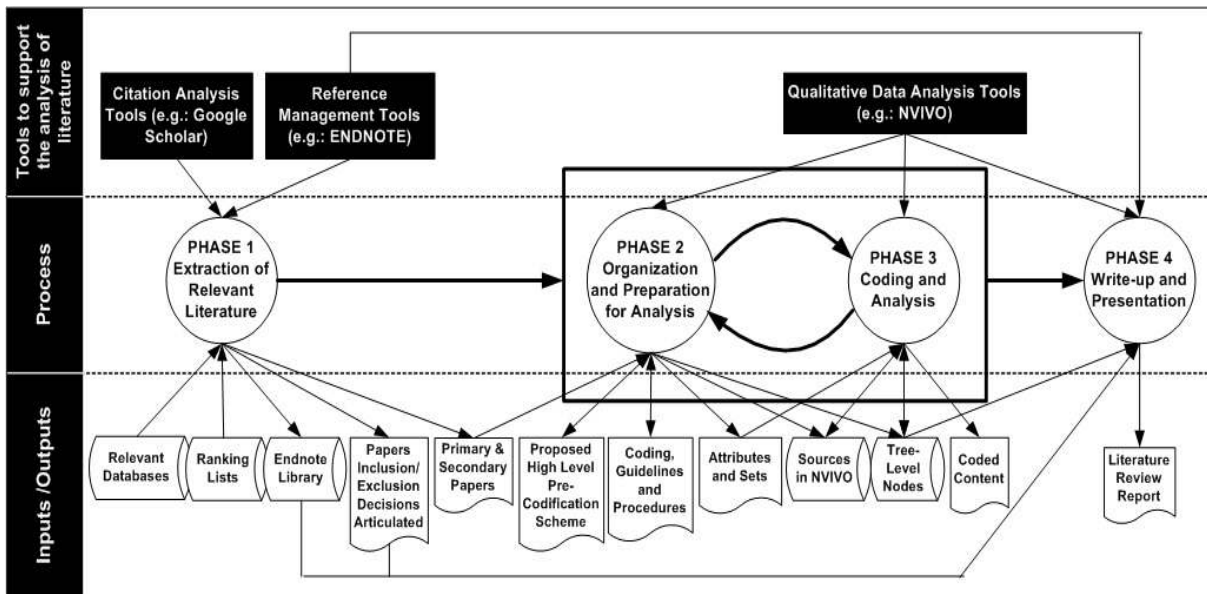
Existing literature reviews have used various tools (see Table A-1 for some examples of tool-supported literature review studies). However, a systematic end-to-end approach for navigating a rigorous tool-supported review process with guidelines on where and how multiple tools/resources can be plugged in to support the various tasks is still non-existent. The examples we could find use tools for only one or two phases of the overall literature review process and mostly for analysis (phase 3, see Section 3 for details). Only some describe how a tool (or a combination of tools) can be used to support all phases of the review process. As Section 3 describes, we present an approach in which tool support can be set up for all four proposed phases of a literature review. We illustrate the application of our proposed approach with a detailed case study (see Section 4) in which we used NVivo (as the primary tool) and Mendeley and Google Scholar (as supporting tools) to facilitate the end-to-end literature review process. Through this, we make a significant contribution to the body of knowledge on research design and implementation.

### 3 The Proposed Tool-Supported Literature Review Approach

Extending Bandara et al. (2011), we propose a multi-phased method to extract, analyze, and report literature-based findings. This tool-supported literature review approach covers several qualitative software tools and procedures that researchers can use effectively to manage the various phases of performing a literature review. We build on a wide range of insights from scholars engaged in designing literature review studies. We complement these guidelines with a stronger synthesis by adding insights from our own literature review experiences and by including a consideration of tool use and support. While this consolidated approach presents one of many ways to conduct a structured literature review, it is the first comprehensive overview that provides specific tool-supported guidelines for a more effective literature reviewing process and exemplary illustrations and guidance for structuring and visually presenting results from literature studies. We illustrate the method's applicability through a case study and propose directions for further empirical work to validate our suggested approach. Figure 1 overviews our proposed method.

The approach employs a systematic four-phased process. It depicts the input, processing, output, and related useful tools for each phase. Although we specifically developed it as a guide for novice IS researchers to conduct literature reviews, its concepts can be adopted by any field by contextualizing it to their respective parameters. The phases we present here are not unique to this paper and, in fact, are very much extracted from and aligned to prior literature review guidelines in IS and closely aligned to the stages presented in generic literature review guidelines. For example, Grant and Booth (2009) present four steps: search, appraisal, synthesis, and analysis. The systematic review standards endorsed by the Cochrane Collaboration (Higgins & Green, 2008; Moher, Liberati, Tetzlaff, Altman, and the PRISMA Group, 2009; Calamita, Saconato, Pelá, & Atallah, 2006) prescribe a comprehensive search of the literature; checklist-driven quality assessment; complex synthesis using textual, numerical, graphical, and tabular methods; and sophisticated analysis; and how to present results in the review. We integrate all of these aspects into the approach presented here. One novel aspect of our approach is the "tool-supported" theme in which we enhance each phase to show how tools can be used to support them. Tool-support for literature reviews have been promoted by others as well. For example, Martelo (2011) and Onwuegbuzie et al. (2012) provide prescriptive tool-supported guidelines for literature reviews. However, they only focus

on the analysis phase with very high-level guidelines, while we integrate tool-support across all phases with more detailed prescriptions of what to do and illustrations on how to do it.



**Figure 1. Overview of the Proposed Literature Review Approach**

The first phase focuses on the systematically identifying and extracting a sample of papers for the review. Here, we discuss the critical step of selecting the right pool of papers to consider in alignment with the target goals. The second phase is related to organizing and preparing the analysis. Here, it is important to properly manage the literature collected and plan ahead for the analysis. This entails how one designs and articulates coding procedures and what classification and coding schemes one uses. The third phase involves actually coding and analyzing the content. The second and third phases go hand-in-hand and are iterative. One may start with some preconceived idea on what to look for and report on, but this can always change in relation to the new insights obtained in the early analysis phases. The fourth and final phase supports researchers to write and report the findings. Although we present these phases as fairly linear, the process is rarely, if ever, that straightforward. Literature reviews will normally go through multiple iterations across these phases.

We recommend several software tools to support researchers to conduct and manage these reviewing phases. We particularly focus on qualitative data management tools that assist in coding textual data in the form of literature. Here, we draw on insights from Wolfswinkel, Furtmueller, and Wilderom (2013) on using grounded theory in literature reviewing. Specifically, these authors recommend exploiting qualitative coding techniques to derive synthesized meaning from literature. How one applies qualitative data-analysis tools in a literature review can increase “representation” (i.e., “the ability to extract adequate meaning from the underlying data” (Leech & Onwuegbuzie, 2007, p. 23)), can increase the transparency of the research process, enable a paper’s findings to be placed in the context of the remainder of the reviewed text (e.g., theoretical framework, sample size, method), and can detect hidden concepts and support theory reflection and advancement. Using qualitative data-analysis software packages (such as NVivo, Atlas/ti, MAXQDA), researchers can systematically capture, code, and analyze the literature. In the illustrative case described in this paper, we chose NVivo for the following reasons: (1) the software vendor QSR encourages the use of the tool for literature reviews; also, some NVivo-based literature reviews are found in IS literature, which serves as proof of its potential to support literature reviews; (2) it is used globally (150+ countries) for qualitative data-analysis purposes; (3) it has useful features important to the processes of qualitative research, such as text searching, memos, and so on, that contribute significantly to the analysis associated with a literature review; (4) it can also assist with the overall project management aspects of doing a literature review; and (5) a host of feasibility factors made it a salient tool to focus on (we and our students had ready access to the software through institutional licenses and had prior experience using the tool for literature studies). Beyond NVivo, we also scrutinize a myriad of other useful tools such as reference-management programs (e.g., Endnote), file-sharing and note-taking tools



(e.g., Evernote), citation-retrieval and citation-analysis programs (e.g., Publish or Perish, Google Scholar<sup>1</sup>), and Excel, Acrobat, and others.

Appendix B introduces the supporting tools that we discuss under the four phases and applied in the illustrative case study, and Appendix C provides more specific guidelines on how to set up and use NVivo for literature reviews (as a reference for novice researchers). In the following sections, we describe each of the phases of our proposed reviewing approach and explain how to apply the tools discussed above. We present a detailed case study example and various visual representations to demonstrate how the approach can be applied. The phases and procedures described can be selectively mined for use with other similar tools for qualitative data analysis.

## Extraction of Relevant Literature

We recommend researchers try to explicitly formulate their review's scope and the goal(s) before searching for literature. While researchers may begin from specific research questions and may find it fairly straightforward to define the areas where answers will be looked for, this is not always the case. Researchers may also be open in their inquiry from the outset, as in grounded theory-type studies, and let key themes and specific questions emerge in later reviewing stages. Researchers may then dig deeper into theoretical concepts and associations and even adjust the research questions when they encounter unexpected themes. Thus, we stress again the iterative nature of this process; however, defining the scope, goal(s), and research fields upfront helps the reviewer in the various reviewing phases. It also makes the reviewing task more structured and easier to replicate and validate. We further recommend that reviewers maintain all their decisions and thoughts through writing logbooks, reports, memos, and diaries (using e.g., Evernote) because this helps in later stages with logically presenting the decisions made during the various review phases.

Once the goals are defined, the searching can commence. Two main criteria must be clarified before one starts to identify and extract a sample of papers for review: (1) the sources and (2) the search strategy. The sources refer to which outlets and databases to target, and the search strategy refers to the search terms and procedures to use during the paper-extraction process. As vom Brocke et al. (2009, p. 2) state: "The quality of literature reviews is particularly determined by the literature search process". It must be robust and described comprehensively. The search design should reflect and align with the review's scope and goal. Relying on ill-defined samples or an unbounded subset of the literature risks misrepresenting the existing literature's diversity in findings, methods, outcomes, and frames of reference. It is, therefore, essential to carefully design search and selection strategies and to embed quality assurance procedures to confirm the quality of the selected literature prior to progressing to the next phases.

## Selection of Sources

Before selecting the various sources, the researcher must specify the domain of interest—the disciplinary area(s) in which to conduct literature search. IS is a multidisciplinary subject; hence, IS researchers often borrow from many other fields. Thus, one needs to identify which other related fields to include in the search. This will depend almost entirely on the study context and the goal of the literature search. For example, as Fiel, Bandara, Miskon, and Gable (2014, p. 4) state:

if the goal is to understand the status of shared services research as reported in IS literature, then the domain will be limited to IS... if the goal is to identify relevant and useful theories for shared services, then other domains that also have an interest in shared services (i.e., Finance, Human Resources, Management, etc.) will also need to be included in the search effort.

The case of e-service quality as a research field is another good example here. While scholars in IS, e-commerce and Internet research are contributing to this literature, the fundamental theories of service quality are still derived from older traditional fields such as marketing, services, management, and psychology. Consequently, a complete review is impossible to achieve since new papers will always appear during the relatively long publication process. Therefore, to achieve a high level of saturation, we recommend justifying the selected domains of the search.

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<sup>1</sup> <http://scholar.google.com>

When and if the goal is to understand selected phenomena in a broader context, investigating various research fields is more suitable than limiting the search to a set of finite sources. In this case, it is best to search at a higher level through various available databases. Normally, this is accomplished by using a pre-determined search term to search selected databases to extract relevant research papers by virtue of their titles and abstracts. One needs to decide whether or not to include other texts such as book reviews, book chapters, or editorials in the overall analysis (this will depend on the study goals). Google Scholar is one resource to consider because “it provides a simple way to search broadly for scholarly literature” (Samadzadeh, Rigi, & Ganjali, 2014, p. 168) across many fields and sources (i.e., conference and journal papers, dissertations, books, abstracts, reports from industry, and other websites related to academic research such as university repositories). While Google Scholar has been subject to fair criticism (e.g., the lack of transparency about its coverage and the way it calculates its citation counts (Beel & Gipp, 2009)), it is now considered as being sufficiently robust so that other widespread applications (e.g., “publish or perish”) are built on it. Google Scholar’s functionality is similar to other freely available tools such as Scirus, CiteSeerX, and getCITED and to subscription-based tools such as Scopus or Web of Science. For an effective outcome, researchers should carefully analyze their study’s topic content and goals, identify relevant databases, and justify the range of sources they select. Examples of this practice can be found in Klaus, Rosemann, and Gable (2000), Esteves and Pastor (2001), Bélanger and Crossler (2011), Bondarouk and Furtmueller (2012), and Fielt, et al. (2014).

Databases that are commonly used among IS scholars to search for literature are the ISI Web of Knowledge, EBSCOhost Business Searching Interface<sup>2</sup>, Scopus<sup>3</sup>, AIS Electronic Library (AISeL)<sup>4</sup>, ACM Digital Library, ACM Guide, Emerald Management Extra, Gartner.com, IEEE Electronic Library, ABI/Inform, IEEE Xplore, Ei Compendex, ProQuest, Ingenta, INSPEC, and ScienceDirect. Some researchers may also use RSS feeds to compile new literature, follow scholars on Twitter, or subscribe to various publishers (e.g., Sage or ResearchGate).

Selecting the right field (domain) to search in is an important aspect: “If the study is specifically focused on the status of research in a selected domain, then academically refereed papers should be sought for from a clearly-defined sampling frame that includes all relevant reputable outlets of the target domain” (Bandara et al., 2011, p. 5). Given that the literature review will be ineffective if the literature gathered is of low quality, incomplete, or irrelevant (Levy and Ellis, 2006), we recommend identifying all the main peer-refereed journal and conference outlets and using existing publication ranking lists to specify the most suitable sources to use. The search conducted in a clearly specified pool of sources (that addresses the study goals) should provide sufficient theoretical background for new concepts to be built on and leads for additional references to the specific subject matter. Researchers who decide to exclusively focus on target sources (i.e., selected journals and conferences) should clearly articulate how the study goals warrant this concentration.

If IS is the specified field of study, then a selection of IS-specific sources should be targeted and justified. Selecting a target set of sources in a predetermined and justified range has been practiced in past IS literature studies. The so-called IS Senior Scholars’ basket of eight journals (henceforth “top basket of IS journals”)<sup>5</sup> is a set of the most highly ranked IS journals to date. Hirschheim and Klein (2012) state that this basket of journals helps academics to recognize the top outlets publishing the highest-quality research in the IS field.

When selecting which journals to include in the search, we also recommend integrating national or international journal ranking lists (with journal citation reports that are updated regularly) because they offer an objective method for evaluating leading journals. Examples of international ranking lists include the Thomson Reuters (ISI) Web of Knowledge<sup>6</sup> and the Harzing Journal Quality List<sup>7</sup>; a country-specific example is the Australian Council of Professors and Heads of IS (ACPHIS)<sup>8</sup> journal ranking list. The Index of IS Journals<sup>9</sup> provides a rich source of information with 750+ IS indexed journals and a diversity of pointers to identify suitable IS outlets. These can be adopted to meet a study’s specific needs and are

<sup>2</sup> See <http://search.ebscohost.com> for further details.

<sup>3</sup> See [www.scopus.com](http://www.scopus.com) for further details.

<sup>4</sup> See <http://aisel.aisnet.org> for further details.

<sup>5</sup> See <http://aisnet.org/?SeniorScholarBasket> for further details.

<sup>6</sup> See <http://www.isiwebofknowledge.com/> for further details.

<sup>7</sup> See <http://www.harzing.com/jql.htm> for further details.

<sup>8</sup> See <http://www.acphis.org.au/index.php/is-journal-ranking> for further details.

<sup>9</sup> See <http://lamp.infosys.deakin.edu.au/journals/> for further details

important to guide researchers away from fraudulent and gold open access journals, which are surfacing regularly.

Another factor to consider is potential organizational or geographic reference models, and scholars may also need to search for papers in journals based on what their home university “values” as high-impact outlets. Universities and academic departments sometimes have their own journal rating list. For example, the Vienna University of Business and Economics (WU-Vienna) provides a journal ranking guide<sup>10</sup> for its faculty and awards monetary incentives to faculty for publishing in certain journals. In the Netherlands, the Erasmus Research Institute of Management (EIJ) also publishes journal ranking lists<sup>11</sup>. In Germany, the newspaper Handelsblatt updates their journal ranking list every five years<sup>12</sup>, which is used to rank all academic staff working in business departments (including IS) in Austria, Germany, and Switzerland. The ranking integrates various rating lists such as the journal rankings of the German Association of Business Administration (VHB-JOURQUAL 2.1), which categorizes journals as A+, A, B, C, and D. Junior researchers are further advised to ask their doctoral advisors for help in identifying appropriate reference papers on their study topic.

Finally, conference papers are usually considered “lower” (or less mature) than those in peer-reviewed international journals in the IS field (with the exception of the International Conference on Information Systems). Hence, when including conference papers, it is important that one develops procedures for selecting the better ones (vom Brocke et al., 2009). For IS conferences, we recommend including those that are affiliated and/or sponsored by the Association of Information Systems (AIS)<sup>13</sup> and expanding the search to others (e.g., those affiliated to the Association of Computer Machinery (ACM)<sup>14</sup> or Institute of Electrical and Electronics Engineers (IEEE)<sup>15</sup>) depending on the topic and target of the literature review. Research output quality indicators, such as the Excellence in Research for Australia<sup>16</sup> (ERA) ranked conference list, include conferences already processed, ranked, and labeled based on field. This strategy is also useful when conducting multidisciplinary IS research.

## Search Strategy

Defining a search strategy significantly contributes to methodical rigor; it provides transparency, clarity, and replicability. Booth et al. (2012) propose five stages for the literature search process starting with 1) scoping search: the initial screening of literature for existing reviews, determining useful databases, identifying key search terms, and developing and documenting a search strategy; 2) conducting search: searching selected databases using the identified search terms, looking for grey literature, considering a methodological filter, and documenting modifications to the search; 3) bibliography search: identifying key citations and forward and backward searching for further useful papers; 4) verification: checking indexing of papers missed by search strategies, revising search strategies, and contacting domain experts if necessary; 5) documentation: articulating how sources were searched, search strategies were used, the number of references found, and the decisions made during the search strategy.

Researchers frequently first conduct a keyword-based search in papers’ titles, abstracts, and keywords. A researcher needs to identify various search terms (i.e., keywords and synonyms) to review a specific area and systematically use these to search through all identified sources (e.g., databases). The search terms will be progressively specified during the search when further related terms are identified, which provides additional useful literature for a specific area. It is common and advised to start with a search term but also to allow this to evolve iteratively through the search attempts (logging its evolution in the process).

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<sup>10</sup> See [http://bach.wu-wien.ac.at/fides/res/WUJR\\_03062009.pdf](http://bach.wu-wien.ac.at/fides/res/WUJR_03062009.pdf)

<sup>11</sup> See <http://www.erim.eur.nl/about/erim-journals-list-ejl>.

<sup>12</sup> See <http://tool.handelsblatt.com/tabelle/?id=34>

<sup>13</sup> The Association for Information Systems (AIS), founded in 1994, is a professional organization whose purpose is to serve as the premier global organization for academics specializing in information systems (see <http://aisnet.org/> for further details).

<sup>14</sup> See <http://www.acm.org/conferences> for further details

<sup>15</sup> See [http://www.ieee.org/conferences\\_events/index.html](http://www.ieee.org/conferences_events/index.html) for further details

<sup>16</sup> The Excellence in Research for Australia (ERA) initiative was a system developed by the Australian Federal Government to identify and promote excellence across the full spectrum of research activity in Australian Higher Education institutions. See <http://www.arc.gov.au/era/default.htm> for further details on what the ERA initiative is. In January 2011, the Australian Government revised the ERA original system (which had field-specific rankings for journals and conferences) and removed all rankings for journals across all fields. Though not an official ERA site, the details of the prior ERA journal rankings for the IS field are still maintained and available at a Web portal maintained by Professor John Lamp of Deakin University (<http://lamp.infosys.deakin.edu.au/era/>). The ERA rankings list for IS journals (as found last in ERA in 2010) can be found under historical information stored at <http://lamp.infosys.deakin.edu.au/era/?page=fordet10&selfor=0806>

If a study's scope is purposefully limited to a particular set of journals (as in the case study in Section 4), in addition to a keyword search, most of the above-mentioned databases also allow searching by journals' International Standard Serial Number (ISSN). In this case, only the papers published in the outlets of interest and containing relevant keywords are included in the search results. ISSN codes can be found on journals' websites or by searching online for "ISSN <journal name>". For example, in the case study we present here, we searched abstracts of the top basket of IS journals, which lead to the following search string<sup>17</sup>: "(gender OR sex OR female OR wom?n OR girl OR femin\* OR male OR m?n OR boy OR masculi\*)" in the abstract field and "(0960085X OR 13501917 OR 13652575 OR 10477047 OR 15369323 OR 07421222 OR 02767783 OR 09638687 OR 02683962) in ISSN" (see the case study in Section 4 for further details).

Most database search interfaces are quite advanced and support input ranging from simple (i.e., text and phrases) to complex (i.e., with Boolean logic) search terms. One can also manage the coverage of the target papers by selecting closed parameters for the dates of the publications in the search strategy. Thus, explicit decisions need to be made about the depth and breadth of the literature research.

Another aspect of the search strategy to consider is whether to focus on exclusively "primary" texts or include "secondary" literature. We refer to primary literature as those papers that are specifically focused on the target topic. In emerging and novel fields, a variety of search strategies may need to be used to detect the most relevant literature. Thus, one may search at a broader level besides the initial database search with keywords and look for what we refer to as "secondary" literature. These papers do not specifically discuss the topic of interest but still provide important explanations and insights enriching the review.

To find secondary literature, searching for the target search term anywhere in the body of the paper may be needed. Another strategy is to simply screen relevant and non-relevant papers and then focus on the specific sections that provide insights related to the review topic and/or research goal. Once papers are imported into NVivo, it is possible to run a simple "key word in context" (KWIC) query to see which terms appear most frequently relative to other terms with pointers to their location and the surrounding text. This list can be meaningful to researchers who are unfamiliar with the topic in that it can assist them in recognizing when an extended literature search using certain keywords might be valuable.

Once an initial corpus of papers is identified, we recommend conducting backward and forward searches. In backward searching, the citations in the relevant papers identified in the initial sample are carefully reviewed to learn about older papers that may be relevant. In forward searching, tools such as Google Scholar and Web of Science are used to identify papers citing the papers identified in the previous steps. Prior or subsequent studies may also contain comprehensive and incisive reviews of related literature. Searching for these is strongly recommended as is integrating them into the current project. Backward and forward searching can also be performed at a later stage when analyzing the final set of papers as in our case study.

Finally, it is invaluable to have the final dataset peer reviewed because competent colleagues who are familiar with the related bodies of work are likely to take note of critical references that are missing. Wolfswinkel, Furtmueller, and Wilderom (2013, p. 49) provide a realistic visualization of a decision tree that can be used as a checklist to help ensure the completeness of the search process.

### Evaluation of the "Quality" of Literature Included in a Review

Researchers should aim to review high-quality papers, but identifying their quality can often be arduous and complicated. This difficulty is especially true in IS due to the vast number of potentially relevant sources and diverse range of their quality. This plenitude is compounded further by different geographic and institutional-level criteria. In other words, there is no easy escape from the hard fact that there is no agreed on definition of quality literature.

One approach for evaluating the quality of scientific work is examining journal ranking lists (as previously mentioned) and exclusively selecting papers whose source passes the threshold of a specific impact factor. For instance, in fields with many available papers, you may concentrate on papers published in journals with an impact factor of at least 1.0. Another approach could be to first concentrate on a certain set of widely recognized top outlets in the field, such as the top basket of IS journals (see the case study

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<sup>17</sup> For ISJ, we included both ISSN and E-ISSN



in Section 4 for an example). However, journal impact factors and top outlets in the field change over time, and one needs to define this approach explicitly (e.g., using impact factors from the current year). It should be clear whether the quality assessment is being used to exclude the poor-quality studies or whether quality is simply used to discriminate between higher-quality studies (those with less likelihood of bias) and those of lower quality.

If multiple authors collaborate on a literature synthesis, they should discuss their criteria for including papers in the review. To enhance the validity of the selected papers, we recommend performing inter-coder reliability checks among at least two researchers. An indicator of search quality is a search syntax used to combine search terms (e.g., AND, OR, etc.). A subject expert will be able to identify missing terms or variants whose inclusion might be expected. One option for doing cross validation in practice is to use Excel (or Google Docs) to list the pre-defined sample of papers in a chronological order. Using such a table, researcher can assess whether the pre-selected sample of papers clearly focus on the review's scope and goal(s). It is helpful to add two or three sentences, comments, or symbols such as “++”, “+”, “-” (see example extract in Appendix D) to indicate why a paper should be included in the final sample. The list and taxonomy of such justifications clearly depends on the nature of the unique corpus at hand. These cross-checks for evaluating the suitability of papers contributes to the solid documentation of the thinking and decision making process during the literature selection. A single researcher such as a doctoral student should discuss inclusion and exclusion criteria with their advisor or peer researchers.

In refining the sample, papers can further be potentially excluded based on reading the full texts. Reasons for excluding and including studies should be made as transparent as possible in order for the review to prove credible. It is only then that readers are able to (1) assess the review's exhaustiveness and (2) other scholars can confidently (re)use the work in their own work.

One may first build the sample of literature for the review based on highly cited papers. Nevertheless, it is critical to bear in mind the obvious point that recent papers, even if published in high-quality journals, will not be highly cited. Booth, Papaioannou, and Sutton (2012) recommend precisely articulating the temporal frame of reference for searching for and selecting papers. In the presented case study, we addressed this issue by calculating and analyzing the average citation frequency per year instead of the total number of times a paper was cited (see the case study in Section 4 for further details).

For evaluating papers' quality, researchers may define and follow a set of questions as a further reference frame in their selection strategy. These questions can be extended by using traditional reviewing guides provided by journals and no doubt will need to be adapted to fit the needs of a particular literature review. Potential questions include:

- How does this paper relate to the scope and goals of my literature review?
- Has the literature review reviewed all of the prior relevant literature? Do the authors maintain a healthy skepticism in this review? Has the review been extended to any contiguous area of literature?
- What is the significance (scope, severity, relevance, originality) of the paper's central problem or issue?
- Who is the author? What are their qualifications and impact in the field?
- Does the paper have a strong theoretical framework?
- Could the research goal have been approached more effectively from another perspective or with another method?
- How transparent are the basic components of the research design: population, intervention, methodology, accuracy, and validity of the measurements?
- What is the paper's research orientation (e.g., interpretive, critical science, statistical)?
- How appropriate is the accuracy and relevance of the data analysis as it relates to the research question?

In general, it is important to select a reasonable volume of papers on which to base a review (we recommend at least 50 papers). A literature review may not be widely accepted when the number and quality of publications selected from a search is relatively low. This risk may be partially mitigated by drawing on knowledge and selecting papers from related fields. Researchers demonstrate their competence through their ability to integrate insights about the development of a research area in relation to other related, and more general, fields over time.



Once the final set of papers is defined, its quality can be double-checked by the KWIC search in NVivo (see Appendix C for details and the case study in Section 4 for an example). The most frequently used words should be in line with the applied search terms and the study goals.

#### Phase 2: Organization and Preparation for Analysis

Instead of starting right away with reading, coding, analyzing, and interpreting a selected sample of papers, we propose that the researcher should first think carefully and decides what to code and how to organize and prepare for the analysis. This phase is focused on getting organized and prepared for a comprehensive and more reliable analysis and is a highly iterative phase. We strongly recommend that researchers familiarize themselves with the literature and carefully read the extracted papers before using software for the actual coding and data analysis. Questions that may help a researcher begin this process are:

- Should I code only emergent information and themes? Or only pre-determined codes? Or use a hybrid?
- What kind of research questions do I want to answer by conducting this literature review?
- What am I specifically looking for in the data?
- Do I want to understand how a phenomena is conceptualized across the literature?
- Am I testing an assumption or hypothesis?
- Do I want to use pre-defined coding schemes (deductive analyses) for coding literature, and why?
- Is my research area more suitable for an inductive and open coding approach, and why?
- Do I want to conduct a more quantitative type of content analysis and look for frequently occurring themes?
- Am I searching for salient antecedents, requirements, consequences, or success factors across the data?

Our approach treats literature as qualitative data that will be coded, analyzed, and reported. The generic norms, options, and procedures of qualitative data analysis can also be applicable in the context of tool-supported literature review analysis. We recommend using NVivo (or any other suitable qualitative data analysis software) for sophisticated literature analysis. However, note that such qualitative software tools need to be treated as support tools only in the reviewing phases. A common myth is that NVivo and similar qualitative analysis tools will do the analysis themselves. In qualitative practice, researchers need to think, analyze, detect themes, interpret, make sense of the data, and identify and understand patterns in the data. Thus, keeping and continually updating detailed notes and interpretations as you work is crucial.

In deciding which coding approach to select, researchers can decide between an inductive, deductive, or mixed approach (Section 2 briefly introduces these). Whichever approach is decided on, preparatory work must be completed. For example, the selected tool needs to be set up and the extracted papers need to be stored and maintained properly, decisions about the coding approach need to be made, and guidelines for the coding rules need to be prepared and tested.

Appendixes B and C summarize the different tool features to consider in the setting-up phase. Examples of how to best set up NVivo and store papers to support an effective literature review can be found in the presented case study and Felt et al. (2014), Beekhuyzen, Nielsen, and von Hellens (2010), and Bandara (2006, 2007).

What to capture and include in a literature review is something one should start thinking about at the very outset of a study (i.e., at the heart of phase 1 when defining the review's motivation, scope, and goals and deciding which papers to include or exclude), but this can also evolve as the researcher becomes more deeply engaged with the literature. As we discuss in phase 3 (as in qualitative research in general), the coding and analysis in literature reviews can be inductive (common for purely interpretive reviews), deductive (common for meta reviews), or mixed (where meta-details are provided together with more interpretative outcomes; see the case study in Section 4 for an example). We strongly recommend that the coding approach is carefully thought through, understood, and planned prior to the actual act of coding. We propose that the researchers develop detailed coding guidelines that articulate the proposed

coding procedures. Most coding approaches will be iterative and multi-phased, and these guidelines should evolve accordingly.

Saldana (2012) presents useful guidelines for coding qualitative data and advocates processes of first- and second-round coding. Coupled with the codebook guidelines that DeCuir-Gunby, Marshall, and McCulloch (2011) present, the researcher can begin to acquire a strong sense of the concepts they are looking for in the literature and what they mean by those concepts. Coding guidelines typically set “ground rules” about to how the coding will be conducted, which of course depends on the selected coding approach. It will define and justify the fundamental paradigm selected (i.e., deductive, inductive, mixed etc.) and set forth rules around the semantic basics of coding based on questions such as:

- Should text fragments, sentences, or paragraphs be captured?
- Can the same content be coded under just one category/node or under several categories/nodes?
- How can the thoughts that emerge during the process be systematically captured (e.g., by using memos or annotations)?
- What is essential and what is feasible regarding the management of coding levels?

Thinking ahead and articulating these elementary hierarchical details in the coding guidelines will help in developing a consistent and useful framework, which itself is essential for the accuracy of the results to be derived at later stages.

Regarding the question of when to use a deductive coding approach, we recommend that, if much research has been carried out on a topic, researchers should use a pre-codification scheme that will help them think in advance of the topics/themes to be covered. It should explicitly address their study goals, which, of course, can evolve as the analysis progresses. In this case, most fields’ literature reviews do have a set of common themes that they are expected to report on. Hence, having a strategy to identify and capture such topic areas is useful. We propose having a pre-codification scheme (at least at a high level) for this purpose. Another good reason for predetermining the topics and areas of interest is that the classification of review types is invariably multidimensional. It normally depends on such variables as the review’s purpose (e.g., the mapping review), the types of included studies (e.g., the systematic review of randomized controlled trails), the nature of included data (e.g., the qualitative systematic review), the type of question being addressed (e.g., the effectiveness review), the phenomenon being investigated (e.g., meta-theory or meta-method), and the underlying intent (e.g., meta-ethnography for theory generation or realist syntheses for theory verification). Having a pre-codification scheme can assist researchers in thinking about these aspects early on.

Most literature reviews focus on basic concepts such as theories, research methods, outcomes, and so on. Figure 2 summarizes core topic areas that are appropriate for most literature reviews in the IS field, and it can act as a base that can be adapted and extended. We derived these dimensions from analyzing past literature-review papers and detailed literature reviews in distinguished award-winning IS dissertations<sup>18</sup>. In this analysis, we identified and extracted common themes reported in IS. When adopting this approach, it is vital to include additional topics that will specifically pertain to the topic area under investigation. An initial scan of the most cited papers in the field might help to immediately identify what dimensions are deemed important. The literature review’s goals will also determine how and to what degree the proposed pre-codification scheme is ready for tackling the domain at hand.

<ul style="list-style-type: none"> <li>• Definitions</li> <li>• Key characteristics</li> <li>• Objectives</li> <li>• Historical analysis</li> <li>• Antecedents</li> <li>• Success factors</li> <li>• Challenges</li> </ul>	<ul style="list-style-type: none"> <li>• Consequences</li> <li>• Research methodologies</li> <li>• Research methods</li> <li>• Epistemologies</li> <li>• Theories</li> <li>• Contexts of studies</li> <li>• Future work</li> </ul>
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**Figure 2. A Summary of Core Pre-Codification Scheme Dimensions to be Included in an IS Literature Review**

<sup>18</sup> We observed past award-winning theses from the ACM SIGMIS Doctoral Dissertation Award Competition listed at [http://awards.acm.org/doctoral\\_dissertation/all.cfm](http://awards.acm.org/doctoral_dissertation/all.cfm), and the Australian Council of Professors and Heads of Information Systems (ACPHIS) PhD Medal, listed at <http://www.acphis.org.au/index.php/activities/acphis-phd-medal>.

The first category in the proposed high-level codification scheme is definitions. Capturing the definitions and confirming the existence of a common understanding of the phenomena is an important precursor for good research. In IS, because most topics are constantly evolving, there is often very little consensus about the definitions of core concepts. Thus, critically reviewing how the topic under investigation is currently and has previously been defined is useful. One can then use this to construct an admittedly compressed common understanding of the concept. This supports the convergence of thoughts that will, in turn, help the field to grow.

A second important category to understand and capture is key characteristics of the topic of interest, which complement the definitions. While analyzing definitions will assist in understanding what a topic is, analyzing its characteristics will help to position the topic and clearly differentiate it from other similar topics. What one captures under the category of characteristics can vary, and important sub-categories are usually created here. For example, when doing research on shared services (see Fielt et al., 2014), it is relevant not only to define what shared services are but also to locate them in other similar areas such as outsourcing and inter-organizational systems. Examples of sub-categories in this case are stakeholders, structures, and types of things that are shared, along with information about how they are shared (service offerings).

Another important coding category is objectives. Understanding the objectives of the investigated phenomena (may it be from a research or practical view) is vital because they provide direction and point to targeted areas that must be focused on over time. For example, as Fielt et al. (2014) describe in their literature review of shared services, understanding why an organization should consider shared services is critical for its success, and understanding why organizations consider and implement shared services is useful as a contextual basis for any investigation associated with shared services.

Further, researchers may engage in coding an historical analysis of an emerging field, which helps researchers understand the roots of the topic area and to see the past trends with the goal of anticipating what the future direction might be.

Other pre-defined coding schemes that can be used in one's analyses include antecedents (or requirements), reported success factors, challenges related to the topic of interest, and consequences (e.g., consequences of a shared services implementation).

Often, it is meaningful to obtain an overview of and code what research methodologies and methods are used across a sample of literature. Recker (2013, p. 36) defines research methodology as "the strategy of inquiry used to answer a specific research question". He distinguishes between quantitative, qualitative, mixed, or design science strategies, and we add the conceptual approach. Quantitative methods typically include surveys or experiments, and qualitative methods typically include case studies, ethnographies, and so on. Methods employed by researchers when investigating particular IS phenomena can significantly draw attention to the philosophical assumptions regarding the nature of these phenomena, which might help to determine what constitutes valid knowledge about them. Moreover, the impact of research can depend on the methods chosen. Having a deeper understanding of dominant approaches in a research area can motivate one to use alternative and currently underused methods to investigate a phenomenon.

Identifying the epistemological perspectives employed in the analyzed literature will illuminate authors' beliefs about knowledge, which might be helpful to better understand their reasoning and interpretations of results. Research epistemologies are classified into post-positivist, positivist, interpretive, or critical.

Another clear source of insight is understanding which theories are applied in the studies on the topic of interest. Creating and applying theory are important to sustain and enhance IS both as a professional and an intellectual field because it is based on competence in a body of theoretical and practical knowledge. Thus, in an attempt to describe the current status of a topic, it is important to try to discover its theoretical underpinnings. Such analysis can also assist and guide the expansion of the IS knowledge base.

Moreover, contexts of studies that are included in the literature review may differ across one's own selected sample of literature. This dimension is different from those mentioned above, which provide an overarching view of a topic's status. In contrast, the concrete contextual aspects to be captured will depend on the specific study's goals. Examples of contextual aspects include the study's setting (e.g., shared services for ERP implementations), its industry sector (e.g., shared services in the Higher Education sector), and its timeframe (e.g., a case study on shared services with interviews conducted

over a four-month period in 2010). This information enables the researcher to better understand and characterize the literature being analyzed.

To obtain a better understanding of potential future research avenues in a subject area, one may search for statements related to directions for future work. The future work section in research papers is dedicated to formulating a high-level research agenda. Based on an analysis of directions for future work in the relevant literature (usually found in the last section of papers) and evidence derived from other analyses and the researchers' expertise, one can create a unique and more comprehensive research agenda. This kind of rich planning is one of the highly valuable outcomes that a critical and thoughtful literature review paper can deliver.

### Phase 3: Coding and Analysis

In the literature review approach we propose, the literature treated as a qualitative data set. Hence, it should seem quite reasonable that common coding and analysis procedures relevant to qualitative research in general can also be applied to literature reviews.

Two specific and frequently used approaches for coding are:

- 1) Inductive: where the themes to be reported on are purely derived from the literature analysis itself, and
- 2) Deductive: where the themes to be reported on are already predetermined to some extent by using coding schemes, theoretical lenses, models, frameworks and/or the coding is aligned with specific research questions.

Researchers may choose to use the first approach (inductive) when the review goal is more interpretative. Here, researchers look for more than evidence on a pre-defined set of themes: they are instead keen to extract what the literature genuinely has presented to date and derive themes as they evolve. Researchers may use the second approach (deductive) when they have a defined set of themes that they would like to gather evidence about from previous research. One could also use a mixed approach; that is, the researcher may enter the coding phase with some high-level coding scheme but allows it to evolve as new themes and insights are obtained from the literature.

The analysis occurs with the identification of themes: "Theme identification is one of the most fundamental tasks in qualitative research. It also is one of the most mysterious" (Ryan & Bernard, 2003, p. 85). Regardless of what coding approach one uses, it is especially important to create memos during the literature review process, which will be helpful during coding and at later interpretation and writing stages. NVivo has a feature to link memos to categories/nodes and enables researchers to maintain annotations on different pieces of text in a source. The researcher can file notes and commentaries and track their thoughts as the coding progresses (see the case study in Section 5 for an example).

### Coding Literature Using an Inductive Approach

Inductive approaches enhance our understanding of the meaning of research concepts (e.g., antecedents, success factors, challenges, consequences). The primary mode of inductive analysis is developing categories from the raw data (e.g., a staple of literature) into a model or framework that captures key themes and processes that a researcher judges to be important. Scholars use various synonyms and/or terms for coding text (e.g., coding concepts, segments, data-bits or chunks of text, labels, incidents, units, thematic units, or categories). What these various terms share is that codes are assigned to portions of related text, and researchers should not get confused by the terms but stick with a specific operationalization throughout their analysis.

We propose using grounded theory for analyzing literature inductively and following the grounded theory literature review method adapted for IS research by Wolfswinkel et al. (2013). Applying grounded theory in the IS community has received significant attention with regular grounded theory workshops at the International Conference on Information Systems (ICIS) and the European Conference on Information Systems (ECIS). Annual research workshops of the grounded theory methodology special interest group (SIG GTM) also provide a forum for IS grounded theorists, from beginners to advanced researchers who want to improve research outcomes.

Many researchers regard grounded theory as a rigorous qualitative approach to data analysis when no relevant theory exists. With this inductive reviewing approach, one not only reviews and synthesizes what

has been said about a topic but also engages in discussing theory to advance the depth and breadth of an academic niche. Grounded theory's inductive nature lets the salient concepts be identified from the literature instead of being deductively derived beforehand. This allows themes to emerge during the analytical process of substantive inquiry.

When researchers use grounded theory for analyzing literature, they continuously compare, relate, link, and refine identified themes with each other and with the studied papers and excerpts. When reading the single studies for purposes of excerpting, the reviewer engages in three salient steps called open coding, axial coding, and selective coding.

In the first step, open coding is performed "to identify, (re-)label and/ or build a set of concepts and insights based on the excerpts from the papers". With open coding, one identifies a set of categories and obtains an overview of the study's findings unified by a set of theoretical and methodological insights. This involves reading, noticing and connecting concepts, triangulating concepts, and operationalizing (Wolfswinkel et al., 2013, p. 50).

In the second step, axial coding is performed in which "interrelations between categories and their sub-categories (including their properties) are identified". These higher-order categories (sometimes described as core, main or key categories) "represent the main themes or patterns" of the studies' results in the data (Wolfswinkel et al., 2013, p. 50). In the third step, selective coding is used to integrate and refine the categories that were identified; "It is mainly during selective coding that the researcher theorises and/ or re-conceptualises" the data. The key task at this point is to develop a singular thread of "reasoning with which one or a set of phenomena are potentially explained". During these coding steps, it is essential to document the coding process. As such, we strongly suggest researchers write memos and store information in a codebook to document emerging and changing ideas, which enables later tracing and retrospective comprehension (Wolfswinkel et al., 2013, p. 51).

These three analytical coding steps are performed in an intertwined fashion; one goes back and forth between papers, excerpts, concepts, categories, and sub-categories. Preliminary results guide the consecutive reading and further analysis of the remaining texts (called theoretical sampling). This unbiased approach optimizes the opportunities for noting aspects of the phenomenon under study that are in need of more data. Researchers constantly compare papers and excerpts until they are all read, understood, linked, and analyzed and until theoretical saturation has occurred. This is only achieved at the point when—while developing the categories—no new concepts, properties, or interesting links arise.

The following approaches help researchers to describe emerging categories:

- **Category name or label:** use a word or short phrase to refer to a specific category (see Table 2 for an example).
- **Description of a category:** describe the meaning of a category, including key characteristics, scope, and limitations. Define and operationalize the category (Table 2).
- **Text or data associated with a category:** include examples of text coded into a category that illustrate meanings, associations and perspectives associated with the category (Figures 3 to 7).
- **Quotes from text:** a quotation from the text could be used to "elaborate the meaning of the category and to show the type of text coded into the category" (Table 4) (Thomas, 2006, p. 245).
- **Links:** categories may have "links or relationships with other categories". In a hierarchical category system (e.g., tree diagram, see e.g., Figure 5), you may use the links to indicate "superordinate, parallel and subordinate categories (e.g., "parent", "sibling", or "child" relationships)". (Thomas, 2006, p. 240)
- **Category model or framework:** the categories may be "incorporated in a model, theory or framework" (see, e.g., Figure 6 factors for successful e-HRM adoption). "Such frameworks include an open network (no hierarchy or sequence), a temporal sequence (e.g., movement or time, see Figure 7), or a causal network (one category causes changes in another)" (Thomas, 2006, p. 240). It is also possible that a category may not be embedded in any model or framework which one could operationalize as such (Ryan & Bernard, 2003).



In the following paragraphs, we present various visual examples of qualitative analyses and coding procedures. The examples come from diverse published studies, which we briefly introduce to provide context for each example.

Table 2, extracted from Buijserd (2009, p. 25), provides an example of terms (category names and labels) used in an e-learning literature review. It shows the conceptual overlaps of the related terms (blended learning, e-learning, distance learning, etc.) in the form of a concept matrix. Information is presented alphabetically based on the authors' names and for each of the papers, the following conceptual properties are analyzed:

- Whether the concept refers to flexibility in a program
- Whether the concept allows remote education or not
- Whether the concept includes blended learning
- Whether the concept includes the use of general technologies, and
- Whether the concept includes the use of advanced technologies.

**Table 2. Concept Matrix Showing Overlaps of the Terms Used in the e-Learning Literature (Extracted from Buijserd, 2009, p. 25)**

Author(s) <sup>19</sup>	Concept	Flexibility in program	Remote education	Blended learning	General technologies	Advanced technologies
Akkoyunlu & Yilmaz-Soylu (2007)	Blended learning			x	x	x
Alonso, López, Manrique & Viñes (2005)	E-learning		x	x	x	x
Bo-Anders & Jonsson (2004)	E-learning		x	x	x	x
Bouhnik & Marcus (2006)	Distance learning,					
Cartwright & Menkens (2002)	e-learning		x		x	x
Carchiolo, Longheu, Malgeri & Mangioni (2007)	Distance learning		x		x	x
Chan & Law (2008)	Web-based learning, e learning		x		x	x
Clarke, Butler, Schmidt-Hansen & Somerville (2004)	Blended learning, open learning			x	x	x
Collis & Moonen (2004)	Distance learning		x		x	x
...	Flexible learning	x	x	x	x	x

Based on this analysis, Buijserd (2009) discusses how most authors (included in his review) agree that distance learning should not require physical student presence in classes and that different types of technologies are required to support it. Most distance learning efforts described were part of an institutional program to offer education to students not able to attend traditional lectures.

In Table 3, we see another example of an overview of papers investigating motives for shared services implementation by Paagman, Tate, Furtmueller, and de Bloom (2014). They explain how two researchers examined papers that discussed the concept of shared services, which explained it as organizational units delivering back-office functions to internal customers of the parent organization. Their analysis shows various authors who mention one of the motives and the number of papers mentioning each motive. The minimum number of motives mentioned in a paper is one, the maximum is 12 out of 13 motives. On average, each paper lists 3.5 motives. The detailed analyses revealed that some motives play a considerable role in the shared services literature, such as cost reductions, while others receive only limited attention, such as mitigating risks (Paagman, Tate, Furtmueller, & de Bloom, 2014).

<sup>19</sup> Please see the original paper (Buijserd, 2009, p. 25) for reference details of papers listed here.

**Table 3. Concept Matrix: Motives for Shared Services (Extracted from Paagman et al., 2014, p. 118)**

	Authors <sup>20</sup>	Year	Cost reductions	Improve quality of service	Improve efficiency / effectiveness / productivity	Access to external resources	Standardize processes	Focus on core competencies	Concentration of innovation	Improve customer orientation	Exchange of internal capabilities	Improve control	Consistent management information	Improve compliance with legislation and standards	Mitigate risks
1.	Borman & Janssen	2012			X				X						
2.	Janssen, Kamal, Weerakoddy, & Joha	2012	X	X		X		X							
3.	Arya	2011						X							
4.	Boglund, Hallsten, & Thilander	2011	X	X	X		X					X			
5.	Conway, Dollery, & Grant	2011										X			
6.	Dollery, Grant, & Crase	2011	X			X					X			X	
7.	McDowell	2011	X		X										
8.	McIvor, McCracken, & McHugh	2011	X	X			X								
9.	Miles	2011	X	X	X										
10.	Miskon, Bandara, Gable, & Fielt	2011	X	X	X		X		X						
11.	Nasir, Abbott, & Fitzgerald	2011	X	X	X			X							
12.	Peng	2011	X	X			X	X		X					
13.	Rothwell, Herbert, & Seal	2011	X			X				X					
14.	Selden & Wooters	2011	X	X	X	X				X					
15.	Wallace	2011	X					X							
16.	Xueli, Min, & Huiting	2011										X			
17.	Borman	2010	X												
18.	Dollery, Grant, & Akimov	2010	X		X										
19.	Gospel & Sako	2010	X	X				X							
20.	Joha & Janssen	2010	X	X	X	X	X	X	X	X	X	X	X	X	X
21.	Maatman, Bondarouk, & Looise	2010			X	X	X			X		X			
22.	Miskon, Bandara, Fielt, & Gable	2010	X	X	X	X	X	X	X	X	X	X			
23.	Niehaves, & Krause	2010	X												
24.	Sako	2010	X	X				X	X						
25.	Schulz & Brenner	2010	X	X	X		X			X					

Table 4 overviews consultants extra roles' behaviors, definitions, and behavioral examples presented in a study of service behaviors of financial consultants conducted by Furtmueller, van Dick, and Wilderom, (2011). In defining category labels and for describing the meaning of the behavioral categories, the authors used words (e.g., "friend"), word pairs (e.g., "active learner") and short phrases (consultants'

<sup>20</sup> Please see the original paper (Paagman et al., 2014, p. 118) for reference details of papers listed here.

efforts to continuously increase expert knowledge) to refer to a specific category (Furtmueller et al., 2011), and provided representative quotations to support this thematic classification.

**Table 4. Consultants' Extra-Role Behavior (Extracted from Furtmueller, et al., 2011, pp. 330-331)**

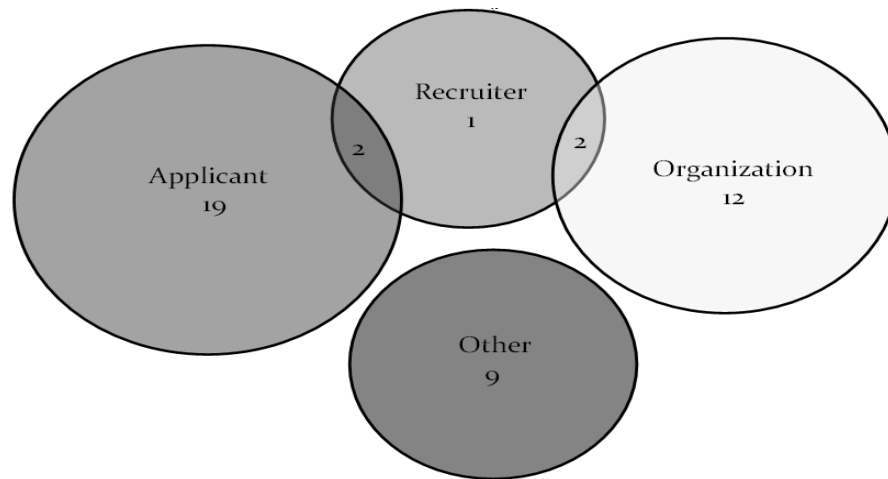
Behavior	Class	Definition	Examples
Active learner	Extra-role	Consultants' efforts to continuously increase expert knowledge	"Willingness to continuously learn new things in your field of expertise, curiosity for new approaches" "Accumulate expert knowledge, strive for increasing your competence" "Continuously read newspapers, finance news, do market research, observe market changes"
Authentic	Extra-role	Consultants' authentic/natural behaviors	"Don't pretend to be someone else;" "Don't hide behind a mask or other people's decisions" "Don't use sales texts you have learned by heart" "Be natural, authentic, be yourself"
Engaged worker	Extra-role	Consultants' full engagement for meeting/exceeding customer needs	"Do more than customers expect, voluntarily take over extra duties" "Full and active attention for meeting and exceeding customer needs" "Engaged for customers, search and provide the best solution, help customers in every aspect, be helpful, offer supplementary services"
Friend	Extra-role	Consultants' cooperative partnership oriented behaviors	"Show that you respect your customers, take each other's opinions and needs seriously" "Put yourself at eye level with customers, don't behave in an arrogant way, gain rapport" "Find and use synergies, create win-win cooperation"
Future planner	Extra-role	Consultants' efforts to create/sustain long-term customer relationships	"Continuous analysis of changing customer needs, goals, desires, interests" "Visualize the future with customers, guide them"; "Provide after-sales consulting" "Actively deliver the message that you are interested in accompanying customers in all phases of their life and handling changing customer situations"

Table 5 is an extract from Furtmueller (2012, p. 63), which shows how 10 e-recruiting themes were derived from a sample of 45 papers relate to the perspectives taken in the e recruiting literature: applicant, recruiter, organization, and other. The author identified the themes and perspectives based on open and axial coding and by using comparative analysis procedures. Virtually all themes are related to the applicants' perspective.

**Table 5. Overview of the Identified Themes (Rows) and Perspectives (Columns) Taken on e-Recruiting in the Analyzed Literature (Extracted from Furtmueller, 2012, p. 63)**

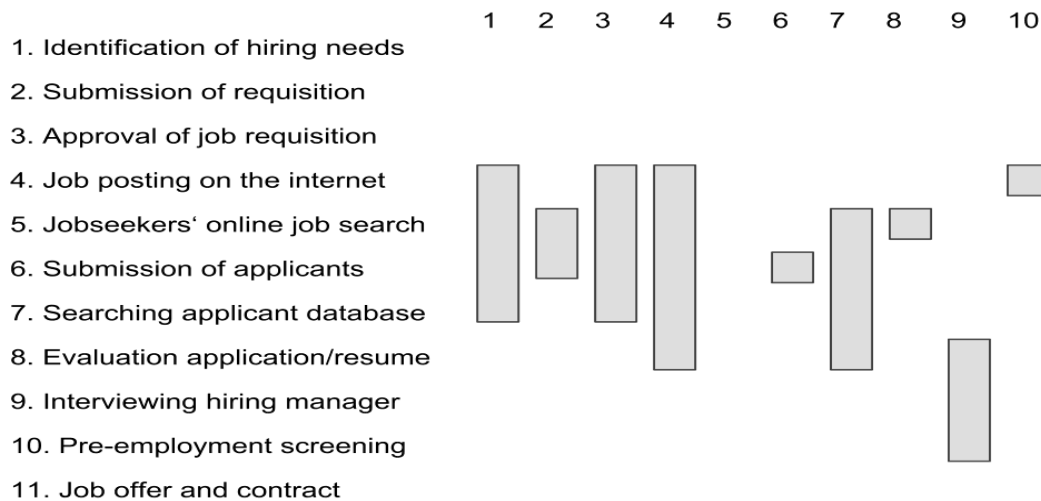
	Applicant	Recruiter	Organization	Other
Corporate/commercial recruiting website (characteristics)	√	√	√	√
Jobseekers'/applicants' attraction/ image/perception of an organization	√			
Presenting or evaluating technologies/techniques/ frameworks/models regarding e-Recruiting services	√	√	√	√
General e-recruiting research	√	√	√	√
Organizations' decisions to recruit online and/or its implications			√	
Jobseekers' decision to apply	√			
Fit	√		√	
Online job search process	√			
Résumés and/or selection process	√		√	
Web-based vs. paper-based job posts	√			

Figure 3 is another extract from Furtmueller (2012, p. 60) where the author presents the number of papers corresponding to the four identified e-recruiting perspectives in the literature. The figure shows that most papers take the perspective of the applicant (19 papers). Only four papers reflect more than one perspective.



**Figure 3. Perspectives on E-Recruiting Research Taken in the Reviewed Papers (45 in Total) (Extracted from Furtmueller, 2012, p. 60)**

In Figure 4, Furtmueller (2012) projected the ten identified e-recruiting research themes (see Table 5) onto the eleven consecutive steps of Lee’s (2011) recruiting process model (for detailed coding procedures, see Furtmueller, 2012). Surprisingly, research has yet to be conducted addressing Lee’s first three steps: identifying hiring needs, submitting job requisitions, and approving job requisitions. Current e-recruiting literature is primarily concerned with investigating Lee’s step four (posting a job on the Internet), step five (searching jobs online by applicants), and step six (submitting applications). Theme five (organizations’ decisions to recruit online) is not related to any of Lee’s steps. The fourth step (posting a job on the Internet) and the fifth step (searching jobs online by applicants) have been addressed in numerous papers examining organization familiarity, image, attraction, website navigational ease, information, style, and the job search process itself. For the last four of Lee’s steps, practically no academic publications have appeared.



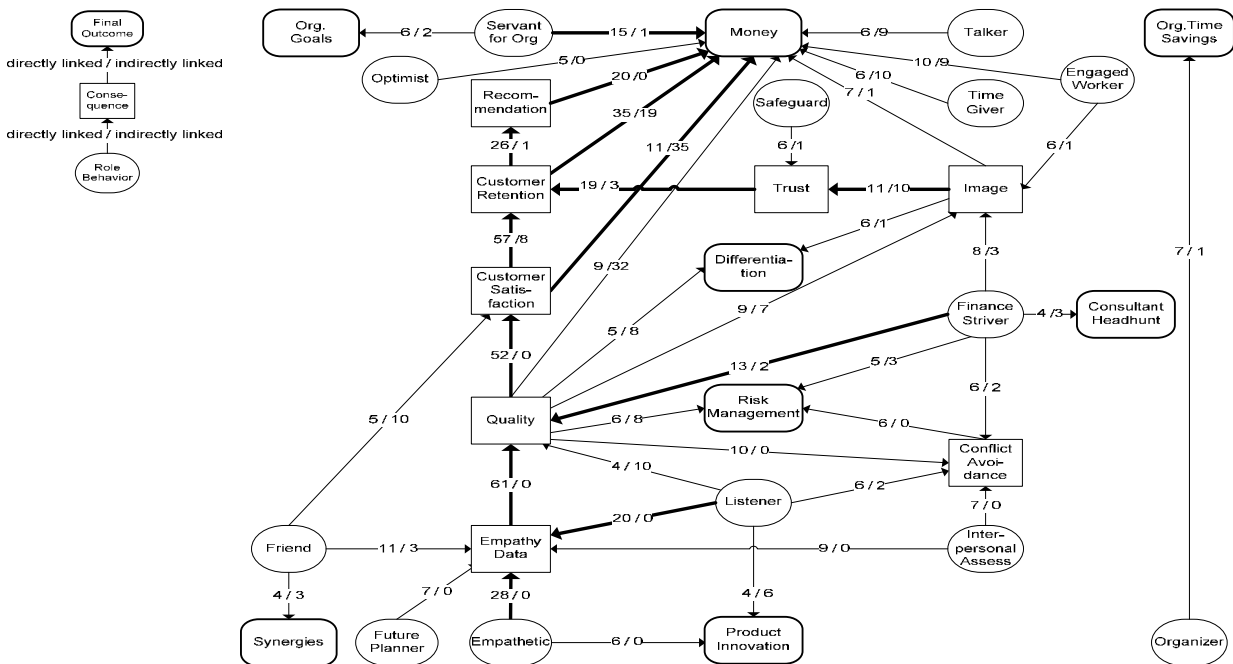
**Figure 4. Projecting the Ten Identified e-Recruitment Themes Onto the Eleven Steps of Lee’s (2011) Recruitment Model (x = Themes In The Synthesized Literature; y = Lee’s Recruiting Steps) (Extracted from Furtmueller, 2012, p. 71)**

Table 6 is an example from Jung (2011) of operationalizing concepts (in this case, retention factors) based on quotes from the literature and interview results. Each retention factor comprises several sub-factors, which Jung (2011) derived from the literature and interview data. For each sub-factor, he provides supportive quotes (see Jung, 2011, for further details).

**Table 6. Examples of Retention Factors for IT Professionals (Extracted from Jung, 2011, p. 62)**

Retention factor	Sub-factor	Quotes from the literature <sup>21</sup>	Quotes from interview data
Organizational climate and culture	Work environment	“Appropriate working conditions/ environment/ good equipment/ tools/ physical space/ quiet.” (Beecham et al., 2008, p. 868)	“but the working environment is really, really important. No matter how good your salary is, if you don't like the people you work with every....”
	Organizational climate	“The blend of ideas, customs, traditional practice, company values and shared meanings that help define normal behavior for everyone who works in a company. Culture is ‘the way we do things around here’.” (Post et al., 2002, p. 132, in Coldwell et al., 2008, p. 615)	“working environment... the informal... and friendly environment.”
Job characteristics	Job content	“Motivated by the nature of the job, e.g., technical success and challenging technical problems.” (Beecham et al., 2008, p. 861)	“... I don't want to do every year the same thing again and again.”
	Job satisfaction	“Affective attachment to a job” (Tett & Meyer, 1993, in Joseph et al., 2007, p. 550).	“and if it gives me a sense of pride to work there! For example, if you work with the government you help all of people and you go home... you think well I've done quite nice things today. Then I think it is a job where I'd stay for a long period of time.”

Another way to present qualitative review data is a hierarchical value map (HVM). Figure 5 presents a HVM and visual arrangements of dominant connections between the identified role behaviors and outcomes for finance organizations extracted from Ettinger (2009, p. 93). Arrows in the figure reveal the direction of the linkages among elements, while numbers attached to the arrows indicate the frequency of the link (direct links in the ladders are represented before the slash, indirect links after the slash). For reading and interpreting the HVM, one typically considers any pathway from bottom to top (or vice versa) as a chain representing a linkage. Figure 6 presents the four main identified factors for successful e-HRM adoption: technology factors, organizational factors, people factors, and environmental factors presented by (de Witt, 2011, p. 117). The figure also shows the associated sub-factors and related studies.



**Figure 5. Finance Organizations Hierarchical Value Map (Adapted from Ettinger, 2009, p. 93)**

<sup>21</sup> Please see the original paper (Jung, 2011, p. 62) for reference details of papers listed here.



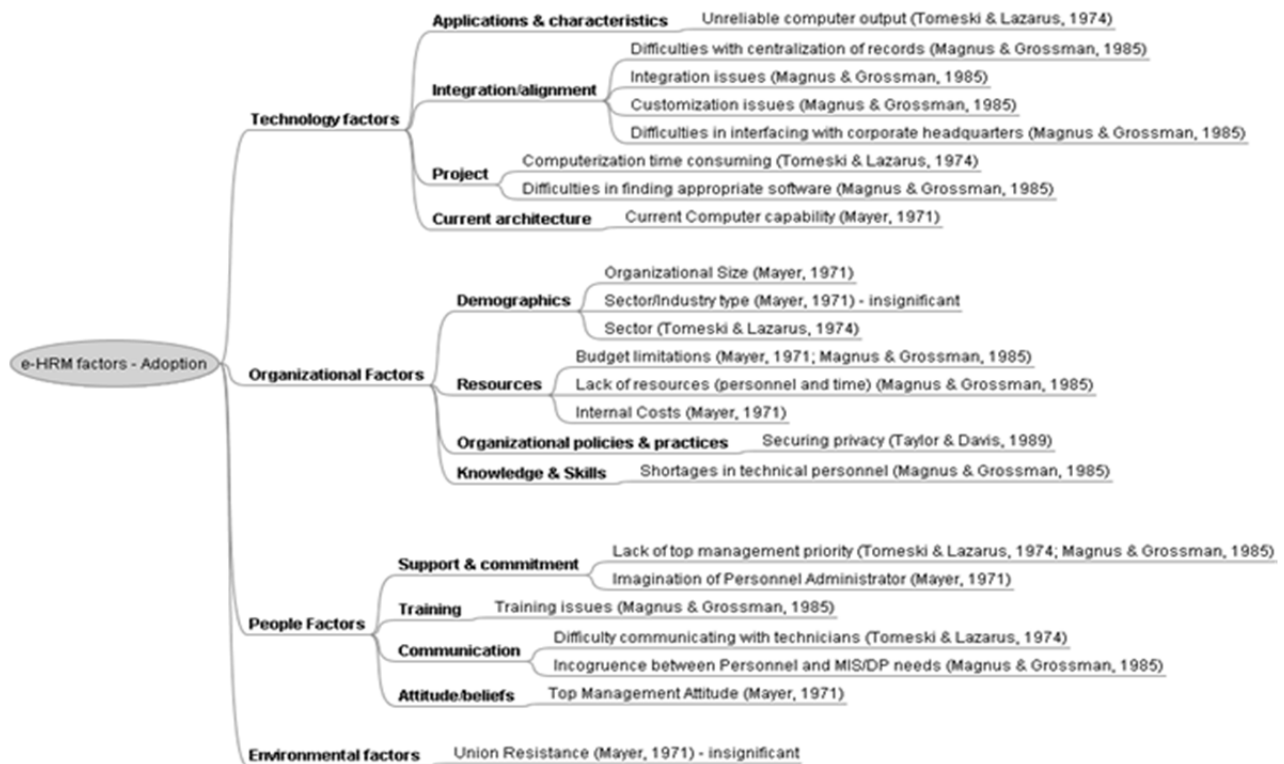


Figure 6. e-HRM Adoption Factors (1970-1990) (Extracted from de Witt, p. 117)

Sometimes, it is helpful to present the results of a study in the form of a flow diagram. Figure 7 depicts how Furtmueller et al., (2011) shows consultants' behaviors change over time as they became more acquainted with a given customer.

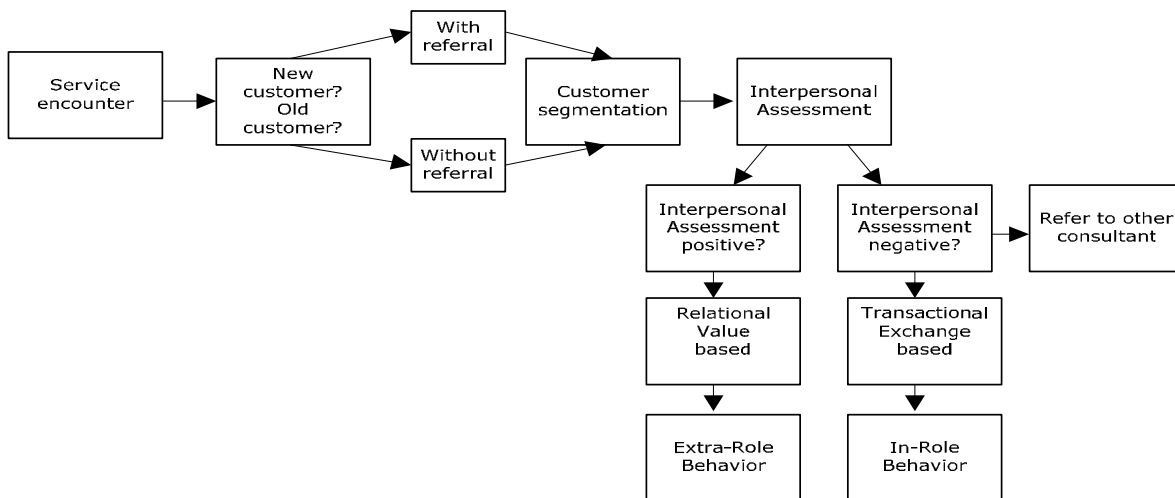


Figure 7. Example of Temporal Sequence in Consulting New versus Old Customers (Extracted from Furtmueller et al., 2011, p. 335)

In interpreting figures, tables, and other visuals, one may need to continuously stand back, think about what's been learned, and ask the following questions:

- What do these categories and patterns mean?
- Which quotes from the text are useful for explaining your identified themes?
- What is most important across the large dataset?
- What are the main findings, agreements, disagreements, gaps, and opportunities?

The following techniques can support the interpretation of the review results.

**Narrative analysis:**

- Chronologically interpret sequence of sentences.
- Linguistic analysis: looking at symbols, metaphors, with an emphasis on outstanding parts of stories (e.g., blame, appraisal).
- Restoring: make sense of the story (past, present, future ideas).
- Deconstructing: investigate loud talk (emphasis on certain words or phrases, statements, call signals), silence, disruptions.
- Using a lens (e.g., a feminist lens to report how stories of women are different).
- Epiphanies: points of dramatic change, turning points of a storyline.

**Linguistic connectors:** one may look for an excessive overuse of certain linguistic terms; these could be causal, conditional, taxonomic, temporal, or relating to frequent negations:

- Causal (because, therefore, since, hence, as a result).
- Conditional (if, then, instead).
- Taxonomic (= “is”; A is a kind of B).
- Temporal (before, then, after, next, later, latterly).
- Negation (no, non-, im-, un-, il-, etc.).

As in any qualitative research project, it is important to validate emerging codes (themes, categories, sub-categories, etc.). Coding guidelines need to be tested (preferably with two or more coders in a research team—often called an inter-coder reliability check) prior to entering the actual coding phase and throughout the coding process. To test the clarity and consistency of one’s category definitions, a sample of one’s data is coded. Zhang and Wildemuth (2005, p. 4) further describe this by stating:

*After the sample is coded, the coding consistency needs to be checked, in most cases through an assessment of inter-coder agreement. If the level of consistency is low, the coding rules must be revised...especially when multiple coders are involved, you should develop a coding manual, which usually consists of category names, definitions or rules for assigning codes, and examples.*

The inter-coder reliability check can be performed in NVivo. Neophytes with NVivo should be forewarned that these protocols are prone to change, especially due to insights for tweaking them that might emerge in the analysis phase. This evolution is typical and to be encouraged. Keeping a logbook that captures the fine tuning during the coding process is also highly recommended.

To make inferences and/or do frequency counts of emerging codes across the whole data set, the codes need to be internally homogeneous and externally heterogeneous. Doubts and problems concerning the definitions of categories or the categorization of specific text paragraphs need to be discussed and resolved (e.g., through peer-checks with one’s research team). Coding sample texts, checking coding consistency, and revising coding rules is an iterative process and should continue until sufficient coding consistency is achieved. Saturation is a requisite for a convincing, representative, theory-based and forward-looking literature review. It is, however, subject to debate, itself typically constrained by the timeframe and other resources a researcher has available. The clear advantage of inductive coding is that it enables a researcher to engage in selective theory building. The researcher may develop integrated frameworks and models and derive grounded hypotheses. Salient themes and identified relations may be used to guide future research. As Wolfswinkel et al., (2013, p. 52) state, “Theory building is one of the increasingly important outcomes when using grounded theory to review a carved-out segment of literature. Using grounded theory when reviewing publications may even lead to challenging the underlying rationale of existing theory”. Grounded theory analysis has the potential to lead to the discovery of fruitful theory emergence and the identification of gaps in knowledge that are important for research explorations with a theory-building focus. Thus, using this reviewing approach not only produces an account of what has been empirically found but also supports theorizing and conceptualizing efforts.

## Coding Literature using a Deductive Approach

The purist hypothetico-deductive perspective "... emphasises universal laws of cause and effect on an explanatory framework which assumes a realist ontology; that is that reality consists of a world of objectively defined facts" (Henwood & Pidgeon, 1993, p. 15).

In deductively coding literature, one begins analysis with potential codes and/or a priori coding schemes already in mind. Ali and Birley (1999, p. 103) explains how "Within this paradigm, the scientist formulates a particular theoretical framework and then sets about testing it". Quantitative or logical positivist methods for analysis are commonly associated with deductive approaches. The value of this type of analytical approach is that one can align their review project from the outset with specific research questions, hypotheses, and/or a theoretical frame. Its limitation is that it is only possible to test whether or not, or to what extent, one's hypothesized relationships exist. Since the focus of this approach is on finding an answer to an already specified review questions or hypotheses, the approach does not help in identifying what other unanticipated factors and surprising insights may exist in the literature, such as contingent variables or new constructs and themes. Thus, the first pass at generating codes is often based on the reviewing questions themselves.

A priori themes come from the characteristics of the phenomenon being studied; from already agreed on professional definitions found in literature reviews; from local, common sense constructs; and from researchers' values, theoretical orientations, and personal experience

A priori codes can be derived from the characteristics of the phenomenon under investigation; from already agreed-on scientific (or professional industry, sector-specific) definitions found in the literature; from common-sense constructs; and "from researchers' values, theoretical orientations, and personal experiences" (Ryan & Bernard, 2003, p. 88). Strauss and Corbin (1990) call this theoretical sensitivity. Even with a fixed set of review questions, one cannot anticipate all the unexpected themes that may arise before analyzing the data. The researcher should use the aforementioned coding schemes that we suggest as specifically relevant for IS literature reviews (phase 2) and/or code their data considering following aspects:

Repetitions/regularities/patterns: coding reoccurrences, regularities, patterns, synonyms, antonyms, frequency, asking yourself questions such as:

- What are the prevailing theories, definitions, findings, gaps?
- What are the major findings and agreements among authors?
- Who are the key authors?
- What methodologies are being used to study the topic?
- Is there a change or argument over time? Are there any trends?
- Are there any dominant philosophical beliefs?

**Similarities/differences:** this analysis relates to the grounded theory analysis using "constant comparison" techniques. You first decide for the unit of analysis: Are you consistently coding phrase by phrase, by paragraph, or are you looking for an answer across the whole article? What is the sentence/phrase about? How is it similar to or different from the preceding or following sentence or phrase? If looking at whole articles, how do they differ?

**Indigenous typologies:** terms that sound strange or are unfamiliar, or different usage of terms between scholarly communities.

**Metaphors/analogies:** metaphors transfer a complex of meaning in a few words. For example, "We are in the cloud"; we are not physically "in the cloud"—this metaphor just indicates that more services are offered online. Or "Broken heart"; a person's heart is not literally broken into pieces, they just feel hurt and sad.

**Transitions:** one may look for paragraph breaks, turn-taking, or hesitations in arguments. For example, how is one paragraph connected with the next?

**Surprising and unanticipated themes:**

- Did I have any assumptions or hypotheses when I started coding?
- What surprising and unexpected insights did I gain in analyzing the papers?

For each deductively selected category, a respective node in NVivo can be created. The coding process at this stage consists of selecting the relevant text passages, followed by capturing them in one or several respective nodes (as per the set coding rules agreed on in phase 2).

As a next step (second-level coding), the excerpts captured during the first round of coding are further elaborated on to create new categories, nodes, and sub-nodes. This can be done from a deductive approach, where lists or frameworks related to the coded content can be used to identify a second-level coding scheme (for a selected node/ theme). For example, in Fielt et al. (2014), they capture aspects of shared services objectives in a first-level node and then code the content with this node using a prior framework (i.e., deductively). This second round of coding can also be done inductively, where the coded content in the node is coded using inductive methods to see what the data captured on that theme actually unveils. At this stage, new nodes are created as sub-nodes, and they are merged or restructured together with the respective textual passages to gain more understanding of the possible meaning. This phase is comparable to the axial coding described in the inductive grounded theory approach above. Fielt et al. (2014) used a similar approach when they presented different forms of sharing (see Table 6 in Fielt et al., 2014).

Coding can occur on more than two levels of analysis, and it depends on how abstract the initial codes are. Even deductive approaches where the initial categories are identified upfront can also employ a blended approach by integrating inductive approaches to coding, especially in the lower levels of analysis.

### Phase 4 – Presentation of Results

Writing a rigorous, logical, and persuasive review of the literature is a skill that needs to be learned. The key to a good review is the ability to structure, write, and present the findings in a clear and consistent way that demonstrates synthesized knowledge of the accumulated facts in a research area. To some extent, a literature review's structure will depend on the purpose and research question(s). A review may be either a single paper, part of a set or series of empirical papers or grant and research proposals, or an introductory chapter in dissertations. Thus, the length, writing style, and structure will differ depending on the type of review. Primarily, a literature review paper can be structured in a similar fashion to reports of empirical studies. Table 7 proposes a simplified structural checklist for a review that consolidates guidelines from Webster and Watson (2002), Wolfswinkel et al. (2013), and Buchanan and Bryman (2011).

A standalone review should be prefaced with an abstract that includes all the typical content of a normal paper abstract. It should start with a clear statement of the importance/value of the review and refer to the gap/problem it is addressing. It should highlight the review methodology, summarize the main results, and, in some cases, present the anticipated implications.

All review papers should include introduction, methods, results, and discussion sections. In the introduction, the review's scope and goal should be stated to provide an appropriate context and rationale for reviewing the literature. In order to create reader interest, in the first section, researchers may point to trends in the research area; conflicts in the theory, methodology and evidence in the field; or gaps in prior research requiring systematic synthesis of knowledge. A literature review in general starts with a "broad conception of what is known about the topic, and potential areas where knowledge may be needed" (Torraco, 2005, p. 359). Also, the review's target group of readers and its specific contribution should be described upfront. At the end of the introduction, some information about the organization and structure of the review (sequence) needs to be included<sup>22</sup>. In the methods section, the procedures used to conduct the study should be presented in sufficient detail that the results will be judged reliable by the reader. These descriptions will vary depending on the review's scope and goals and on the tools used for identifying, extracting, and analyzing the literature.

The results may be organized around research questions, consensus, or contradictory viewpoints regarding the topic, inconsistencies, gaps, methodologies used across the reviewed studies, chronological development of the research area over time and in geographic regions, emerging themes, or a priori defined themes. A strong review paper does not only provide an objective account of the literature, but also evaluates the state-of-the-art of the body of knowledge reviewed and discusses "evidence about a topic, pointing out similarities and differences and offering possible explanations for any inconsistencies

<sup>22</sup> For guidelines see <http://www.emeraldgroupublishing.com/authors/guides/write/abstracts.htm>

uncovered” (Cronin, Ryan, & Coughlan, 2008, p. 43). Accordingly, the discussion should bring surprising findings to the fore. Through evaluating other's work, scholars are challenged to identify any gaps that might exist and are able to frame studies that contribute to new knowledge in a field. The review may include a conclusion with a concise summary of the findings and offer a rationale for conducting future research. Using qualitative reviewing methods and software, it may be possible to use the developed themes to construct and present a conceptual framework that will inform future research.

**Table 7. Proposed Structural Checklist for a Literature Review**

Recommended section to include	Checklist of what to include
<b>Abstract</b>	Importance of this literature review Clear problem statement (what does this work attempt to solve?) Brief outline of the review's scope Brief statement of the method applied for the review Highlights of the findings/ reported content Implications
<b>Introduction</b>	Scope of the research area Goals and/or review question(s) Rationale for the review (motivation) A background literature (general and related to the scope of the research area) against which to position the work Potential readers that this paper is targeting Trends in the research area or conflicts in theory Contributions of the review to academia and practice Sequence of the remainder of the paper
<b>Methods</b>	Scope of the search and fields Literature search strategy (precise search terms used) Defining the sources (databases and/ or selected sources) Describe “quality assurance” procedures (paper inclusion/ exclusion rules applied) Some details of the tool(s) used to support the analysis (if any) and the choices made in relation to tool selection Overview of strategies (techniques) used for coding and data analysis
<b>Results</b>	Specific findings for each section, and all sections aligned with the research question(s) and study goals Chronological representation of the literature (i.e., trends) Emerging themes or coding schemes Methodological meta-analysis Philosophical analysis and overview observed in the literature Critical review of the literature (i.e., evaluation of the development on prior work) Inconsistencies (i.e., controversies) Gaps (hence, possible input to a research agenda)
<b>Discussion</b>	Evaluates the state-of-the-art of the body of knowledge Discuss evidence about a topic, similarities and differences Surprising observations Offer possible explanations for any inconsistencies
<b>Conclusion</b>	Condensed summary Limitations Future research and practice

One approach to presenting a review is to organize the discussion of the studies in order of their chronological appearance (see Appendix E for visual examples from other similar studies). Trends in studies over the years offer an impressive overview of how a topic has emerged.

Another approach is to organize the literature methodologically, with each section focusing on a different method. A summary of the methods applied in current publications pertaining to the topic is useful for identifying the different types of research techniques that have been applied to date. These methods can be used as input for justifying the selected method of other emerging research for the topic and can also give a broad view of the maturity of the field.

Pre-defined coding schemes can also be used to present tables with condensed information about author, year, research goal, methods (or more detailed information: sample, procedure, measures), main results, and/ or future research (see Appendix E for an example). Another mode of presentation is to operationalize core themes and show how they are grounded and conceptualized in the literature. Quotes from various authors can be used to derive internally homogenous and externally heterogeneous categories, sub-categories (see Appendix E for an example). or even taxonomies. Some qualitative methods provide sophisticated means for presenting results of literature reviews with visualizations in



graphs, figures, models, frameworks, process chains, networks, value maps, and so on. Alavi and Leidner (2001) present various examples for graphical representations in literature reviews using flow charts and tables. Webster and Watson (2002) share visualizations for concept-matrices augmented with underlying concepts. Wolfswinkel et al. (2013) give examples of how to present the results of grounded theory-type reviews.

Defining key concepts, especially in an emerging field, can be a critical and useful outcome in a review effort. Fielt et al. (2014) provide a good example of how one can track down prior definitions from the literature to form a synthesized and consolidated new definition supported by evidence (the literature itself). They also provide a good example of how to visually illustrate the scope of their search strategy's sampling frame (see Figure 1 in Fielt et al., 2014).

Presenting the most common outlets for a research topic in the searched domain is useful for researchers and practitioners in identifying potential outlets to examine for related research. It also assists novice researchers to identify potential target outlets for their work. This can be derived by exporting the count of papers extracted for each main source (something easily done through tools such as NVivo with a simple query). This kind of analysis may also provide useful insights to journal editors because it can indicate their support/tolerance for certain/emerging topics based on how many papers have already been published in their outlets.

A summary of the prominent authors on a topic in the current literature can also possibly assist the growth of a field. It may create potential collaborations on the topic or simply point to other researchers whose work should be considered in upcoming research in the field. A summary of the authors of seminal and highly cited papers can easily be derived by looking closely at the NVivo project database. If different authors focus on specific themes in the topic, this too can be observed and extracted from the NVivo database and presented in a tabular format.

In Appendix E, we provide additional exemplary tables and figures for presenting a literature review's results. In Section 4, we present an illustrative case example that depicts how the proposed tool-supported literature review methodology can be applied.

## 4 Case Study: Literature Review on Gender Research In Information Systems

In this section, we present an illustrative case study on gender research in IS. We apply the four-phased approach to conducting literature reviews introduced above and use NVivo as a qualitative data-analysis tool (see Section 3 and Appendices B and C for details). We conducted this literature review to identify the gaps in previous research on gender and IS and to derive a research agenda for future studies. The preliminary results can be found in Gorbacheva (2013). We chose this topic because of a concerning lack of attention to the improvement of gender diversity in IS in spite of the worldwide skill shortage and a continued female under-representation in the information and communications technology (ICT) workforce (Trauth, 2011; Adam, Howcroft, & Richardson, 2004).

### Applying Phase 1: Extraction of Relevant Literature

#### Case Study: Selection of Sources

Taking advice from Bandara et al. (2011), who present a clear strategy for selecting their research outlets, and in accordance with the "selection of sources" sub-section above, we purposely limited the study's scope to the top basket of IS journals (for further details see phase 1 of Section 3 above). We assumed that such an outlet selection provides a good snapshot on the state-of-the-art in gender and IS research and can act as a basis for developing a research agenda for future studies.

#### Case Study: Search Strategy

We first searched all available paper abstracts. We expected that abstracts would contain all the relevant keywords and represent the main ideas of the papers, so we saw additional effort related to a search of papers' titles and keywords as unnecessary. Unfortunately, only one journal website, that of the *Management Information Systems Quarterly (MISQ)*, allowed us to search in abstracts, so we accessed such online bibliographic databases as EBSCOhost Business Searching Interface, Scopus, and AISeL. All of these bibliographic databases allowed us to search by journal ISSN codes to include only those papers

published in the outlets of interest. Therefore, in addition to the keyword search in abstracts, we also searched using the ISSN codes of the top basket of IS journals, including *MISQ*.

We identified the volumes and issues of the top basket of IS journals available in the three online databases by entering the ISSNs with no additional keywords into a search string. We then sorted the results chronologically and found out that all of the issues of all eight journals (up to the year 2014) were represented with the exceptions of the 1991-1995 issues of the *European Journal of Information Systems (EJIS)* and the 1991-1993 issues of the *Information Systems Journal (ISJ)*. We checked these volumes manually by investigating the online archives of the journals' websites. First, we screened the papers' titles and further analyzed the abstracts of those related to the topic of gender.

We found selecting the search terms that best capture gender-related research to be challenging, and we did several iterations of searches using different combinations of keywords. It was important to employ a rigorous and repeatable strategy to reduce the dataset, so we selected both gender-neutral terms and the terms that reflect the feminine or masculine aspects of gender. As a result, we searched for the papers with any of the following ten terms in their abstracts: gender, sex, female, wom?n, girl, femin\*, male, m?n, boy, masculi\* (the final search string is presented in the "search strategy" subsection of phase 1). The wildcard question mark (?) represents any one character, so that the terms woman, women, man, and men were included. The wildcard asterisk (\*) can be substituted with any number of characters, so that the search included the terms such as femininity, feminism, masculine, masculinity, and so on.

### Case Study: Evaluating the "Quality" of Literature Included in a Review

The search resulted in 89 papers: that is, it included those papers that mentioned any of the search terms in their abstracts at least once (see earlier discussion of search terms used). All papers that we found by searching *MISQ*'s website we also identified in the online databases, which increases confidence that the results are reliable.

As a next step, in accordance with the "Evaluation of the quality of literature included in a review" subsection (see phase 1 details of Section 3 above), we had to identify the criteria for including papers for further analysis. Thirteen papers appeared to be review papers or editorials, and another 13 were not related to gender research, such as papers with phrases like "23 men and 10 women took part in the survey" in their abstracts. Excluding all such papers from further analysis decreased the dataset to 63 papers. We manually screened the full texts of these papers and identified that not all studies had a gender-related topic as their focus. Many treated gender as one of the factors or socio-demographic variables (alongside with income, age, education etc.), which did not fit our study's goals. Therefore, we defined the criteria for final paper inclusion and two researchers independently categorized each paper as being relevant or non-relevant for further analysis. We agreed that a paper had the topic of gender at the core of its research if it either provided a detailed analysis of a gender-related topic, if gender was part of the research question, or if gender was the only or main variable tested. As a result, we selected 27 papers for further detailed analysis (Figure 8 overviews the final paper selection process).

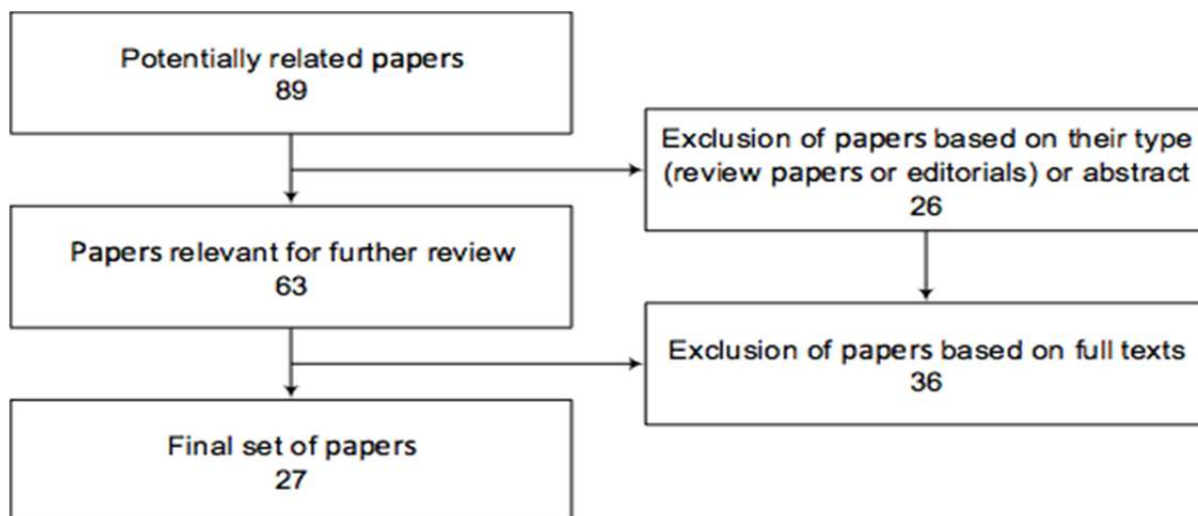


Figure 8. The Process of the Final Dataset Formation

To double-check the validity of the selected papers, we performed a word frequency query of the full texts of the 27 papers in NVivo once we imported them into it (see phase 1 of Section 3 and the “queries” subsection in Appendix C for more details). The most frequently used terms include women (3011 instances), men (1239), gender (2066), work (1508), research (1393), information (1240), systems (858), and technology (881). This result shows evidence that we selected the papers with gender at the core of IS-related research.

## Applying Phase 2: Organization and Preparation for Analysis

According to the phase 2 process outlined earlier, before starting full paper text analysis with NVivo, it is necessary to determine what information should be extracted from the literature. On top of the selected papers in the top basket of IS journals, during the discussions with several peers involved in gender and IS research we identified seminal gender and IS studies published in other outlets (e.g., Trauth, 2013). We also reviewed several prominent IS literature review papers, such as Orlikowski and Baroudi (1991) and Wareham, Zheng, and Straub (2005). Based on these readings, and taking into consideration the high-level coding scheme proposed in phase 2 in Section 3, we selected several categories for analysis (a deductive approach) in accordance with the study goals and research questions. We revisited these categories when coding and analyzing the papers with NVivo10, which resulted in the four dimensions presented in Table 8 (the “deductive approach” column).

On the other hand, we could not find studies that either summarized the themes and challenges that motivated gender and IS research (research agenda of the past, see Gorbacheva, 2013, for preliminary results) or proposed in a comprehensive way the directions for future research in the field. In other words, for these two areas, we defined no set of themes in the prior literature, and, therefore, we needed to derive them using an interpretive (inductive) approach (see the “inductive approach” column in Table 8 and phases 2 and 3 of Section 3 above). However, when working on a research agenda for future studies, we took the recommendations proposed in previous seminal studies on gender research in IS as a basis for initial coding, but we then substantially reworked and expanded them. We did the same with the preliminary categories of challenges in gender research that Gorbacheva (2013) proposes.

Thus, our literature review used a mixed approach; that is, it used both deductive and inductive methods (see phases 2 and 3 of Section 3).

Also, note that, initially, we considered numerous additional potential dimensions for analysis. We did not elaborate on these dimensions either because the information captured there yielded no interesting results or because we decided to consider these categories in future work. These categories included the following:

- Publication year
- Interdisciplinary (yes/no)
- Funding organization/project
- Authors’ number/ gender/ location
- Data collection technique(s)/data source(s)
- Other IS theories
- Other theories
- Timeframe of the study
- Findings and contributions
- Limitations
- Relation to any of the five topic-oriented IS research categories (based on Orlikowski & Baroudi, 1991)
- Relation to any of the four previously identified fields of study in gender and IS research (based on Wilson, 2004)
- Relation to one of the five types of theory in IS (based on Gregor, 2006)

**Table 8. Final Coding Categories**

Deductive approach	Inductive approach
Followed approaches to theorizing gender in the IS field (often implicitly) Research methodology Research method Epistemology (often implicitly)	Research themes and challenges (research agenda of the past) Recommendations and propositions for future research (future research agenda)

Also note that, before importing the papers into NVivo for further analysis, it is important to ensure that all papers' texts in the dataset can be searched and coded. Therefore, for those .pdf papers for which we could not select and copy text passages (e.g., if they were created as image files), we applied either the Adobe Acrobat in-built optical character recognition (OCR) feature or, when that did not work, the Zamzar file conversion service (see Appendix C for details). Once this text recognition check was done and NVivo had been installed and set up, we uploaded the papers into the program and organized them: we created sub-folders in the "sources/internals" folder (a folder for each of the journals under study) and transferred the papers into their respective journal's each folder.

### Applying Phase 3: Coding and Analysis

We began analyzing the papers by performing forward and backward searches for each of them (Fisher, Shanks, & Lamp, 2008; Moed, 2006). Thus, forward and backward searching can be done not only to collect additional useful papers or to evaluate the quality of selected papers (as proposed in phase 1) but also to analyze the publications forming the final dataset.

For the forward search, we used Google Scholar. Although there are several other online platforms providing information about the number of times a scientific paper has been cited (e.g., ISI Web of Knowledge or Scopus), we discovered that Google Scholar returned the most comprehensive total citation count. Assuming it to be one possible indicator of a paper's impact, we also calculated the average citation frequency per year.

We found out that the citation count for most papers was quite low, but two papers had an exceptionally high number of citations. We analyzed these two studies and those citing them separately. We discovered that both studies investigated the differences between men and women in the ways they use technology, and the absolute majority of the citing papers used the technology acceptance model (TAM) or referred to the online behavior aspects and were not related to gender and IS research.

Backward searching and analyzing papers' references revealed one additional seminal paper on gender and IS, which was cited the most frequently. This study (which is outside the top basket of IS journals) helped us to better understand the foundations of such gender and IS theory as the individual differences theory of gender and IT (Trauth, 2002). Our backward searching also showed the most cited outlets, with *MISQ* leading the list followed by *Communications of the ACM*, *Information Systems Research (ISR)*, and the *Academy of Management Journal*.

We used NVivo10 to extract and code the passages related to any of the identified coding categories (Table 8). For each of these categories, we created nodes in NVivo and then selected relevant text excerpts and placed them into one or more categories/nodes. Two researchers used NVivo to code the most frequently cited papers first, then the most recent papers, and then the rest of the papers because they expected that the most cited and the most recent papers would support faster learning about the topic because they usually provide either the most significant contributions to a field (the most cited papers) or the most comprehensive overviews of a field (the background sections of the most recent papers).

We established a classification (the summary of attributes) for pre-defined coding categories (deductive approach) in NVivo so we could compare papers (see Figure B-1 in Appendix B). Two researchers independently assigned all 27 papers to the concepts in each of the pre-defined dimensions (theoretical approaches, research methodologies and methods, and epistemologies) and then compared their results and discussed and resolved any points of disagreement. Extracting information for these descriptive categories was mostly straightforward because the related concepts were well-established: for example, each papers' research methodology can be classified into quantitative, qualitative, mixed, or conceptual,

and their epistemology can be classified into positivist, interpretive, or critical. Most relevant information here could be extracted from the papers' abstracts and their methodology sections.

For the theme development and conceptual analysis (inductive approach) of the research themes and challenges (research agenda of the past) and recommendations and propositions for future research (future research agenda), we applied the grounded theory method (see Wolfswinkel et al., 2013 and phase 3 in Section 3 for further details). We built the initial set of concepts through open coding. The relevant passages related to the research agenda of the past usually became clear after we read a paper's introduction section, which usually included the studies' motivations, main topics, goals, and research questions. In turn, we partially built the future research agenda on the propositions for future research, which we usually found at the end of each paper. Once we finished that, we analyzed the excerpts in each node and merged, restructured, and created additional nodes and sub-nodes where needed (axial coding). In this case study, once we finished axial coding, we first switched to writing some other sections of the paper before continuing with selective coding because we needed to have some distance to the created nodes to develop the themes. Several weeks later, we scrutinized the coded data and the memos linked to nodes again, from which we derived four major categories of challenges in the field of gender and IS and four areas for future research in the field (selective coding).

Note that the coding and analysis process using both deductive and inductive approaches was not straightforward; rather, the two researchers performed several iterations of re-reading and discussing the papers before reaching a consensus.

The NVivo10 software provided considerable support throughout the literature analysis process. In addition to the word-frequency query, we ran matrix-coding queries in NVivo to analyze the connections between categories and concepts and attributes (see the queries sub-section in Appendix C for more details). For example, our analysis of the relationships between research methodologies and epistemologies showed that all quantitative papers were positivist and that the qualitative papers were mostly interpretive but also critical. This result is in line with previous IS research. Moreover, NVivo enabled the researchers to create a model for each paper that showed all the nodes containing passages from that paper. This provided a useful overview and enhanced our overall understanding of each paper.

### Applying Phase 4 – Presentation of Results

The structure of the manuscript describing the preliminary case study's results (Gorbacheva, 2013), for which we used Mendeley for reference management, is in line with the structural checklist presented in Table 7 (see phase 4 in Section III). The abstract summarizes the study's goals and main results. The introduction justifies the importance of the literature review and presents the goals and research questions. The method section describes the process of papers' selection and evaluation. The study's findings section analyzes the results of the forward search and the challenges in gender and IS research. A subsequent section discusses the evolution of these challenges over time. Finally, a section discusses the study's limitations and proposes directions for future research in the field and another concludes the paper.

The study presenting the final results of this literature review is currently in progress. In it, we plan to again follow the structural checklist suggested in phase 4. When presenting the final list of the 27 selected papers, we plan to create a table that includes a list of papers with their unique numbers (to facilitate the in-text referencing to a particular paper throughout the paper) grouped by journals that published the studies. We also plan to include the papers' main ideas and the total and average annual citation counts in this table (see application of phase 3 in Section 3 for details). In the table summarizing the categories and sub-categories of the challenges in gender and IS research, for each sub-category, we plan to group the related papers (represented by their unique numbers) according to the approaches to theorizing gender followed in them. We intend to show the trends that studies following different theoretical approaches deal with different agenda. For presenting the results of deductive analysis (analysis of articles based on the pre-defined coding categories), we are currently designing a figure to demonstrate the development of the theoretical approaches to gender and IS over time. We will image each approach with a cube and put each paper (again represented by its unique number) into a respective part of a cube so that it corresponds to its theoretical approach, research methodology, and research method. Finally, we plan to summarize the directives for future research on gender and IS in a table, which will present relevant research questions for each of the proposed directions.



## 5 Discussion and Outlook

Guidelines for literature reviewing do not ordinarily explicitly describe procedures in a step-by-step manner with formal advice and examples showing how to analyze, interpret, and present results. Existing guidelines usually focus on how to search and select a relevant sample of literature for a review. However, scholars have paid relatively little attention to systematic approaches for analyzing data and the various options for presenting the results. Given this gap, we purposively collated and enriched prior guidelines and explained in-depth how one can use citation analysis tools, reference management tools, and especially qualitative data analysis software packages in the different phases of the reviewing process. The specific contributions of the guidelines we present in this paper include extensive tool-support, pre-codification schemes, coding, and strategies to present literature review findings. In particular, we highlight the advantages of qualitative reviewing approaches. We show how these approaches can deepen understanding of contextual dimensions of IS literature and contribute to thorough research integration.

Adopting the proposed tool-supported method provides researchers with several advantages. Using qualitative software tools can assist with managing large amounts of papers and related ideas, thoughts, learning, and sense-making across different phases of a long-term research study. It supports the entire literature review process from storing the extracted papers to analyzing them in depth and writing one's own paper. Having the selected literature in a single database and using a clearly documented protocol also enables multiple researchers to effectively communicate and share their thoughts about the literature being reviewed. The ability to look at past and emerging trends (as a result of the analysis) helps researchers to predict and present future research agendas, and it provides an evidence base. One can also see the project database as a library of papers that can be used in the future to expand the range of studies in a particular domain. While we focus specifically on the IS field in this paper, the overall method can certainly be adapted and used in other fields as well. The more refined the techniques for solidly and critically analyzing research papers, the faster and better we understand the progress of our (IS) world. We intend our proposed method as a guideline and it should be used as such: researchers should keep in mind that flexibility is key. A detailed systematic approach, as the one presented here, increases clarity on how to proceed with a systematic tool-supported literature review with its detailed end-to-end guidelines and illustrations. The clear methodological articulation we encourage here makes it easier to judge what researchers have and have not done. The tool-supported aspect equips researchers with an extra layer of transparency and better data management, which allows them to keep a clear trail of evidence and supports the three critical pillars of clarity, validity, and auditability.

We used NVivo in the case examples to illustrate the value of software tool-support for the end-to-end literature review process. Many other similar tools that can achieve similar results also exist (see Section 2). Researchers should carefully consider supporting software's role, both in terms of the benefits and disadvantages. Researchers need to adequately document the way they are used and properly understand their impact on the outcome of the study needs. Researchers need to have knowledge in the investigated research area to use qualitative analysis tools such as NVivo effectively. The applicability of more advanced features such as "sets", "models" and "relationships" to support literature reviews could be investigated (e.g., modelling the methods or their apparent absence helps to visually show gaps). One of NVivo's main limitations is that, while the tool-supports advanced querying facilities, it may process data slowly at times. One needs to wait when implementing complex queries (such as checking redundancies using matrix intersections across different sources in different folders). The database can also become corrupted at times; hence, we recommend regularly backing up the NVivo database (especially prior to running complex queries). Overall, one must diligently reflect on the genuine feasibility of a tool-supported literature review process and proceed only if the circumstances suggest it will actually add significant value.

Researchers should also consider that the depth and breadth of the published literature review emphasizes one's credibility in their field. Moreover, "Research synthesis sometimes yields unwelcome results that challenge strongly held opinions and other vested interests" (Chalmers, Hedges, & Cooper, 2002, p. 3). By aggregating studies, literature reviews help to detect and confirm previously hidden themes. Therefore, they offer a valuable aid to the decision-making that leads to designing new empirical studies. The "recommendations from a research synthesis may be disregarded, however its very existence allows transparency on a research topic" (Booth et al., 2012, p. 4). Systematic reviews can yield useful information for policy makers and they generally include information about the "nature and extent of a problem, and the potential benefits, harms, uncertainties, and costs of interventions and

policies”; in this case it can be useful (as some scholars propose) to draw a distinction between “reviews for knowledge support and those for decision support” (Booth et al., 2012, pp. 4-5).

Literature reviews are themselves important papers and serve as a foundation for various other types of significant academic papers and for a plethora of thesis and grant applications. That said, it is surprising that the review process itself has not been considered as a methodological process in its own right. The review of the literature has been frequently regarded as just one step in empirical research projects, rather than being a topic of study itself.

As scholars, we need to ask ourselves ethical questions in respect to the quality of our reviewing approaches:

- Can we claim to have done rigorous research if our literature review is not rigorous?
- Can we claim relevant and replicable research if—after writing the literature review section—we ignore and even contradict how we defined, searched, selected and analyzed literature?
- Can we claim innovative and original research if we simply summarize and extend past studies?
- Can we claim valid, reliable, comprehensive, and convincing research if we do not explicitly make the literature review method clear and transparent?
- How often can/should we cite our own prior publications in one single paper such as a review?
- How often can/should we cite our colleagues and advisors?
- On what basis can we claim to have thoroughly searched in relevant databases?
- Have we:
  - included the dominant authors on a topic?
  - built solid hypotheses?
  - reviewed empirical facts versus assumptions?
  - gained knowledge of the chronological and disciplinary development of a research area?

We would like to see an increase in high-quality literature reviews published in the IS field and hope that readers can make use of some of the techniques presented here when conducting their reviews. We urge journal editors to make dedicated space for special review sections and motivate authors to submit extant and systematic review studies. Since research fields are increasingly spanning boundaries, we challenge scholars to integrate concepts from related fields and learn across fields. We challenge software vendors to provide more guidance on how to effectively use resource management and qualitative data-analysis tools for producing high-quality literature reviews.

## 6 Conclusion

Literature studies can significantly contribute to the systematic and incremental development of any research domain. Most research areas in IS evolve quickly, which makes it important to be able to conduct quality literature studies relatively efficiently. Hence, a structured and efficient approach to working through these challenges is essential, and it is natural (especially for IS researchers) to see how existing software tools can assist with this effort. In this paper, we first overview prior literature in which we outline the literature review process and the value of and need for tool-supported literature review approaches. We then present and consolidate past work that has demonstrated the potential for tool usage in literature reviews and given some form of guidelines. Overall, we point to an untapped opportunity and the need for an end-to-end tool-supported literature review methodology.

We argue that there is significant utility in grasping the nature and relevance of the four-phased tool-supported methodology we propose as best practice in conducting literature reviews in IS. The approach encourages the reader to see the literature review process as a qualitative study and to use qualitative data analysis approaches that treat the literature as the data set. It addresses the complex puzzle of how best to extract relevant literature and justify its scope, relevance, and quality. We strongly encourage researchers to articulate these aspects, which are often entirely absent in literature reviews. Multiple tools, especially qualitative data-analysis tools such as NVivo, are useful as a means to manage the dataset and the overall analysis, synthesis, and write-up of the literature review. We describe how to organize and prepare the papers for analysis and provide detailed guidelines on the actual coding and analysis,

including detailed illustrative strategies to effectively write-up and present the results. We present a detailed case study (literature review on gender research in IS) as an illustrative example of our proposed approach put into practice. Finally, we discuss the means, value, and clear pitfalls of applying tool-supported literature review approaches.

In sum, we provide systematic guidelines for novice IS researchers seeking to conduct a robust literature review. We consolidate existing scattered guidelines into one set and compliments this consolidation further with (a) details on how to use tools to support the various tasks and (b) detailed step-by-step guidelines. The illustrative case study demonstrates its applicability. Future work can consider our proposed literature review approach as an artefact for which more formal evaluations (as per design science and/ or action research guidelines) can be conducted to further refine and validate it.

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## Appendix A: Review of Prior Tool-Supported Literature Review Studies

We used an iterative search strategy to review prior tool-supported literature review studies. We looked at papers that were published in the last 10 years to avoid considering outdated tools that are no longer widely used. First, we searched for tool-supported literature review studies with Google Scholar to familiarize ourselves with the nature of these papers and use this understanding to develop a strong search strategy and prepare for further coding. Because the examples initially found in the IS literature were scarce, we sought to expand this further.

Therefore, we selected the fields that were most likely to have such tool-supported review papers. Based on the internal discussion and the backward search of the initial list of tool-supported literature review papers (extracted from the first basic search with Google Scholar), we selected several domains: information systems, computer science, medicine, nursing, pharmacy, biomedical sciences, library and information sciences, engineering, education, management, accounting, business, and finance and marketing.

We searched a total of 14 electronic databases covering publications in the above-mentioned fields, including ABI/INFORM, ACM Digital Library, AISel, Emerald journals, IEEE Xplore Digital Library, Informit (Australian databases), Inspec, ProQuest, SAGE, Science Direct, Scopus, Springerlink, Web of Science, and Wiley Online Library.

We used a series of search strings to search in these databases in the papers' titles, abstracts, and keywords. We applied several combinations of keywords related to tool-supported literature reviews. We

started with generic search strings such as (“literature review” AND qualitative software) and (“literature review” AND (Computer-Assisted Qualitative Data Analysis Software OR CAQDAS)). This initial search strategy returned a vast number of papers. Based on their preliminary analysis, we identified a list of tools (software packages) often used to support literature reviews. Therefore, in the second iteration of paper searching, we focused on the following promising qualitative software packages as search terms: NVivo, Atlas.ti, MAXQDA, Leximancer, Citespace, QDA Miner, and Microsoft Excel (see Table A-1). We customized the search strings for each of the identified tools; for example, (“literature review” AND NVivo). In parallel, we also continued to analyze the papers found during the generic search. We also included synonyms of the term “literature review”, such as “systematic review”, “critical review”, “integrative review”, “mapping review”, “meta-analysis”, “mixed study review”, “mixed method review”, and “literature study”.

Initially, we were open to extract both the papers presenting methodological guidelines and those containing examples of tool usage for supporting the literature review process. Eventually, in line with the goals of this initial analysis, we concentrated on only the examples of actual tool usage. The identified methodological guidelines on how to use tools for literature reviews were scarce and abstract. We mention these studies in Section 3, in which we propose and present our four-phase approach, but we did not further analyze them.

We retrieved more than 400 relevant studies based on the search strategy mentioned above. We based our decisions to include or exclude papers according to several criteria summarized below:

- Duplicates: we excluded studies that we identified more than once from different sources.
- Unobtainable full texts: we excluded studies whose full text versions we could not obtain electronically.
- Language and time span: we included only papers in English published between January 2004 and August 2014.
- Content: we included only the studies that used tools (software packages) for facilitating the literature review process and that described how these tools were used.

Table A-1 contains several examples of studies where we applied the above-mentioned tools supporting the literature review process. However, at this stage, we did not perform a thorough quality evaluation of the selected papers. For the scope and purpose of this paper, Table A-1 does not report on tools that were used for mere note-taking and reference management purposes because almost every literature review uses some form of reference management tool and note-taking procedures. The last column of Table A-1 briefly describes the main idea behind each study and the way a particular tool was applied and presented there. In particular, we were interested in the used tool features. On top of that, in Table A-1, we also capture the phase(s) of the literature review process, where a tool was used, in accordance with the four-phased approach we introduce and discuss in detail in Section 3: (phase 1) extraction of relevant papers, (phase 2) Organization and preparation for analysis, (phase 3) coding and analysis, and (phase 4) write-up and presentation.

**Table A1. A Synthesized Summary of Tool-supported Literature Reviews**

Tool	Core tool features reported	Literature review phase tool is used in	Sample studies	Supporting description
NVivo	None	Phase 3	Mosadeghrad (2013)	This paper presents a literature review exploring the major reasons for the failure of TQM programs in healthcare organizations. The authors claim that they applied NVivo software (version 7) for qualitative data analysis (in the form of content analysis to describe and explain the reasons for the failure of TQM programs in healthcare organizations) and retrieval, but they do not describe how they used the tool at all.

**Table A1. A Synthesized Summary of Tool-supported Literature Reviews**

	Nodes, documents	Phase 3	Burda & Teuteberg (2013)	This is a systematic literature review about digital pervasiveness. The authors report on various aspects such as drivers, stakeholders, and applied research methods. They briefly describe how they used NVivo for content analysis from a deductive perspective (p. 445) and state that the use of the tool “allowed us to analyse the underlying paper in a repeatable way” (p. 451).
	Nodes	Phase 3 and phase 4	Leseure, Bauer, Birdi, Neely, & Denyer (2004)	This paper presents the results of a systematic literature review about the adoption of promising practices by organizations. The authors describe how they used NVivo to keep a trail of evidence and to assist with sense making in the inductive analysis approach they applied (pp. 174, 176). They captured information about different variables of interest in different nodes and, for each node, they built an “evidence table” to summarize available evidence for that variable (see Table 1 in Leseure et al., 2004). Later on, they link the coded, synthesized information for each variable (in each node) to the study model (see Figure 2 in Leseure et al., 2004).
	Nodes, inter-coder agreement measures	Phase 3	Wang, Zheng, Xu, Li, & Meng (2008)	This is a literature review of the current status of electronic marketplace (EM) research. The authors used NVivo to support the content analysis: two coded the papers and calculated inter-coder agreement for each code.
	None	Phase 3	Grubic (2014)	This literature review identifies and critically analyzes relevant research addressing the topic of remote monitoring technology and servitization. It looks at aspects such as the benefits and challenges of using remote monitoring technology to support servitized strategies. The authors claim they used NVivo in their analysis by coding the papers into broad categories of examples, benefits, and challenges. They then re-coded these categories in multiple iterations to derive a finer list of sub-categories.
	Nodes, documents, attributes, case, queries	Phase 3 and phase 4	Valaitis et al. (2012)	“This paper describes the methods, strategies and technologies used to conduct a scoping literature review examining primary care (PC) and public health (PH) collaboration” (p. 1). The authors describe how they used NVivo to assist their analysis by assigning demographics (such as publication year, country of origin etc.) as attributes to each document source. The also describe how they maintained themes and sub-themes in the NVivo database. They used the file-naming convention of author and year to enable them to highly efficiently link abstracted data from NVivo nodes to citations when writing the report.
QDA Miner Atlas.ti	Coding (at multilevels), Linking descriptive variables to papers, Search operations, KWIK (“key-word-in-context”) tools, Frequencies	Phase 3	Anderson, Jolly, & Fairhurst (2007)	This is a content analysis of retail trade journals that reports on customer relationship management in retailing. The authors briefly describe how they used QDA Miner for the coding phase and further reference (p. 396) papers that describe the tool features in greater detail.

**Table A1. A Synthesized Summary of Tool-supported Literature Reviews**

MAXQDA	None	Phase 3	Higginbottom et al. (2012)	This paper presents a protocol for a systematic review using a narrative synthesis on immigrant women's experiences of maternity-care services in Canada. The authors briefly describe how they used ATLAS.ti in the data analysis but do not provide any detailed description or illustration of it.
	Text-based analysis	Phase 3	Wittich, Southall, Sikora, Watanabe, & Gagné (2013)	This is a literature review on the "deafblindness" concept. More specifically, the authors review the existing definitions of the term. They briefly mention that they used ATLAS.ti for text-based analysis but do not provide any further details on the tool's application.
	None	Phase 3	Casimir & Tobi (2011)	This paper focuses on how the "household" concept is conceptualized in literature during 2000-2010. The authors mention that "abstracts and full papers were assigned to Atlas.ti" (p. 1) and that the papers were then scored and coded in Atlas.ti for the presence or absence of a definition of the concept of household. The authors do not provide any further details as to how the coding took place.
Leximancer	Codes/themes, comments	Phase 3	Brandon & Fukunaga (2014)	This paper investigates the state of empirical research literature on stakeholder involvement in program evaluations. The authors used Excel and MAXQDA. The authors describe how they analyzed the studies in a multi-stage process, summarizing and coding them using an iterative, grounded-theory approach with MAXQDA software.
	Codes, categories, clusters	Phase 3	Engelhardt-Nowitzki (2012)	Based on a thorough literature review, this paper develops a procedural approach for improving value chain flexibility and adaptability in build-to-order environments. The authors briefly mention how they performed a content analysis with MAXQDA software (pp. 323, 326).
	Codes	Phase 3	Lodenstein, Dieleman, Gerretsen, & Broerse (2013)	This paper proposes a protocol to synthesize the effect of social accountability interventions on health service providers' and policy makers' responsiveness. They mention how they exposed extracted data to MAXQDA software, "which is used to add codes to texts by highlighting and annotating passages that contain relevant information on the intervention and evidence for the preliminary program theory" (p. 8). However, they provide little information to show how they used the tool for the analysis.
	Codes/themes, search operations, notes	Phase 3	Nabavi, Vanaki, & Mohammadi (2012)	This paper is a systematic review that looks at forming academic service partnerships to reform clinical education. The authors mention using MAXQDA for the initial stages of coding and claim that it "is a useful organizational tool that allows the researcher to index segments of the text to particular themes, carry out complex search and retrieval operations quickly, and link research notes to coding" (p. 122). However, they provide no further information on how they used the tool.
	Concepts and concept maps, themes	Phase 3	Erichsen & Christensen (2013)	This literature review reports on the "dynamic development of the field of design management – a cross-disciplinary research field seeking to establish itself in its own right" (p. 107). The authors used Leximancer to search for frequencies of themes and concepts in the texts and to analyze the co-occurrence of themes and concepts.



**Table A1. A Synthesized Summary of Tool-supported Literature Reviews**

	Text analysis, concept maps (seeded and automatic), document maps	Phase 3	Indulska & Recker (2008)	The authors examine design science papers published in major IS conferences and subject the selected pool of papers to statistical, thematic, and methodological analysis. They used Leximancer to support the thematic analysis to automatically generate themes from the data.
	Concepts/ nodes, concept maps (with visualization of proximity)	Phase 3	Kromidha & Cordoba-Pachon (2014)	This study maps the dynamics of e-government rhetoric through a discourse analysis to unveil established concepts that influence e-government policy development in the public administration context. The authors identify clusters of terms and map their relationships based on their proximity in the text and their frequency of appearance. They used Leximancer to automatically identify concepts, which they list based on their frequency of appearance in the text and proximity to each other.
CiteSpace (a bibliometric visualisation tool)	Nodes, clustering	Phase 1	Higginbottom et al. (2011)	The paper talks about the challenges and means of approaching multidisciplinary research domains that have large pools of potentially relevant papers to consider. The authors “map out the research and practice landscape of modelling, simulation, and management methods, spanning a variety of sectors of application where such methods have made a significant impact” (p. 234). They propose and demonstrate the use of CiteSpace to show how “the terrain in question can be surveyed quickly and in a versatile manner” (p. 235).
	Knowledge map	Phase 3	Chen, Bain, Sullivan, & Wang (2012)	This is a literature analysis paper on wetlands that outlines variations in research topics. The authors used CiteSpace to investigate research topic changes and draw a knowledge map, to identify clusters of research activity, and to interpret these clusters relative to wetland function and type.
	Networks of co-authors, countries, and institutions;  document co-citation networks and document co-citation clusters	Phase 3	Liu (2013)	This study is about terahertz technology. The author “compare[s] the research status quo on terahertz technology between 1990 and 2010 using knowledge domain visualization techniques” (p. 1037). The data set consisted of patents and journal papers. The author used CiteSpace as a promising visualization approach to analyze patents and papers in any given field.
Micro soft Excel	Matrices	Phase 3 and phase 4	Jezewski, Meeker, Sessanna, & Finnell (2007)	This study is a synthesis that reports on the state of the interventions to increase advance directive completion rates. The authors apply Garrard’s (2004) method for conducting a systematic literature review and use a series of matrices designed in Microsoft Excel as a means to synthesize and present the results. The first author designed the matrices used to organize the data, and three authors extracted the data was accomplished by independently reviewing the studies and later reaching consensus on them.

**Table A1. A Synthesized Summary of Tool-supported Literature Reviews**

	Chi-square, <i>t</i> -test, and logistical regression analyses	Phase 3	Johannson et al. (2011)	This study is a systematic review on primary total hip arthroplasty. The authors examine “whether the outcomes of this procedure have improved over the past two decades, and to compare outcomes based on study level of evidence” (p. 465). The authors extracted demographic data, types of fixation, associated risk factors and/or diagnoses, outcome data, study level of evidence, and years of index surgery into Microsoft Excel and used Excel (and SigmaStat) to perform statistical reporting across the literature sample.
	(Simple) spread sheets	Phase 3	Kako, Ranse, Yamamoto, & Arbon (2014)	This paper “describe[s] the role of nurses who assisted in the 2011 Great East Earthquake of Japan by reviewing Japanese literature and reporting the findings in English” (p. 275). The authors used Excel to support a detailed thematic analysis. They maintained information from each manuscript (i.e., author/s, manuscript title, journal title, manuscript keywords, summary of findings pertaining to the role of nurses) in spreadsheets and performed thematic coding in Excel (as explained in Table 1 in the paper).
	(Simple) spread sheets	Phase 3	Dizon, Grimmer-Somers, & Kumar (2012)	This is a systematic literature review to identify the effectiveness of evidence-based practice (EBP) training programs and their components for allied health professionals. The authors designed a purpose-built Microsoft Excel sheet to assist in their extracting data (i.e., author, year, country, study aim, design, study population, EBP training program details, outcomes and measures of outcomes, validity of outcomes if any, study findings, etc.). They resolved disagreements by discussion until they reached a consensus, and, if required, they contacted a paper’s author(s). They use both narrative and realist synthesis approaches to comprehensively present and discuss the findings.

## Appendix B: Introducing the Recommended Support Tools

### NVivo as Qualitative Data Analysis Software

NVivo is a “computer program for qualitative data analysis” that allows one to import and code all forms of data including text, audio, video, and photographs<sup>23</sup>. For text-based analysis such as literature reviews, one can interpretively code, then retrieve, review, and re-code coded data. One can also search for combinations of words in the text in-context and crosstab for patterns in the coding. One can also add another dimension to the literature review by importing bibliographical data from ENDNOTE, Refworks, Mendeley and Zotero. Sinkovics and Alföldi recommend using Endnote and NVivo concurrently to manage references and document the development of the theoretical foundations of the study. By importing a bibliographical reference library, one can search the full text of each paper in terms of not only its content, but also its attributes/ meta-data (year, journal name, title, author, publisher, etc.).

All data (including literature and categories/concepts) in the NVivo program is arranged around “sources” and “nodes”. Sources are the data that one analyzes in the study—in this case, literature from journals and conferences. Nodes are places where one stores ideas through coding. As Bandara (2006, p. 8) notes, “It is important to note the difference between a code and a node in NVivo parlance”. A node is a physical location where one can store the collected ideas that have been coded, and these nodes can be organized into a hierarchy (like a tree) or can remain without a hierarchy as “free” nodes. Coding

<sup>23</sup> See vendor (QSR) web page (<http://www.qsrinternational.com>) for a set of rich resources for further details including free trials and demos, written and video tutorials, webinars, example cases etc.

(arranging data into nodes to help in interpretation and analysis) is a process that is most often discussed in relation to qualitative interviews, as a way to label elements of the data, and to sort data in distinct categories. Nodes, on the other hand, hold all the data coded under a certain category.

When a reference library is imported, it is created as a source classification with the associated meta-data created as attributes. A single classification with the relevant meta-data is automatically added to each full-text paper imported from the reference library. Each attribute is allocated to the relevant paper and aids in the query process. Any research notes, abstracts, or keywords are added into a memo, which is linked to the full-text. Figure 9, which presents the NVivo source classification of the selected papers focusing on gender research in IS, shows an example.

	A : Gender and IS theories	B : Research methodology	C : Research method	D : Epistemology	E : Year	F : Interdisciplinarity	G : Who funds	H : Nr. of authors	I : citations (...)	J : citati
1 : Adam et al...	social construction theory	qualitative	case study	critical	2006	No	European Social	6	44	5,50
2 : Ahuja (2002)	social construction theory	conceptual	analysis of literature and	positivist	2002	Yes	No information	1	252	21,00
3 : Greenhill a...	social construction theory	conceptual	analysis of literature and	critical	2006	No	No information	2	18	2,25
4 : Light (2007)	social construction theory	qualitative	case study	interpretivist	2007	Yes	No information	1	24	3,43
5 : Panteli, Sta...	social construction theory	mixed	case study	interpretivist	1999	Yes	Particular Univer	4	91	6,07
6 : Reid, Allen...	social construction theory	qualitative	focus group	critical	2010	No	No information	4	5	1,25
7 : Trauth, Qu...	individual differences theory	qualitative	grounded theory	interpretivist	2009	No	National Science	3	50	10
8 : Clayton, B...	individual differences theory	mixed	case study	interpretivist	2012	No	No information	3	5	2,50
9 : Harvey (19...	social construction theory	qualitative	ethnography	interpretivist	1997	Yes	No information	1	23	1,35
10 : Howcroft ...	individual differences theory	conceptual	analysis of literature and	critical	2008	No	National Science	2	40	6,67
11 : Panteli (2...	social construction theory	qualitative	case study	interpretivist	2012	No	European Social	1	6	3
12 : Quesenb...	individual differences theory	mixed	case study	interpretivist	2012	No	National Science	2	5	2,50
13 : Ridley & ...	Not Applicable	mixed	document analysis	positivist	2012	No	Particular Univer	2	6	3
14 : Roberto...	social construction theory	conceptual	analysis of literature and	critical	2001	No	No information	5	34	2,62
15 : Duxbury, ...	essentialist theory	quantitative	survey	positivist	1992	No	Social Sciences	3	127	5,77
16 : Adam 2002	social construction theory	conceptual	analysis of literature and	critical	2002	No	No information	1	50	4,17
17 : Shen et al...	essentialist theory	quantitative	survey	positivist	2010	No	Research Grant	4	12	3
18 : Wilson 20...	social construction theory	conceptual	analysis of literature and	critical	2004	Yes	No information	1	46	4,6
19 : Awad & R...	essentialist theory	quantitative	survey	positivist	2008	Yes	No information	2	157	26,17
20 : Baroudi &...	essentialist theory	quantitative	survey	positivist	1994	No	No information	2	123	6,47
21 : Zahedi et ...	social construction theory	qualitative	grounded theory	interpretivist	2006	Yes	No information	3	27	3,38
22 : Ahuja & T...	essentialist theory	quantitative	survey	positivist	2005	Yes	No information	2	341	37,89
23 : Gefen & S...	essentialist theory	quantitative	survey	positivist	1997	No	No information	2	1434	84,35
24 : Igbaria & ...	essentialist theory	quantitative	survey	positivist	1995	No	Particular Univer	2	133	7
25 : Riedl et al...	essentialist theory	quantitative	laboratory experiment	positivist	2010	Yes	No information	3	63	15,75
26 : Truman &...	essentialist theory	quantitative	survey	positivist	1994	No	No information	2	96	5,05
27 : Venkates...	essentialist theory	quantitative	survey	positivist	2000	No	No information	2	2132	152,28

Figure B1. Example NVivo Source Classification (Source Attribute Summary)

Through combining NVivo and reference management tools, the features enable a user to search for patterns across their data in a way that is not possible with only one of the tools (Bandara et al., 2011). In the following paragraphs, we explain when and how to use the various features of the tool in each phase of the proposed method (see Figure 1). For example, one can search for things such as which methods were used in which epistemological approaches or which theories were used with the different research approaches (qualitative/ quantitative/ mixed methods).

NVivo also interfaces well with Excel. For example, once a source classification is set up for a bibliography in NVivo, one can export it to work in Excel. Different search results (i.e., search results in a matrix format) can also be exported to Excel from NVivo. This is useful in situations where other team members may not have direct access to NVivo. Unstructured data can be exported to .pdf and .doc(x) and often to .html formats to enable viewing across any platform.

NVivo can import data captured through the NCapture tool from web-based social media: Twitter, Facebook, and LinkedIn. These may provide useful sources for literature, particularly through discussions on LinkedIn and through posts by academic Twitter users such as SAGE. The NCapture button appears in the Web browser once the tool is installed and provides a convenient way to capture Web content. It

captures not only social media but also regular webpages (such as journal papers) to be imported into NVivo.

### Auxiliary Reference Management Tools

Endnote is one of several available reference management computer programs. We use and recommend it here as an overall bibliography tool because many universities worldwide support it. It enables one to systematically capture reference details during the searching and selection process and helps one to manage citations from the various sources during the writing process. Bazeley and Jackson (2013, p. 189) describes three fundamental ways to use Endnote in conjunction with NVivo: 1) extract the required reference from the Endnote bibliographic database, 2) format the attributes “author” and “date” with heading styles in Word as a preparation to be imported to NVivo database, and 3) import into NVivo the auto code for headings and code the note content.

If one’s institution does not support Endnote, we recommend Mendeley<sup>24</sup>, which has similar functions and is a free cloud-based solution available from any computer. We used Mendeley as a reference management tool in our illustrative case study.

These tools are essential to any large-scale research project. They enable the researcher to keep track of the descriptive details of each paper they collect and also to add notes and memos as they work through their analysis. The most valuable features, however, are the ability to insert a citation in a word document with ease and the automatic generation of the references list in customizable styles. The help files for both programs are quite extensive. Because Mendeley is open source, it has a wide support community online.

Importing one’s reference library is not essential because attributes can be created manually and purposefully in NVivo (consider that most fields in Endnote are not used) to suit a particular analysis and research questions. Importing a reference library may also mean that one needs to develop a workflow to import newly added papers because this is not done automatically. Therefore, one should carefully consider importing a reference management library. We encourage researchers to consider whether they want to:

- Conduct literature searches and crosstabs based on the attributes (meta-data) imported from ENDNOTE/Mendeley, and
- Attach each .pdf paper (in Optical Character Recognition as the best option for searching and coding) to each record in Endnote/Mendeley?

Then once imported, researchers can consider:

- What keywords or phrases would be useful to gather together.

## Appendix C: Setting Up Nvivo to Support One’s Literature Analysis Process

One needs to have some basic NVivo training and a fundamental understanding of the basic tool features to begin using it for a literature review. The video and documented tutorials on the vendor website<sup>25</sup>, the NVivo user manual<sup>26</sup> (QSR International, 2014), and the book by Bazeley and Jackson (2013) are excellent starting points for obtaining this basic know-how. This appendix provides a high-level checklist describing how one can use and setup the different tool features to best assist with the management, analysis, and write-up of a literature review when using NVivo as a support tool.

### Sources

- Prepare your sources in the formats that NVivo can use (.pdf / .doc / .docx / .txt / .rtf).

<sup>24</sup> See <http://www.mendeley.com/>

<sup>25</sup> See <http://www.qsrinternational.com/support.aspx>

<sup>26</sup> See [http://www.qsrinternational.com/products\\_books-and-manuals.aspx](http://www.qsrinternational.com/products_books-and-manuals.aspx) for all books and manuals provided by vendor

- Once the papers have been found (or captured via the NCapture tool which is installed via the web browser), save them in .pdf format and preferably go through the Optical Character Recognition (OCR) process for each of them. If a pdf does not allow OCR to be performed, it can be converted using the Zamzar free file-conversion service ([www.zamzar.com](http://www.zamzar.com)), first to .doc and then back to .pdf. Literature papers in a .pdf format, which went through OCR or Zamzar file conversion, will give greater flexibility when searching and coding documents.
- Papers may be arranged in folders by year or year range, or by journal as in the presented case study (i.e., where each journal in the Basket of 8 Journals had its own relevant folder).
- Decide how to name papers; we suggest either by Title or by Author and Year. The Author and Year option was used in the case study, as it allows the researcher to easily trace the papers and (manually) link them with the reference management tools used to finalize the write-up.

## Attributes

- If there is value in searching papers by their meta-data (journal name, year, author etc.) in a reference library (ENDNOTE, Mendeley, Refworks, Zotero), then import it to NVivo.
  - Please carefully consider the value of importing a reference library: what will be done with it once importing it? This step is not necessary and is only useful if one plans to run any analysis using the meta-data tags found in the reference library.
  - Hint: attach .pdf papers to a library first and NVivo will arrange them as internals (full-text) and memos (research notes, abstracts, and keywords).
- Decide how to name papers: by title or by author and date.
- Note: one can easily add more papers at a later date. One can export papers from a reference library first (in .xml or .ris format) and then import it into NVivo.
- If one decides not to import a reference library, one can import each .pdf and manually assign attributes for each paper instead (as we did in the case study). One may also add new attributes manually to those imported from ENDNOTE. In the case study, we included such attributes as theory (choice of theories), methodology (qualitative/quantitative/mixed/conceptual), method (survey/experiment/case study/ethnography, etc.), and epistemology (positivist/interpretive/critical).

## Nodes

- Set up nodes for the a priori codes to use. These could be from a pre-codification scheme as we describe in phase 2 (see Section 3) of the proposed approach and include things such as main topic, paper goals, research questions/hypotheses, research motivation, research limitations, recommendations, and proposals for future research. Other nodes might include elements from the methodology and include concrete instances of the assigned attributes such as a list of relevant theories, Relationships are a special category of nodes that can be used to record statements or hunches one has developed about how items in a project are linked. They can be useful when trying to interpret and synthesize the literature.

## Models (optional)

- Create a conceptual model with shapes representing the concepts one is considering in the literature and draw lines to represent preliminary relationships.
- As one creates nodes, add them to the model and even the attributes to show connections and gaps in the literature, the methods used, and so on.

## Coding (see Phase 3 for Further Details)

- Decide on coding segment (sentence, paragraph etc.) and work through coding relevant passages that provide evidence. It is better to code too much than not enough (it can be ignored if deemed not necessary later).
- An inter-coder reliability check can help keep teamwork coding on track. Combine this with a codebook to define the concepts coded for (see DeCuir-Gunby, Marshall, & McCulloch (2011) and Saldana (2012) for further details about how to derive a good code book).
- Check coding by making coding stripes visible (via the view menu). This gives a visual cue as to what is coded where.



- Relationship nodes are used to move from individual concepts to themes in the data and provide an explicit way to make a connection between two nodes.

## Memos

One should keep notes while setting up the project and while coding. This should be done via memos. Always date-stamp memos via the home/insert ribbon. A memo may also be linked to a specific paper or be standalone. Our advice is to never read without making notes. Different uses of memos include:

- As a “project diary”: which maintains descriptions about how NVivo is used on a daily basis (e.g., which nodes were created, which documents were imported, etc.).
- For definitions of concepts and how they change over time or to compare them.
- For concept development: discussions about how one came to understand certain concepts, where they were first found, one’s interpretation of them, and so on.
- For theory development: how the literature fits with theories one has read about.

## Annotations

Annotations are different to memos in that annotations are temporary notes to oneself. Select the text and create a link to show there is more information without changing the actual paper.

- A footnote is created that contains notes.

## Queries

A range of queries can be run; the most useful queries in the early stages are the word frequency and the text search:

- Word frequency: a key word in context (KWIC) search allows one to collect the most frequently used words in a paper or set of papers. This helps to identify the main words used. The word cloud can be used as a starting point to explore the data further, and/or it can be exported for use in a PowerPoint presentation. All word frequencies should be documented (paste into the project diary to record them).
- Text search: a text search allows one to search for individual keywords, multiple keywords, and phrases using Boolean operators (AND, OR, NOT), allowing for stemmed words, synonyms, specializations, and generalizations. All searches can be scoped to a set of papers or a folder. The output is an interactive visual concordance in the form of a word tree. This is also a good starting point to gather key terms together and to look for subtle words that may not have been noticed when browsed manually.
- Matrix coding: matrix coding queries can be set in NVivo to ask a wide range of questions about patterns in the data and to gain access to the content that shows those patterns. One can use matrix coding queries to compare differences and similarities across the different strata of your data set (i.e., papers from pool X and Y) and to see overlaps across lists generated from the analysis.

We summarize some of the NVivo tool features that can be usefully applied in the literature review above. More detailed guidelines, tutorials, and hints can be found via the QSR International website ([www.qsrinternational.com](http://www.qsrinternational.com)).

## Appendix D: Paper Selection and Classification of Relevance

Classifying abstracts helps to find good reasons for including a paper. In the following appendix, we present some examples and argumentations for including papers in a study that looked at effective services behaviors and service encounters (Furtmueller et al., 2011).

### Paper: The Service Experience in Two Cultures: A Behavioural Perspective (1997)

Author(s): K. F. Winsted

Source: *Journal of Retailing*, 73(3), 337-360

Times cited: 54; references: 82

**Abstract:** *This research examines how consumers in the U.S. and Japan evaluate service encounters. It broadens traditional thinking about components of service transactions and develops behaviourally based service encounter dimensions, each with multiple measures, for the two countries. The study shows a conversation factor not presently identified in the services literature and significant cross-cultural differences in both the dimensions and behaviours identified in the two countries. It also examines the relationship of dimensions to encounter satisfaction in both countries.*

**Classification: +++**

- *Information about behavioral dimensions of service encounters*
- *Introduction / theoretical background.*

**Paper: Assessing the Theatrical Components of the Service Encounter: A Cluster Analysis Examination (1998)**

Author(s): S. J. Grove, F. P. Fisk, & M. J. Dorsch

Source: *Service Industries Journal*, 18(3), 116-134

Times cited: 14; references: 59

**Abstract:** *The relative influence of setting, employees, other customers, and overall performance of a service on customers' satisfaction/dissatisfaction with the service organisation was the focus of this study. The results showed that some service components were more important in customer assessments of satisfaction/dissatisfaction. Furthermore, three different segments of customers were discovered. While each segment differed in terms of the importance placed on the four service components, the segments did not possess distinct demographic profiles. The implications of these findings are then discussed.*

**Classification: ++**

- *Information about service components that are valued by different segments of customers*
- *Main research question / discussion.*

**Paper: Service with a Smile and Encounter Satisfaction: Emotional Contagion and Appraisal Mechanisms (2006)**

Author(s): P. B. Barger & A. A. Grandey

Source: *Academy of Management Journal*, 49(6), 1229-1238

Times cited: 16; references: 47

**Abstract:** *Primitive emotional contagion has been proposed to explain why "service with a smile" predicts encounter satisfaction. We provide a comprehensive test of this mechanism by examining mimicry and mood as mediators in service encounters, contrasting such mediation with a direct path through perceived service quality. Independent coders recorded the strength of employees' and customers' smiles at three points in time during real service encounters, and 173 customers completed post encounter surveys. Mimicry effects were supported; however, only service quality appraisals, and not customers' affect, fully mediated the relationship of employee smiling and encounter satisfaction.*

**Classification: +**

- *Information about behavior that is valued by customers*
- *Research question 3 / theoretical background.*

**Appendix E: Presenting Literature Analyses Results**

One can result literature analysis results in tabular and/or graphical form, and they should always be supported by textual clarifications. Possible ways to present the results of a literature analysis (see phase 4 section on writing and presenting results of a literature review in Section 3) include, but are not limited to, the following:

- In a chronological order (see Table E-1 to Table E-4)
- In accordance with a pre-defined coding scheme (see Table E-4)
- Highlighting particular coding dimensions (see Table E-1 and Table E-2)
- Identifying themes and concepts (see Table E-3 and Figure 6 – in Section 3)
- Further analyzing the identified themes and concepts (Figure 3 and Figure 4 – in Section 3)

Table E-1 presents an extract from Furtmueller (2012, p. 43) that depicts the authors, methods, and data collection techniques of 45 reviewed papers on e-Recruiting in a chronological order.

**Table E 1: Transformational Consequences of e-HRM (1970-2010) (Extracted from Furtmueller, 2012, p. 53)**

1970-1989	1990-1999	2000-2010
IT-oriented research	Human resource management organizational behavior, management and psychology-oriented research	Human resource management organizational behavior, (international) management and psychology-oriented research
Conceptualizing HRIS phenomenon	Various terms for computerization of personnel departments	Conceptualizing HRIS vs. e-HRM
HR administrative role	HR relational role	HR transformational role
Focus on technology factors for successful implementations	Focus on organizational factors for successful implementations	Focus on people factors for successful implementations
HRIS consequences: focus on operational cost savings, efficiency and effectiveness gains	HRIS consequences: focus on operational and increasingly relational consequences (HR Service Improvements, HR Relationship Management, HR Status)	e-HRM consequences: focus on transformational consequences (HR Globalization, HR Strategic Change Management, HR Knowledge Management, HR Planning)

Table E-4 extracted from Beekhuyzen and von Hellens (2008, p. 95) illustrates a taxonomy of empirical studies on online music distribution and use over time and by location, focus of study, method, and details about participants.

**Table E 2: Analysis of Empirical Studies on Music File Sharing and Downloading (Extracted from Beekhuyzen & von Hellens, 2008, p. 95)**

Year	Location	Authors <sup>27</sup>	Participants	Focus of study	Method
<b>Users—general</b>					
2006	Europe (Greece & UK)	Vlachos, Vrenchopoulos, & Pateli	25 consumers (and music execs below)	Moving traditional business models to mobile	Interviews
2005	US	Voida, Grinter, Ducheneaut, Edwards, & Newman	13 iTunes users	iTunes use and sharing aspects	Interviews
2003	US	Pew	2515 adult Internet users	Internet and music use	Survey
<b>Users—file sharing</b>					
2007	Canada	Andersen & Frenz	2100 respondents	How p2p networks influence music purchasing	Survey
2005	Europe	Skageby & Pargman	P2p network for 6 months	Gift giving behaviour	Observations, forums
2004	US	Oberholzer & Strumpf	P2p network for 17 weeks	Music sharing, impact on sales, network use	Observations

<sup>27</sup> Please see the original paper (Beekhuyzen & von Hellens, 2008, p. 95) for reference details of papers listed here.

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