Finding More Needles in More Haystacks:
Rigorous Literature Searching for Systematic Reviews and Meta-Analyses in
Management and Organization Studies

Authors:

Irina Lock, Ph.D.

Amsterdam School of Communication Research (ASCoR)

University of Amsterdam, Nieuwe Achtergracht 166, 1018WV Amsterdam, The Netherlands

Email: i.j.lock@uva.nl

ORCID: 0000-0002-0524-3330

Stefano Giani, Ph.D.

Library of the University of Amsterdam

University of Amsterdam, Nieuwe Achtergracht 166, 1018WV Amsterdam, The Netherlands

Cite as:

Lock, I. & Giani, S. (2021). Finding More Needles in More Haystacks: Rigorous Literature Searching for Systematic Reviews and Meta-Analyses in Management and Organization Studies.

Supplementary material:

S1_study: Short paper with the review of reviews: <https://doi.org/10.21942/uva.12369266.v3>

S1_sample: Sample selection: <https://doi.org/10.21942/uva.12369287.v2>

S2: Application example: <https://doi.org/10.1016/j.pubrev.2019.101829>

Finding More Needles in More Haystacks:

Rigorous Literature Searching for Systematic Reviews and Meta-Analyses in Management and Organization Studies

Abstract

With increasing numbers of publications, synthesizing research in management and organization studies (MOS) and the social sciences in general has become necessary to summarize knowledge, discover research gaps, and gather interdisciplinary insights. To do so, reviews of the literature depend on a rigorous method for searching specifically for MOS that is to date largely lacking. This article demonstrates a six-step protocol for setting up a rigorous search. Instead of sampling from a limited set of journals, it focuses on databases and uses information in thesauri, key articles, and automated text analysis to construct a search string. It details decision aids on database inclusions and syntax adaptations and discusses additional search techniques, with best practice examples. The six-step process provides practical considerations for authors and develops assessment criteria for journal editors and reviewers to judge the rigor of the search in terms of construct, internal, and external validity and reliability. Thus, the article facilitates more rigorous syntheses in the social sciences by focusing on the heart of any such endeavor, the search.

Keywords:

Systematic review; Search String; Database; Review; Synthesis; Search; Rigor; Meta-analysis; Reliability and Validity; Research Design

Introduction

The need for research synthesis in the social sciences in general has been acknowledged since the 1970s: “[This] endeavor deserves higher priority now than adding a new experiment or survey to the pile” (Glass, 1976, p. 4). One way to examine a specific problem is by reviewing, summarizing, and drawing conclusions from existing publications on the subject (King & He, 2005; Petticrew & Roberts, 2006; Webster & Watson, 2002). The development of a rigorous search lies at the heart of such an endeavor (Harris, 2005), just like selecting a case for case studies or sampling for surveys. Without a rigorous search (Gibbert & Ruigrok, 2010), bias is invited at the earliest stage of the research synthesis and can scarcely be overcome in the course of the study (King & He, 2005; Harris, 2005; Maggio, Tannery, & Kanter, 2011; Hausner, Guddat, Hermanns, Lampert, & Waffenschmidt, 2015).

While management and organization studies (MOS) researchers have published more and more literature reviews, their degrees of quality vary (Jones & Gatrell, 2014). A qualitative analysis of 186 review articles published in 12 top MOS journals¹ shows the various challenges that authors face when conducting and writing up searches. Researchers need to create the search string from the research question, balance sensitivity (recall) and sensibility (precision) by setting search limits, choosing databases, and evaluating sufficient hits, and decide on additional searches and documentation. These methodological decisions have been reported only by a small set of best practice articles (5.38%), while most described the search in a rather sketchy manner. The majority has stated the searched databases (90.22%), additional searches performed (77.17%) such as collecting grey literature, and the number of hits retrieved by a search (61.96%). However, hindering replicability of the review, only 11 articles (5.98%) report the search string, which is the central component of every search, and authors rarely (5.43%) document the search process. One

¹ *Journal of Management, Academy of Management Journal, Organizational Research Methods, International Journal of Management Reviews, Journal of Marketing, Strategic Management Journal, Journal of Management Studies, Journal of Applied Psychology, Journal of Organizational Behavior, Journal of Marketing Research, Management Science, Long Range Planning.* For sample selection, see S1_sample: <https://doi.org/10.21942/uva.12369287.v2> A description of methods and detailed results are reported in the supplementary material S1_study: <https://doi.org/10.21942/uva.12369266.v3>

third of the articles (27.17%) cite methodological sources in their literature search section, mostly (56%) referring to Tranfield, Denyer, and Smart's (2003) seminal article. This indicates that MOS reviews make far too little use of the review methodology's recent progressive adjustments in healthcare, medical research, and other social sciences (e.g., Booth, Sutton, & Papaioannou, 2016; Bramer, de Jonge, Rethlefsen, Mast, & Kleijnen, 2018; Petticrew & Roberts, 2006).

These challenges of searching, reviews' increasing popularity, and the several more recent pleas for better reporting of reviews (Macpherson & Jones, 2010; Jones & Gatrell, 2014; Lakens, Hilgard, & Staaks, 2016; Kunisch, Menz, Bartunek, Cardinal, & Denyer, 2018) highlight the need for an updated contribution specifically devoted to the MOS literature search. Thus, this article provides a six-step protocol outlining a rigorous search in the context of MOS, but applicable to the broader social sciences as well. Given MOS's interdisciplinary character (Post, Sarala, Gatrell, & Prescott, 2020), researchers cannot readily adopt review protocols used in medical sciences and healthcare (e.g., Cochrane-Higgins & Green, 2011; AMSTAR-Hausner et al., 2015; PRISMA-Moher et al., 2009). Thus, we develop a six-step protocol that synthesizes and adapts the methodological literature on searching from the social, natural, and information sciences. The six steps include (1) extracting concepts from the research question, (2) reporting and documentation, (3) translating concepts into search terms, (4) creating search strings and running the search, (5) adapting the search syntax, and (6) additional searching. Rigor criteria along internal, external, and construct validity and reliability (Gibbert & Ruigrok, 2010) serve to assess the steps (Table 1), as rigorous searching is a necessary condition for a review to identify all the evidence on a research problem (Siddaway, Wood, & Hedges, 2019).

Since the search is at the heart of every review, this six-step protocol serves as guidance for researchers in MOS and the social sciences in general to conduct a rigorous search for literature, regardless of whether it is followed by quantitative (e.g., meta-analysis) or qualitative analysis (e.g., content analysis). The six-step protocol accounts for the specificities of the discipline, its conceptual ambiguity (Fisher & Aguinis, 2017), the multiplicity of underlying assumptions in theory and method (Post et al., 2020), publication bias (Dalton, Aguinis, Dalton, Bosco, & Pierce,

2012), and the lack of tradition in complete reporting. It enables readers, reviewers, and editors to assess the systematic nature of the review and its quality in terms of rigor. Last, researchers can conduct rigorous reviews to foster social sciences' potential for synthesizing knowledge and discovering knowledge gaps to ultimately build theory.

Six steps for a rigorous search

Setting up a search is part of the broader process of a review, defined as a review of a clearly formulated question that uses systematic and explicit methods to identify, select, and critically appraise relevant research, and to collect and analyze data from the studies that are included in the review. Statistical methods (meta-analysis) may or may not be used to analyze and summarize the results of the included studies (Moher et al., 2009, p. 264).

The search will reveal the sample for both quantitative and qualitative research (Siddaway et al., 2019; Cooper, 2017) and may need to be adapted to the research question and subsequent analysis. Several frameworks exist for the general layout of such a process (Booth et al., 2016; Denyer & Tranfield, 2009; McGowan & Sampson, 2005; Neely et al., 2010; Petticrew & Roberts, 2006; Tranfield et al., 2003). Among the methodological resources focusing on the search (Appelbaum et al., 2018; Sampson et al., 2009), the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement's flow diagram and checklist (Liberati et al., 2009; Moher et al., 2009; Moher et al., 2015) have been extensively adopted for reviews, but not necessarily in MOS (see supplementary material S1). This article focuses on the retrieval of studies (stages 6 to 8 of the PRISMA checklist) and suggests six steps to use in searching (see Table 1).

Table 1 <i>Six steps for a rigorous search and key points of consideration for efficiency.</i>			
Steps	Rigor assessment	Assessment points	Practical considerations
1 Extracting concepts from the research question	<i>Internal validity</i>	Theory triangulation: <ul style="list-style-type: none"> – Identification of key articles; – Deciding on key concepts to be included in search; 	<ul style="list-style-type: none"> – Reciprocate between theory and trial searches in a selected database.
		Pattern matching: <ul style="list-style-type: none"> – 	
2 Reporting and documentation	<i>Reliability</i>	Documentation and data access: <ul style="list-style-type: none"> – Setting up a logbook and providing access to data – Research diary reporting: <ul style="list-style-type: none"> – search strings used (including limits such as publication type, time span, etc.), 	<ul style="list-style-type: none"> – rationale for selection of databases searched (including their providers and coverage); – number of references retrieved (including retrieval date); – additional searches performed (citation tracking, hand searching, grey literature) and changes in search strings
	<i>External validity</i>	Multidisciplinarity: <ul style="list-style-type: none"> – 	
	<i>Construct validity</i>	Changes: <ul style="list-style-type: none"> – 	
3 Translating concepts into search terms with the help of an appropriate database	<i>External validity</i>	Balancing sensitivity and sensibility: <ul style="list-style-type: none"> – Development of a personal workflow in one specific database (e.g. PsycINFO at Ovid); – Balancing between the database's network of subject headings and the free-text terms; – Considering automated text analysis of key articles. 	

4 Creating search strings, running the search and validation	<i>Construct validity</i>	Search string validation:	<ul style="list-style-type: none"> – Identification of syntax of the chosen database (e.g. Boolean, adjacency/proximity operators, etc.); – Set up single-line queries for each search term; – Review search strategy by peers and by subject librarian; – Search string validation (e.g. by scanning sets of higher-ranked results) and adjustments.
5 Adapting the search syntax to other databases	<i>Construct validity</i>	Disciplinary triangulation:	<ul style="list-style-type: none"> – Selection of appropriate databases (e.g. <i>Business Source Premier</i> (Ebsco), <i>Communication & Mass Media Complete</i> (Ebsco), <i>Sociological Abstracts</i> (ProQuest), <i>Worldwide Political Science Abstracts</i> (ProQuest)); – Adaptation of search strings to the syntax of each database; – Search string validation and adjustments.
6 Additional searching: citation tracking, hand search, grey literature, expert consultation	<i>Construct validity</i>	Disciplinary triangulation:	<ul style="list-style-type: none"> – Considering citation tracking and appropriate tools (e.g. Google Scholar, Web of Science); – Selection of journals for hand search; – Search string adaptation to syntax of journal websites and repositories of grey literature.

Literature reviews aid in theoretical innovation by clarifying the construct under study and outlining boundary conditions (Post et al., 2020). The six-step process discussed here forces MOS researchers to detail a concept's meaning and define its boundaries by deciding which search terms to include in a grounded theory process (Strauss & Corbin, 1994; step 1) and with the help of databases and automated text analysis (step 3). The use of databases helps in “breaking down disciplinary silos and offering alternative outlooks on matters that have previously received limited

attention within management journals” (Jones & Gatrell, 2014, p. 252) and saves time (Adams, Smart, & Huff, 2017). Disciplinary triangulation (step 5) gives MOS researchers the opportunity to stretch their searches beyond their own discipline and addresses publication bias (step 6). The guidelines on reporting and documentation (step 2) enable researchers to report their work to editors, reviewers, and readers in a way that ensures reliability through replication (Aguinis & Solarino, 2019). Together with internal, construct, and external validity, reliability forms four criteria to assess the *rigor* of the search (Popper, 2012).²

Since setting up a search is partially a qualitative process, we borrow from the criteria of rigor for qualitative case studies in MOS and apply the secondary reports (de facto research activities) of the rigor criteria to the six-step process (Gibbert & Ruigrok, 2010). In the following, we review each of the rigor requirements and outline how they are met by following the six-step process (see also Table 1).

To ensure construct validity, a study needs to measure what the researchers intend to measure; thus, the data must portray reality accurately (Denzin & Lincoln, 1994; Stone-Romero, 2009). We propose that search strategy construct validity is based on:

- Disciplinary triangulation: looking at the concept under study by including different studies retrieved from databases, hand searching, citation tracking, and grey literature (steps 5, 6)
- Reviewing the search by peers to avoid researcher bias (step 4)

² While rigor criteria are standard in a positivist research tradition, qualitative researchers may be skeptical about adopting this natural science mode of quality assessment (e.g., Pratt, Kaplan, & Whittington, 2019) for searches that result in a qualitative literature analysis. However, here, we isolate the literature search (“identify” and “select”; see definition by Moher et al., 2009, p. 264, referenced below) from the subsequent literature analysis. Thus, we argue the search for any type of literature review must be rigorous to identify all the evidence on a research problem, such that researchers are “led by the available evidence, whatever that looks like” (Siddaway et al., 2019, p. 754). Whether the following analysis of the literature is subject to rigor assessments is beyond the scope of this note. In addition, we follow Gibbert et al.’s (2010, p. 725) argument that even though “the two broad epistemological camps are in disagreement as to what specific labels to use when it comes to ensuring rigor (so-called primary reports, e.g., of construct validity, internal validity, generalizability, or external validity, and reliability), they do seem to be in at least partial agreement when it comes to the concrete research actions that are necessary to ensure rigor (so-called secondary reports, i.e., reporting of concrete research actions).” Table 1 and the following sections therefore show both the labels and the concrete research actions.

- Reviewing the search by a subject librarian (Neely et al., 2010) to confirm that triangulation takes place (step 4)
- Providing a clear chain of evidence to illustrate how the authors came from the research question to the search string (step 2)
- Indicating changes made to the search string and strategy during the search process and the different steps such as additions/exclusions of key words (steps 2, 3)

Internal validity refers to the internal consistency of the research design (Cook & Campbell, 1979), often in terms of assumed causal relationships, which can only be established in experimental settings (Stone-Romero, 2009). Thus, the focal point to ensure internal validity in reviews is logical validity (Gibbert & Ruigrok, 2010) with regard to the theoretical setup of the concept under study and the related research question:

- Pattern matching urges researchers to go back and forth between theory and trial searches in a database to corroborate whether their assumptions regarding the search are met in reality (Gibbert, Ruigrok, & Wicki, 2008; step 1).
- Theory triangulation refers to the use of multiple theoretical perspectives on a phenomenon, which can be ensured by identifying key articles that are based on different theoretical assumptions. A theoretically rich choice of key articles also leads to meaningful results from the inductive text analysis for identifying key concepts (step 1).

External validity asks whether phenomena are generalizable and allow for more wide-ranging findings. We are in line with Gibbert and colleagues (2008, p. 1468) when distinguishing between statistical and analytical generalization: “Analytical generalization is a process separate from statistical generalization in that it refers to the generalization from empirical observations to theory, rather than a population.” We thus assess:

- Rationale for balancing sensitivity vs. sensibility to assess whether authors have made deliberate decisions to favor one over the other (step 3)
- Rationale for multidisciplinary: (non-)necessity of review of the literature in multiple disciplines other than the “home” field (step 2)

Reliability refers to the measures undertaken to provide information about the trustworthiness and absence of random error, achieved by creating transparency and replication (Denzin & Lincoln, 1994) through documentation and reporting:

- Setting up a search log book that documents the decisions in the review process which can be consulted ex-post by researchers and audiences via the appendix, supplemental online material, or data repositories (step 2)
- Providing access to the data including the search string and the final sample of articles retrieved from the databases for audiences and reviewers to replicate the review via the appendix, supplemental online material, or data repositories (step 2)

The article's supplemental material³ provides an example from the field of organizational communication to illustrate the practical application of the six steps, which are - in theory and by citing examples from MOS - outlined in the following section.

Step 1: Extracting key concepts from the research question

As with every other research design, formulation of the research question is crucial to a review (Bramer et al., 2018a). Indeed, conceptual clarity ultimately guides studies of theory elaboration in MOS (Fisher & Aguinis, 2017), for which reviews are well suited.

To check whether the research question is suitable, scholars can either rely on key articles already known to them or think about what a study that could answer their research question would look like (Bramer et al., 2018a). To better identify and clarify a review's main concepts, the research question can be examined through the lens of the logic of Context Interventions Mechanisms Outcomes (CIMO; Denyer, Tranfield, & Van Aken, 2008; Denyer & Tranfield, 2009). By defining four elements of a review question in MOS, CIMO echoes the logic of the Patient, Intervention, Comparison, Outcome (PICO) framework, a well-established tool for identifying the key concepts of a research question and developing reviews in the medical field

³ Supplementary material application example S2: <https://doi.org/10.21942/uva.12369296.v3>

(Schardt, Adams, Owens, Keitz, & Fontelo, 2007; Methley, Campbell, Chew-Graham, McNally, & Cheraghi-Sohi, 2014).

The research question likely contains a contextual component, for instance, detailing the type of institution (e.g., corporation, non-profit, small or medium-sized enterprise), the culture (e.g., country, ethnic group, organizational culture), the setting (e.g., online, offline), and the subjects (e.g., employees in a team, leaders, and their demographic characteristics). Either the studied intervention is the targeted concept reviewed for conceptual clarification or one (or several) independent variable(s), as motivation or antecedent, cause the outcome. Interventions can refer to managerial practices such as leadership style or to behaviors such as adherence to rules. However, this focal construct must be clearly delineated, which can be challenging. Atewologun, Kutzer, Doldor, Anderson, and Sealy (2017), for instance, discuss and identify the boundaries of the identity concept and translate these boundaries in the exclusion criteria for their study (p. 275). Interventions like this identity concept touch mechanisms such as sense making, which then lead to the intended effects (Denyer et al., 2008). In research questions, mechanisms can appear as mediators or covariational factors, as well as underlying assumptions (Atewologun et al., 2017). The managerial or organizational outcomes spurred by the interventions and mechanisms are the dependent variables or, in qualitative terms, the focal concepts of the study. Once these key concepts from the research question have been identified, the next step is to determine which of them should be included in the search.

Generally, the fewer concepts included, the better the recall. However, while “not all elements of a research question should necessarily be used in the search strategy” (Bramer et al., 2018a, p. 532), the scope of the review will always be the leading principle (Harris, 2005; Tranfield et al., 2003). The chosen concepts must be as distinct as possible to avoid overlap that results in missing relevant publications. However, the more specific the concepts, the more likely it is that studies with a similar focus are excluded. This may also introduce bias relating to the researcher’s implicit assumptions (Dudden & Protzko, 2011), for instance, in terms of concept labeling evoked by different disciplines or schools of thought. Thus, while on the one hand this step needs to clarify

what the concept under study entails, often, the goal of a review is construct clarification itself (Post et al., 2020). This presents a difficulty for MOS researchers, which can be addressed by a “critical attitude” toward existing work and openness to other disciplines’ perspectives (ibid, p. 3).

Step 2: Reporting and documentation

A review requires documentation of the search procedure: “[The] quality and scope of the search strategy is the foundation on which every facet of the systematic review is built” (Harris, 2005, p. 82). Documentation can be in the form of a log document that details each step (Bramer et al., 2018a; McGowan & Sampson, 2005), along with a research diary, where the researcher documents the thoughts and justifications for the decisions taken to aid reflexivity (Nadin & Cassell, 2006). Such “record-keeping systems” (Siddaway et al., 2019, p. 759) demonstrate the systematic nature of the search and aid the reporting of the review process and its results. Rigor is furthermore enhanced by providing access to the sample of studies included in the review via a database (Gibbert & Ruigrok, 2010).

Summarized (Booth et al., 2016; Bramer et al., 2018a; McGowan & Sampson, 2005) and detailed indications (Appelbaum et al., 2018; Liberati et al., 2009) exist on reporting requirements of search strategies. They include at least:

- Search strings for each database, and steps followed to set them up (i.e., reasons for the decisions taken)
- Databases searched and their providers (e.g., *PsycINFO* at Ovid), years they covered at the time of the search, and any limits used such as language, publication type, time span, or date the search was conducted
- Number of references retrieved with each database and retrieval date (the day when the references are downloaded as a dataset on which study selection is run)
- Additional searches (retrieval date and reasons for the choices taken), or if none, the reasons why:
 - Citation tracking of included articles: which tools (*Google Scholar*, *Scopus*, *Web of Science*)

- Hand-searching: which journals for which years, and search terms used
- Grey literature: repositories searched, and search terms used
- Expert consultation: researchers' or institutions' names

Details on the search process are often found in the supplementary material to review articles (e.g., Nguyen, de Leeuw, & Dullaert, 2018; Knight, Patterson, & Dawson, 2017; Loignon & Woehr, 2018). Adopting a specific online application for reviews such as *Rayyan* (Ouzzani, Hammady, Fedorowicz, & Elmagarmid, 2016) or *Covidence* (Babineau, 2014) can aid in facilitating the initial selection process.

Step 3: Translating concepts into search terms with the help of an appropriate database

When identifying the key concepts from the research question, the use of a database plays a significant role (see step 1). By going back and forth between theory - the level of specificity for each key concept - and trial searches - to balance sensitivity (recall: identifying all relevant publications) and specificity (precision: identifying only publications that are relevant; Booth et al., 2016; Petticrew & Roberts, 2006) - we can translate the research question's concepts into a search string. This process resembles a grounded theory approach in qualitative research in that it entails a constant comparison between theory and method (Strauss & Corbin, 1994). Compared with the recognized relevance and widespread use of databases for reviews in other social sciences (Booth et al., 2016; Petticrew & Roberts, 2006), their importance for searching literature has only been mentioned briefly in MOS (Adams et al., 2017; Denyer & Tranfield, 2009). To address and incorporate the conceptual inconsistencies and contradictions in meaning of MOS concepts (Post et al., 2020), we suggest two parallel procedures: (1) the thesaurus-based, conceptual approach with “pearl growing” and (2) frequency-based text analysis.

Thesaurus-based, conceptual approach, and “pearl-growing”

It is necessary to select an appropriate database for translating the key concepts into search terms and strings. Importantly, access (via the researcher's institution) to the databases deemed relevant for the review largely determines the applicability of what follows and therefore must be

carefully considered *before* starting the review process. Following Bramer et al. (2018a), we propose *PsycINFO* (hosted by Ovid) as the tool to start with. Its scope goes well beyond psychology and offers what is arguably the best structured thesaurus available for social sciences. The network of subject headings and related terms provided by *PsycINFO* facilitates in-depth reflection on the key concepts and thus their matching with existing thesaurus terms. However, appropriate subject headings might not exist for all the key concepts, as thesauri vary in their architecture and tend to have a discipline-specific focus. For instance, the concept “corporate social responsibility,” while familiar in MOS, is not included in *PsycINFO*’s thesaurus (see application example in supplemental material). However, *PsycINFO*’s thesaurus refers to several related terms, such as “social responsibility.” The database definition is fairly accurate: “the responsibility of an organization, business, individual, or other entity to make decisions and take actions that will benefit the welfare of society.”

The bias that the choice of a specific database such as *PsycINFO* can introduce in the search string design must always be counterbalanced. This is even more the case in MOS, where the two databases likely expected to retrieve more results (*Business Source Premier* and *Communication & Mass Media Complete*; hosted by EBSCO) do not include a well-built thesaurus for use as an alternative to *PsycINFO*’s. This challenge can be addressed by relying on one or preferably more known articles relevant to the review topic.

The inherent issue for researchers is the identification of these candidate articles because a main argument for conducting a review is to find such publications in the first place. These articles can be identified by a preliminary scoping search (Booth et al., 2016; Petticrew & Roberts, 2006) or by citation tracking. Of importance are the terms they provide, both free-text and subject headings, “on which a search can subsequently be based [...] this pearl-growing process may be repeated several times until no further relevant terms are identified” (Booth et al., 2016, p. 115; see also the concept matrix proposed by Webster and Watson (2002)). These terms will help in “correcting” the limits and possible biases of the *PsycINFO* thesaurus in its application to a topic in MOS.

Frequency-based text analysis

Complementary to the thesaurus-based, conceptual procedure that is deductive in nature, an inductive technique based on text mining (Kobayashi, Mol, Berkers, Kismihók, & Den Hartog, 2017) can be added to identify terms for the search string not captured in the previous approach. In medical science and health care, researchers have used automated text mining techniques for search string conceptualization (Hausner, Waffenschmidt, Kaiser, & Simon, 2012). The method relies on an extant population of high-quality reviews from which to draw (*Cochrane Database of Systematic Reviews*), which is not available in MOS. Instead, we can rely on the key articles identified previously. The underlying idea is that the terms pertaining to the key concepts of the research question are frequently named in these texts. Thus, since these key articles are central to the research question, the concepts they most frequently mention are also vital to the review at hand. Several software packages can aid researchers in automatic content analysis of a text (e.g., WordStat, TextMiner), along with openly accessible Python codes and packages. These applications automatically process the selected articles and - after removal of common words such as “the” or “and” - yield the most frequently used terms. Based on these term matrices, the researchers can enrich the search string with concepts still missing (for an application example, see supplemental material).

Step 4: Creating search strings, running the search, and validation

The development and fine-tuning of search strings is time-consuming (Booth, 2010; Bramer et al., 2018a; Hausner et al., 2012; McGowan & Sampson, 2005). At this point, each key concept must be developed into a search string component. The combination of these search strings leads to the global search that delivers the set of publications on which study selection will be run.

Search strings are built by combining the search terms with Boolean operators and parentheses. Each database follows a specific architecture, that is, “the special set of rules and symbols unique to each database that define how a correctly constructed search operates” (Bramer et al., 2018a, p. 536). These rules determine the handling of spelling differences (behavior versus behaviour), abbreviations (OSN versus online social networks), and truncations (organi* for

organisation, organization). Adjacency or proximity operators also need to be considered (Booth et al., 2016; Bramer et al., 2018a; Sampson et al., 2009), as they hold great significance for harvesting the multiple meaning layers often encountered in the terminology of MOS and other social sciences. The use of quotation marks - the adjacency operator for searching two or more words as an exact phrase - is arguably a matter of consequence when, for example, searching free-text for publications on social media. Equally relevant is knowing that a given database, such as *PsycINFO*'s "*Advanced search*," always searches multiple words as exact phrases and, therefore, does not need to use quotation marks.

Well-built search strings aim to balance between exhaustiveness and relevance. While the latter can be increased by removing less relevant terms from the search string, sensitivity is increased by expanding the number of terms (Bramer et al., 2018a). Thus, the number of hits retrieved by each individual search term matters. It is advisable to create single-line queries for each search term. The removal, addition, or modification of search terms must be weighed against the aim of finding all (or most) publications that are potentially relevant to the research question. Each adjustment of a search string affects the results of the global search. Thus, the optimization process includes going back and forth between the different search strings (see, e.g., Nguyen et al., 2018; Supplementary material S2).

This process can be streamlined in several ways, such as checking which articles drop out when specificity is increased and sensitivity is decreased, and then deciding whether those articles can be omitted or not. Another way to validate search strings is to scan a set of higher ranked results retrieved by the combined search strings, the individual ones, or a single-line query. An individual search term resulting in a lack of seemingly relevant studies might be removed, while new terms provided by publications deemed relevant might be added, as mentioned earlier when illustrating the pearl-growing approach. The set of key articles represents another instrument for measuring the efficacy of search strings. Provided that these key articles are indexed in the database employed, they must be retrieved by the global search. If that is not the case, adjustments are needed such that these publications are included in the set of results.

Step 5: Adapting the search syntax to other databases

Organizations are also studied from multiple perspectives outside of genuine MOS journals (Hinings, 2010). Thus, the approach suggested here is based on a selection of databases that aims to cover all the social sciences and therefore to capture research that is published beyond MOS journals, thereby accounting for the heterogeneity of MOS concepts (Denyer & Tranfield, 2009).

Database selection nevertheless depends on the context of the research and comes with several challenges due to the different underlying syntaxes and access procedures (Harris, 2005). First, the number and type of publications indexed by each database, and its discipline-specific terminology, can determine a large increase in the number of hits, which might prove too time-consuming and challenge the feasibility of the review (Bramer et al., 2018a; Bramer, Rethlefsen, Mast, & Kleijnen, 2018; Hausner et al., 2015; Hausner, Guddat, Hermanns, Lampert, & Waffenschmidt, 2016). Balancing between sensitivity and specificity remains the guiding criterion. A second issue is whether reliable subject headings are used, possibly organized in a well-built thesaurus, and whether they carry the same meaning across the different databases. The third issue is which fields - similar to *PsycINFO*'s abstracts, titles, and identifiers - can be searched with free-text terms. Bramer et al. (2018a, p. 535) provide a useful overview of field codes for common databases. The fourth issue concerns how truncations, Booleans, adjacency, and proximity operators work. Knight et al. (2017, S1) detail the adapted search strings for eight databases including dissertation and thesis collections, showing how limited the latter are in their search options due to the minimal number of keyword combinations possible (see also step 6). Overlap in journals included in more than one database (each provides a coverage list) is not a cause for concern because duplicates can easily be removed from the dataset in a later stage of the review process with the help of reference management software (see, e.g., Okwir, Nudurupati, Ginieis, M., & Angelis, 2018; Nguyen et al., 2018).

All the above may be challenging, such that the assistance of a librarian expert in database searches is vital (Dudden & Protzko, 2011; McGowan & Sampson, 2005). A benefit of different search syntax reflecting different terminologies is the possible emergence of additional terms for

describing the key concepts of the research question. The adjustments that this might impose on the search strings originally set up based on *PsycINFO* are largely compensated by the enriched interdisciplinary character of the search, leveling out search biases evoked by subjective expert knowledge (Hausner et al., 2012).

One last point that deserves attention when developing, fine-tuning, and validating a database search is to decide when to stop searching. While time and human resources help determine a realistic extent for the search (Booth et al., 2016; Cooper, Booth, Varley-Campbell, Britten, & Garside, 2018; Petticrew, 2015), defining stopping rules (predefined accepted minimum of article retrieval, i.e., one relevant item per 100 references; Chilcott, Brennan, Booth, Karnon, & Tappenden, 2003), reaching theoretical saturation (e.g., whether further studies from a particular field offer new definitions of a concept), or retrieving a set of key articles are methods available for identifying data saturation (Booth, 2010).

Step 6: Additional searching: citation tracking, hand search, grey literature, expert consultation

Additional search techniques such as hand search and citation tracking are expected to complement the databases' findings. This is based on well-established literature search methods (Bramer et al., 2018b; Lakens et al., 2016; McKibbin, 2006) and on studies emphasizing that only a percentage of the publications included in reviews stem from a database search (Denyer & Tranfield, 2009; McKibbin, 2006). As with any other stage of a review, the use of hand search and citation tracking must be made explicit from the outset of the review process.

Citation tracking is run on the publications emerging from the database search. Additional references can be discovered via both their reference lists and their citation scores at *Google Scholar*, *Scopus*, or *Web of Science* (Booth et al., 2016; Bramer et al., 2018b). Similarly, a hand search is only run on (a selection of) the journals represented in the set of database results, for instance, because specific time frames are only archived on paper. The journal search does not correspond to the search strings of the databases, mainly because of the limited search options of most journals' websites.

In addition to this “white” literature, that is, publications controlled by commercial publishing houses that undergo peer review (Booth et al., 2016), there is an ongoing discussion in all fields about whether grey literature, that is, “the diverse and heterogeneous body of material available outside, and not subject to, traditional academic peer-review processes” (Adams et al., 2017, p. 433), should be included. Several authors (Adams et al., 2017; Booth, 2010; Harris, 2005; King & He, 2005; Petticrew & Roberts, 2006; Tranfield et al., 2003) are in favor of adding grey literature, particularly in the social sciences, because “a vast quantity of evidence exists in practitioner journals, books, and reports from public, private and voluntary sector bodies as well as official publications” (Booth et al., 2016, p. 120). Searching grey literature further helps minimize so-called publication bias, also referred to as the file drawer problem (King & He, 2005; Petticrew & Roberts, 2006). However, grey literature has mostly not undergone peer review and thus imposes other potential biases in its interpretation (Rothstein & Hopewell, 2009). To cope with the question of whether to include grey literature in reviews, we suggest following the decision criteria outlined by Adams et al. (2017, p. 448) specifically for MOS. After a decision has been taken on which categories of “grey literature” to include, search tools specializing in those specific publication types need to be individuated and their search options explored.

A case in point is represented by doctoral theses. Several repositories of theses and dissertations are searchable online: *American Doctoral Dissertations*, *DART-Europe*, *Networked Digital Library of Theses and Dissertations*, *Open Access Theses and Dissertations*. However, none of these tools is equipped with search functionalities suited for systematic searching, and not all dissertations can be accessed as full texts. The same issues - limited search options and restricted full-text access - often arise with conference proceedings. While some of these studies might be included in databases, the papers presented at large academic conferences such as those hosted by the *Academy of Management* or the *European Group of Organization Studies* are not consistently included. Authors submitting to conferences may also decide not to make their papers publicly available.

The limits imposed by inadequate search functionalities (see, e.g., Knight et al., 2017, S1) can be only partially overcome by adjusting the search strings. Therefore, how each individual repository of dissertations, proceedings, or any other category of grey literature has been searched should be recorded in the review log book to ensure reproducibility (e.g., Loignon & Woehr, 2018).

Several (potentially) relevant publications might have been identified in this process that are not accessible to the researcher because they are not part of one institution's library collection or because they are not online. One way to cope with this issue, which can apply to white literature as well, is to request copies of the missing publications via the interlibrary loan service available at any university library (Booth et al., 2016; Harris, 2005; McGowan & Sampson, 2005). An alternative or complementary solution is to contact the publications' authors, as Rudolph, Kooij, Rauvola, and Zacher (2018) did, to gather all recent literature on employees' perceptions of their future employment. This might be especially needed for dissertations or unpublished proceedings papers (Appelbaum et al., 2018; Liberati et al., 2009). A record of the contacted scholars and, when applicable, of the publications retrieved via this expert consultation should be part of the review log book.

Conclusions

The need for research synthesis is the foremost rationale for reviewing literature: “[There] are few studies that are so methodologically sound, whose results are so generalizable and that leave us so certain that the results represent a good approximation of the ‘truth’, that we should accept their findings outright” (Petticrew & Roberts, 2006, p. 2). However, for such syntheses to be sound, no matter if informed by quantitative or qualitative analyses, they need to be based on an appropriate sample of the literature (Jones & Gatrell, 2014) gained through rigorous searching. The six-step protocol described here provides authors with guidance on how to rigorously search the literature for research problems in MOS and more broadly in the social sciences. Based on the rigor criteria, reviewers, editors, and readers can assess the quality of what happens in the “research kitchen” (Aguinis, Ramani, & Alabduljader, 2018, p. 85). Such carefully crafted research

syntheses can advance theoretical insights into MOS (Post et al., 2020) and possibly spill knowledge beyond the discipline (Fisher & Aguinis, 2017).

References

- Adams, R. J., Smart, P., & Huff, A. S. (2017). Shades of grey: Guidelines for working with the grey literature in systematic reviews for management and organizational studies. *International Journal of Management Reviews*, 19, 432-454. <https://doi.org/10.1111/ijmr.12102>.
- Aguinis, H., Ramani, R. S., & Alabduljader, N. (2018). What you see is what you get? Enhancing methodological transparency in management research. *Academy of Management Annals*, 12, 83-110. <https://doi.org/10.5465/annals.2016.0011>.
- Aguinis, H. & Solarino, A. M. (2019). Transparency and replicability in qualitative research: The case of interviews with elite informants. *Strategic Management Journal*, 40, 1291-1315. <https://doi.org/10.1002/smj.3015>.
- Appelbaum, M., Cooper, H., Kline, R. B., Mayo-Wilson, E., Nezu, A. M., & Rao, S. M. (2018). Journal article reporting standards for quantitative research in psychology: The APA publications and communications board task force report. *American Psychologist*, 73, 3-25. <http://dx.doi.org/10.1037/amp0000191>.
- Atewologun, D., Kutzer, R., Doldor, E., Anderson, D., & Sealy, R. (2017). Individual-level foci of identification at work: A systematic review of the literature. *International Journal of Management Reviews*, 19, 273-295. <https://doi.org/10.1111/ijmr.12148>.
- Babineau, J. (2014). Product review: Covidence (systematic review software). *Journal of the Canadian Health Libraries Association/Journal de l'Association des Bibliothèques de la Santé du Canada*, 35, 68-71.
- Booth, A. (2010). How much searching is enough? Comprehensive versus optimal retrieval for technology assessments. *International Journal of Technology Assessment in Health Care*, 26, 431-435. <https://doi.org/10.1017/S0266462310000966>.

Booth, A., Sutton, A., & Papaioannou, D. (2016). *Systematic approaches to a successful literature review* (2nd ed.). Los Angeles, CA: Sage.

Bramer, W. M., de Jonge, G. B., Rethlefsen, M. L., Mast, F., & Kleijnen, J. (2018). A systematic approach to searching: An efficient and complete method to develop literature searches. *Journal of the Medical Library Association*, 106, 531.
<https://doi.org/10.5195/jmla.2018.283>.

Bramer, W. M., Rethlefsen, M. L., Mast, F., & Kleijnen, J. (2018). Evaluation of a new method for librarian-mediated literature searches for systematic reviews. *Research Synthesis Methods*, 9, 510-520. <https://doi.org/10.1002/jrsm.1279>.

Chilcott, J., Brennan, A., Booth, A., Karnon, J., & Tappenden, P. (2003). The role of modelling in prioritising and planning clinical trials. *Health Technology Assessment*, 7, 23. <https://doi.org/10.3310/hta7230>.

Cook, T. D., & Campbell, D. T. (1979). *Quasi-experimentation: Design and Analysis Issues for Field Settings*. Chicago, IL: Rand McNally.

Cooper, C., Booth, A., Varley-Campbell, J., Britten, N., & Garside, R. (2018). Defining the process to literature searching in systematic reviews: a literature review of guidance and supporting studies. *BMC medical research methodology*, 18, 85.
<https://doi.org/10.1186/s12874-018-0545-3>.

Cooper, H. (2017). *Research synthesis and meta-analysis: A step-by-step approach* (5th ed.). Los Angeles, CA: Sage.

Dalton, D. R., Aguinis, H., Dalton, C. M., Bosco, F. A., & Pierce, C. A. 2012. Revisiting the File Drawer Problem in Meta-Analysis: An Assessment of Published and Nonpublished Correlation Matrices. *Personnel Psychology*, 65, 221-49. <https://doi.org/10.1111/j.1744-6570.2012.01243.x>.

Denyer, D., Tranfield, D., & Van Aken, J. E. (2008). Developing design propositions through research synthesis. *Organization Studies*, 29, 393-413.
<https://doi.org/10.1177/0170840607088020>.

- Denyer, D., & Tranfield, D. (2009). Producing a systematic review. In D. Buchanan & A. Bryman (Eds.), *The SAGE handbook of organizational research methods* (pp. 671-689). Los Angeles, CA: Sage.
- Denzin, N. K. & Lincoln, Y. S. (1994). *Handbook of qualitative research*. Thousand Oaks, CA: Sage.
- Dudden, R. F., & Protzko, S. L. (2011). The systematic review team: Contributions of the health sciences librarian. *Medical Reference Services Quarterly*, 30, 301-315.
<https://doi.org/10.1080/02763869.2011.590425>.
- Fisher, G., & Aguinis, H. (2017). Using theory elaboration to make theoretical advancements. *Organizational Research Methods*, 20, 438-464.
<https://doi.org/10.1177/1094428116689707>.
- Gibbert, M., & Ruigrok, W. (2010). The “what” and “how” of case study rigor: Three strategies based on published work. *Organizational Research Methods*, 13, 710-737.
<https://doi.org/10.1177/1094428109351319>.
- Gibbert, M., Ruigrok, W., & Wicki, B. (2008). What passes as a rigorous case study? *Strategic Management Journal*, 29, 1465-1474. <https://doi.org/10.1002/smj.722>.
- Glass, G. V. (1976). Primary, secondary, and meta-analysis of research. *Educational Researcher*, 5(10), 3-8.
- Harris, M. R. (2005). The librarian's roles in the systematic review process: A case study. *Journal of the Medical Library Association*, 93, 81-87.
- Hausner, E., Waffenschmidt, S., Kaiser, T., & Simon, M. (2012). Routine development of objectively derived search strategies. *Systematic Reviews*, 1.
<https://doi.org/10.1186/2046-4053-1-19>.
- Hausner, E., Guddat, C., Hermanns, T., Lampert, U., & Waffenschmidt, S. (2015). Development of search strategies for systematic reviews: Validation showed the noninferiority of the objective approach. *Journal of Clinical Epidemiology*, 68, 191-199. <https://doi.org/10.1016/j.jclinepi.2014.09.016>.

Hausner, E., Guddat, C., Hermanns, T., Lampert, U., & Waffenschmidt, S. (2016).

Prospective comparison of search strategies for systematic reviews: An objective approach yielded higher sensitivity than a conceptual one. *Journal of Clinical Epidemiology*, 77, 118-124. <http://dx.doi.org/10.1016/j.jclinepi.2016.05.002>.

Higgins J. P. T., & Green, S. (Eds.) (2011). *Cochrane handbook for systematic reviews of interventions* [Version 5.1.0]. London: The Cochrane Collaboration. Retrieved from www.handbook.cochrane.org.

Hinings, C. R. (2010). Thirty years of organization studies: Enduring themes in a changing institutional field. *Organization Studies*, 31, 659-675. <https://doi.org/10.1177/0170840610372576>.

Jones, O., & Gatrell, C. (2014). The future of writing and reviewing for IJMR. *International Journal of Management Reviews*, 16, 249-264. <https://doi.org/10.1111/ijmr.1203>.

King, W. R., & He, J. (2005). Understanding the role and methods of meta-analysis in IS research. *Communications of the Association for Information Systems*, 16, 665-686. <https://doi.org/10.17705/1CAIS.01632>.

Knight, C., Patterson, M., & Dawson, J. (2017). Building work engagement: A systematic review and meta-analysis investigating the effectiveness of work engagement interventions. *Journal of Organizational Behavior*, 38, 792-812. <https://doi.org/10.1002/job.2167>.

Kobayashi, V. B., Mol, S. T., Berkers, H. A., Kismihók, G., & Den Hartog, D. N. (2017). Text mining in organizational research. *Organizational Research Methods*, 21, 733-765. <https://doi.org/10.1177/1094428117722619>.

Kunisch, S., Menz, M., Bartunek, J. M., Cardinal, L. B., & Denyer, D. (2018). Feature Topic at Organizational Research Methods: How to Conduct Rigorous and Impactful Literature Reviews?. *Organizational Research Methods*, 21(3), 519-523. <https://doi.org/10.1177/1094428118770750>.

Lakens, D., Hilgard, J., & Staaks, J. (2016). On the reproducibility of meta-analyses: Six

- practical recommendations. *BMC Psychology*, 4.
- Liberati, A., Altman, D. G., Tetzlaff, J., Mulrow, C., Gøtzsche, P. C., Ioannidis, J. P., ... & Moher, D. (2009). The PRISMA statement for reporting systematic reviews and meta-analyses of studies that evaluate health care interventions: Explanation and elaboration. *PLoS Medicine*, 6. <https://doi.org/10.1371/journal.pmed.1000100>.
- Loignon, A. C., & Woehr, D. J. (2018). Social class in the organizational sciences: A conceptual integration and meta-analytic review. *Journal of Management*, 44, 61-88. <https://doi.org/10.1177/0149206317728106>.
- Macpherson, A., & Jones, O. (2010). Editorial: strategies for the development of international journal of management reviews. *International Journal of Management Reviews*, 12, 107-113.
- Maggio, L. A., Tannery, N. H., & Kanter, S. L. (2011). Reproducibility of literature search reporting in medical education reviews. *Academic Medicine*, 86, 1049-1054. <https://doi.org/10.1097/ACM.0b013e31822221e7>.
- McGowan, J., & Sampson, M. (2005). Systematic reviews need systematic searchers. *Journal of the Medical Library Association*, 93, 74-80.
- McKibbin, A. (2006). Systematic reviews and librarians. *Library Trends*, 55, 202-215.
- Methley, A. M., Campbell, S., Chew-Graham, C., McNally, R., & Cheraghi-Sohi, S. (2014). PICO, PICOS and SPIDER: a comparison study of specificity and sensitivity in three search tools for qualitative systematic reviews. *BMC Health Services Research*, 14. <https://doi.org/10.1186/s12913-014-0579-0>.
- Moher, D., Liberati, A., Tetzlaff, J., Altman, D. G., Tetzlaff, J., & The PRISMA Group (2009). Preferred reporting items for systematic reviews and meta-analyses: The PRISMA statement. *Annals of Internal Medicine*, 6(7), 264-270. <https://doi.org/10.7326/0003-4819-151-4-200908180-00135>.
- Moher, D., Shamseer, L., Clarke, M., Ghersi, D., Liberati, A., Petticrew, M., ... & PRISMA-P Group (2015). Preferred reporting items for systematic review and meta-analysis

- protocols (PRISMA-P) 2015 statement. *Systematic Reviews*, 4.
<https://doi.org/10.1186/2046-4053-4-1>.
- Nadin, S., & Cassell, C. (2006). The use of a research diary as a tool for reflexive practice: Some reflections from management research. *Qualitative Research in Accounting & Management*, 3, 208-217. <https://doi.org/10.1108/11766090610705407>.
- Neely, J. G., Magit, A. E., Rich, J. T., Voelker, C. C. J., Wang, E. W., Paniello, R. C., ... & Bradley, J. P. (2010). A practical guide to understanding systematic reviews and meta-analyses. *Otolaryngology--Head and Neck Surgery*, 142(1), 6-14.
<https://doi.org/10.1016/j.otohns.2009.09.005>.
- Nguyen, D. H., de Leeuw, S., & Dullaert, W. E. (2018). Consumer behaviour and order fulfilment in online retailing: A systematic review. *International Journal of Management Reviews*, 20, 255-276. <https://doi.org/10.1111/ijmr.12129>.
- Okwir, S., Nudurupati, S. S., Ginieis, M., & Angelis, J. (2018). Performance measurement and management systems: A perspective from complexity theory. *International Journal of Management Reviews*, 20, 731-754. <https://doi.org/10.1111/ijmr.12184>.
- Ouzzani, M., Hammady, H., Fedorowicz, Z., & Elmagarmid, A. (2016). Rayyan—a web and mobile app for systematic reviews. *Systematic Reviews*, 5.
<https://doi.org/10.1186/s13643-016-0384-4>.
- Petticrew, M. (2015). Time to rethink the systematic review catechism? Moving from ‘what works’ to ‘what happens’. *Systematic Reviews*, 4.
<https://doi.org/10.1186/s13643-015-0027-1>.
- Petticrew, M., & Roberts, H. (2006). *Systematic reviews in the social sciences : A practical guide*. Malden, MA: Blackwell.
- Popper, K. (2012). *The open society and its enemies*. London: Routledge.
- Post, C., Sarala, R., Gatrell, C., & Prescott, J. E. (2020). Advancing theory with review articles. *Journal of Management Studies*, 57, 351-376.
<https://doi.org/10.1111/joms.12549>.

- Rothstein, H. R., & Hopewell, S. (2009). Grey literature. In H. Cooper, L. V. Hedges, & J. C. Valentine (Eds.), *The handbook of research synthesis and meta-analysis* (pp. 103-125). New York, NY: Russell Sage Foundation.
- Rudolph, C. W., Kooij, D. T. A. M., Rauvola, R. S., & Zacher, H. (2018). Occupational future time perspective: A meta-analysis of antecedents and outcomes. *Journal of Organizational Behavior*, 39, 229-248. <https://doi.org/10.1002/job.2264>.
- Sampson, M., McGowan, J., Cogo, E., Grimshaw, J., Moher, D., & Lefebvre, C. (2009). An evidence-based practice guideline for the peer review of electronic search strategies. *Journal of Clinical Epidemiology*, 62, 944-952. <https://doi.org/10.1016/j.jclinepi.2008.10.012>.
- Schardt, C., Adams, M. B., Owens, T., Keitz, S., & Fontelo, P. (2007). Utilization of the PICO framework to improve searching PubMed for clinical questions. *BMC medical informatics and decision making*, 7. <https://doi.org/10.1186/1472-6947-7-16>.
- Siddaway, A. P., Wood, A. M., & Hedges, L. V. (2019). How to do a systematic review: A best practice guide for conducting and reporting narrative reviews, meta-analyses, and meta-syntheses. *Annual Review of Psychology*, 70, 747-770. <https://doi.org/10.1146/annurev-psych-010418-102803>.
- Stone-Romero, E. F. (2009). Implications of research design options for the validity of inferences derived from organizational research. In: D. Buchanan, & A. Bryman (Eds.), *The Sage handbook of organizational research methods* (p. 302-327). London: Sage.
- Strauss, A., & Corbin, J. (1994) Grounded theory methodology: An overview. In: K.D. Norman & S. L. Y. Vannaeds (Eds.), *Handbook of qualitative research* (pp. 273-285). Thousand Oaks, CA: Sage.
- Tranfield, D., Denyer, D., & Smart, P. (2003). Towards a methodology for developing evidence-informed management knowledge by means of systematic review. *British Journal of Management*, 14, 207-222. <https://doi.org/10.1111/1467-8551.00375>.

Webster, J., & Watson, R. T. (2002). Analyzing the past to prepare for the future: Writing a literature review. *MIS quarterly*, 26(2), xiii-xxiii.