

Systematic Review: a cornerstone to promote the uptake of research findings for evidence-based practice

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Educational aims

- To inform of the benefits of using systematic review to support evidence-based practice, decision making and policy
- To outline the advantages of systematic review over traditional literature review
- To describe the methodology of systematic review and explain its applicability to different areas
- To explain some of the difficulties encountered with the conduct of systematic review
- To motivate the increased adoption and use of systematic review

Key words

systematic review, traditional literature review, evidence-based practice, decision making; uptake

Abstract

Review of existing research findings from the literature is essential to inform evidence-based practice, decision making, academia and policy. In the medical field, systematic review is considered as standard practice, while in other fields there are different levels of uptake. As compared to traditional literature review, the methodology of systematic review adopts a number of steps and is systematic and transparent. This leads to increased rigour, less bias and allows reproducibility and update. There are still a number of difficulties with the conduct of systematic reviews. The utilisation of systematic review to support different areas of practice is highly recommendable.

Introduction

There is increasing interest in 'evidence-based health care'. Decisions made by healthcare professionals, providers, managers, purchasers and policy makers are consistently required to critically consider the research evidence to ensure best practice, achieve maximal benefit/risk and maintain optimal utilisation of resources.¹ Reviews of existing research accumulate findings from existing literature and have the potential to inform evidence-based practice, decision making and academia. The quality of the information used is critical to its value^{2,3} and systematic review can enhance the use of evidence by producing reliable knowledge through systematic accumulation, assimilation and presentation of findings from a range of studies.⁴ Moreover the way that the voluminous information is analysed, synthesised and presented through systematic review allows it to be assimilated quickly and increases its access to practitioners and its use by them.⁵

The developments in the utilisation of systematic review

Systematic review has been extensively developed and improved as an important technique in the evidence-based approach particularly in certain fields such as medicine, social policy, healthcare and education where knowledge of the value of an intervention is critical.^{6,7} A 'standard' approach to systematic review was developed initially in the field of medicine by the Cochrane Collaboration in the early 1990s and this is still contemporary.⁸ This was followed by other consortia such as the Campbell Collaboration which was founded in 1999 and the Evidence for Policy and Practice Information and Co-ordinating Centre.⁹ In other areas such as management and organisation studies the adoption of systematic reviews has been more slow and divergent.^{4,7,10}

In the medical field adoption of systematic review is the standard practice, particularly in the evaluation of medical interventions.^{5,6,7} In education systematic review methodology was mainly promoted due to changes in policy towards evidence-based practice and the introduction of benchmarking and performance indicators to support achievement of targets.⁹ In the area of management and organisational research a number of leaders in the field such as Briner and Denyer⁴ and Denyer and Tranfield¹⁰ support the basic principles

associated with systematic review as compared to traditional literature review. However, there is general concern that systematic reviews as conducted in fields such as medicine are not adequate for management and organisation studies. A number of authors are against the simple and direct transfer of systematic review as specified by the Cochrane Collaboration to management research and argue that certain fields have distinctive features which require developments in systematic review which are specific, tailored and 'fit' for the particular purposes, forms and applications relevant to the field.^{4,7,10}

The advantages of systematic review over traditional literature review

Systematic review has improved its methodology over traditional literature review to make it systematic, rigorous, minimise the level of bias and increase replicability. It is distinct from the

traditional literature review as it is guided by specific principles. A comparison between systematic reviews and traditional literature reviews and listing of the advantages of systematic reviews is summarised in Table 1.

Systematic review addresses a clear specific question, usually derived from a specific problem or objective. It utilises transparent methods and draws conclusions about the available knowledge related to the question addressed. Systematic review has improved its methodology to make it explicit, standardised, replicable and updateable.^{1,5,11} This standardisation allows someone from outside the review team to replicate the study method and to be able to update the systematic review.^{4,5}

In contrast, traditional literature reviews are usually not systematic. They are less focused and more wide-ranging in scope. They are also less explicit about the inclusion and exclusion criteria.² In traditional review, there is no validation and

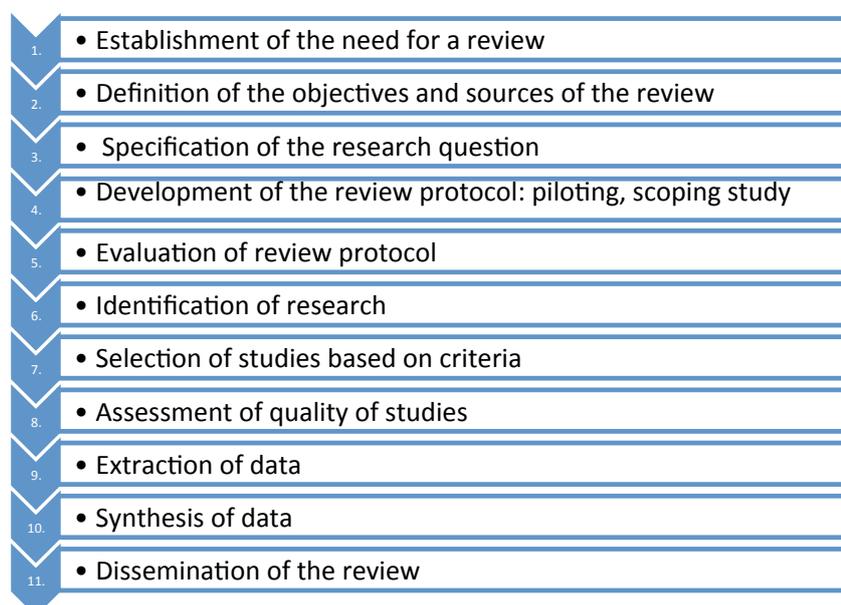
the decision for inclusion and interpretation lies with the author, leading to a high risk of author bias. Traditional reviews have informal and subjective methods to collect and interpret information and do not address the possibility of 'cherry picking'.¹⁰ There are no specific criteria for judging of quality of articles. Authors are sometimes influenced by different aspects such as the rating factors of the journal in which the study is published, the number of citations, the rejection rate or the name of the author of the research.⁴ Information from traditional literature reviews is generally represented in quite broad and confident statements which can be biased, particularly by the orientation of the authors. Similarly, the existence of a relationship between phenomena is often presented dogmatically and then simply followed by a list of authors or references to renowned organisations. Such reviews do not quantify the proportion of previous literature supporting certain information, how many

Table 1: Comparison between systematic review and traditional literature review

Elements of review	Systematic review (SR)	Traditional literature review	Advantages of systematic review
Authorship	Involves a team of researchers and ideally also users	Usually involves one researcher	Improves validity, reduces bias
Review question	Focused and specific on a single defined question. Usually in PICO format	May describe an overview or general discussion	Provides focused answer, Pre-set, Clearly defined
Protocol	A peer reviewed protocol	No protocol	Avoids reporting bias. Reproducible
Background	Summaries of available literature provided		
Objectives	Clear objectives identified	May be identified or not	Focused answer
Inclusion and exclusion criteria	Stated before review is conducted	Usually do not describe why studies are included/excluded	Addresses selection bias
Search strategy	Comprehensive, Systematic, Pre-defined databases, To locate all published and unpublished studies	Not explicitly stated, Not systematic, Do not usually attempt to locate all relevant literature	Addresses selection bias, Can be updated
Selection and evaluation of articles	Clear and explicit. Evaluation of study methods and quality	Evaluation of study quality may or not be included, Could be subjective	Explicit. Reproducible by anyone using similar methods
Evaluation of evidence	Clear and specific; Overall assessment of strength of evidence by outcome	Not explicit; Subjective or absent	Study quality and confidence of evidence reported
Results and data synthesis	Clear summaries of studies related to quality and source of evidence; Can be quantitative	Qualitative summary; May be influenced by reviewers' perspectives	Combines evidence Identifies gaps; Reports validity of findings
Conclusion and presentation	Based on set and pre-defined outcome measures	Based on summary of the findings of the studies	Relates to research question; Quality of review evaluated

Adapted from: Bettany-Saltikov¹⁵, Briner & Denyer⁴, Denyer & Tranfield¹⁰, Perry & Hammond⁹, Petticrew²³, Sriganesh *et al*³ and Vishnu *et al*²⁵

Figure 1: Summary of the process of systematic review



Adapted from: Boell & Cezec-Kecmanovic¹²

Search strategy

Systematic reviews offer a strong search strategy which is designed in advance and in relation to the research question which is explicit, documented, ensures transparency and minimises biases.⁵ Systematic searches identify key words and mesh terms. Moreover, there are pre-specified relevance and quality and eligibility criteria for the selection and inclusion of studies and to make such criteria transparent to readers.^{2,10} In systematic reviews researchers make extensive efforts to locate all studies that fit the set criteria including those that show negative and contradictory findings and in order to eliminate biases such as publication bias and author 'cherry picking'. In traditional reviews studies which show positive findings tend to be published and those with negative findings are put away – 'file-drawer problem'.⁴

Evaluation of the effectiveness of interventions

The systematic review evaluates the effectiveness of an intervention and considers PICO criteria (Patient group/s with the condition, Intervention, action or activity under consideration, Comparison or alternative to the intervention and Outcomes).¹⁵ Social sciences adopt versions of the PICO framework. SPICE considers the Setting or context, Perspective of the stakeholder asking the question, the Intervention or phenomenon of interest, Comparison and Evaluation of the success.⁴

Utilisation of reviewers

Systematic reviews include two or more reviewers for interpretation and evaluation of the evidence and there need to be mechanisms to solve disagreement between reviewers. The Campbell Collaboration recommends that in social science a number of tasks of systematic review are conducted by a review advisory group to enhance the iterative, critical and collaborative process expected in this kind of field.^{4,7,11}

Appraisal of articles

Reviewers need to apply the inclusion and exclusion criteria to each paper or study to check whether they are relevant to the review. Information can be provided from the abstract or from full papers as needed particularly to find details of the method. The studies are critically appraised in line with the quality criteria devised as part of the systematic review protocol. The criteria

studies, consistency of information, the negative studies, the study designs of the studies referenced and the justification of these designs.⁴

The methodology of systematic reviews

The methodology of systematic review covers a number of steps. These steps are summarised in Figure 1. The steps consist of the planning: including framing a question, criteria and a protocol for the review; identification, selection and critical appraisal of primary research including the assessment of the quality of the studies; the extract and analysis of data from the studies that are included in the review and the synthesis of the evidence and interpretation and reporting of best evidence.^{2,5,8,10,12,13}

Authors in management research Briner and Denyer⁴ show a broad consensus about the steps involved in systematic review as specified by the Cochrane Collaboration,⁸ however they stress that the stages are not 'linear' and in practice may involve a series of smaller steps. The process may vary considerably across reviews as it is very dependent on the review question.⁴

The review question

Systematic reviews should identify and be set to answer a clear specific well-formulated

and answerable review question.^{4,10} User involvement in the setting of the research question supports the uptake of the evidence by practitioners in the field. The review question guides setting of the protocol, the design of research strategy including inclusion and exclusion criteria and pre-set the databases to be used. In the medical field review questions are set specific, focused and are concerned with the effectiveness of an intervention.² Generally, in social sciences research questions are much wider, with unclear boundaries and are subject to evolve. In management research, it is difficult to find a precise review question.^{2,7,12} It is recommended to find an advisory group of experts and potential users of the review to help formulate and adapt the research question to ensure that the question is answerable and that it is adequate to address the needs of practitioners.⁴

The protocol

A protocol should be set which clearly details each step of the review before the search is actually conducted, in order to minimise bias.¹⁴ The protocol enables third parties to challenge the review method, to be criticised and to be revised or improved in future reviews.⁴

for evaluation are listed in a checklist which is used consistently by all the reviewers. The reviewers would answer each of the specific questions contained in the checklist and thus there will be an overall quality score or rating or category.⁴

Specificity about sources of information

In systematic review, the authors are required to specify the source of the data and how it was processed. Popular sources for health literature include Medline, PubMed, Cumulative Index to Nursing and Allied Health Literature (CINAHL) database, Exerpta Medica dataBASE (EMBASE) and other databases, Cochrane controlled clinical trials register, literature in foreign languages, 'grey-literature', references cited in primary sources, other unpublished sources known to experts in the specialty and raw data from published trials.^{5,8,16,17}

Description of the sources of information and the process

Systematic review gives an overall picture of the quality and amount of evidence in relation to the review question. This includes a systematic and stratified synthesis and presentation of the numbers, characteristics and quality of the studies reviewed and the findings of the included studies. Searches and acquisition of data need to be clearly described so that there can be tracking back of the reasons why certain study designs and attributes are judged to reflect the required quality of studies. It provides an audit trail of the reviewers' decisions, procedures and conclusions.^{4,7,10} The PRISMA Statement guides authors to systematically report the exercise of systematic reviews including the number of records identified, screened, assessed, excluded and those finally included.^{18,19} In a number of instances reviewers may find that there is less evidence on a given topic and then the information is inconsistent and less robust than widely believed. Finding an absence of evidence is important information. Scoping studies, which are a type of literature review used to map relevant literature in the field of interest, can be conducted to ensure that the search studies are effective and that the studies picked are relevant.⁴

Inclusion and exclusion criteria for research

Systematic reviews apply criteria for quality of research to be included in relation to the review question in advance.⁴ Quality assessment addresses the study's internal validity, its design and how it related to the

Table 2: The 'hierarchy of evidence'

1. Systematic reviews and meta-analyses
2. Randomised controlled trials with definitive results
3. Randomised controlled trials with non-definitive results
4. Cohort studies
5. Case-control studies
6. Cross-sectional surveys
7. Case reports

Adapted from: Greenhalgh⁵ and Petticrew & Roberts²⁰

research question.⁷ Each study in a medical systematic review is assigned weight and evaluated in terms of its methodological quality considering the extent to which the design is likely to have prevented systematic error (bias), precision (which is a measure of the likelihood of random errors) and external validity which concerns the extent to which the results are generalisable or applicable to a particular target population.^{5,7}

The 'hierarchy of evidence'

In the field of medicine the 'hierarchy of evidence' which lists a range of study designs ranked in the order of increasing internal validity is used to critically evaluate studies (Refer to Table 2). This hierarchy places systematic reviews and meta-analyses first and randomised controlled trials with definitive results second.^{5,7,20} In contrast the concept of hierarchy of evidence is often problematic to appraise evidence in certain other fields. Leading authors in management and organisational studies insist that reviews cannot be restricted to certain research designs but require identification of the best available evidence from a variety of sources to answer the research question. Rather than supporting a specific classification these authors resist privileging one method over another and insist that the design decision should prioritise that the review is 'fit for purpose'.^{4,7} In fields where there is concern over the incompatibility problem in the hierarchy of evidence a switch to the matrix-analytical approach for conceptualising the strength and weaknesses of methodologies is preferred.^{20,21} Different quality checklists and tools have been adopted to critically appraise different types of studies, particularly qualitative studies. Qualitative research is not a unified field and in spite of many proposals for quality criteria, there is lack of consensus over the evaluation of such studies.²²

Synthesis and presentation of the information

Systematic reviews should summarise all existing information in a thorough and unbiased manner.¹⁰ Reviews should present meaningful information and ideally a conclusion about the outcome.⁴ Where possible they should compare results of different studies to establish generalisability of findings and consistency of results. Moreover, reasons for heterogeneity (inconsistency of results across studies) can be identified and new hypotheses can be generated across particular subgroups.⁵

Systematic reviews pull together the results of the review in a structured and organised way and summarise the evidence related to the review question. Systematic reviews report what is known and what is not known about the question addressed and ideally result in mapping of the field.⁴ Where there are studies that provide consistent results, systematic reviews might be expected to provide solid and dependable evidence that is robust and potential for generalisation and possibly transfer across different contexts. Use of tables helps the presentation and generalisation of results.^{7,10} There are numerous established methods for synthesis of research which can be grouped into four categories: aggregative, integrative, interpretation and explanation. Statistical methods (meta-analysis) may be used in some systematic reviews as a method for aggregation which quantitatively analyses, combines or summarises the findings from studies using statistical techniques. This increases the precision of the overall result.^{5,19} In the field of management there is less standardisation and the most common approach for presentation of results remains narrative synthesis and the applicability of other methods of synthesis remains limited.⁴ Where reviews identify knowledge

gaps or incongruent findings then this calls for further research.¹⁰ Generalisation is not sought in terms of association among variables but considers the application of generative mechanisms over time. The output of systematic review in management serves as guide and refers to what works, why and how the relation works.⁷

Difficulties with conducting systematic reviews

Despite the advantages of systematic reviews over the traditional literature review and the advances and increased utilisation of this review methodology, there are still a number of difficulties with systematic reviews.

Different levels of acceptability of systematic review in different areas

There are different levels of application, acceptability, experience and use of systematic review in different fields. In medical research, systematic research is considered as the expected norm. The lack of exposure and experience of management researchers and management practitioners with systematic reviews and the priority for the adoption of cutting edge practices may limit the acceptability and use of this type of research in this field.⁴ Petticrew²³ explains that there is common misconception that systematic reviews are only capable of summarising the results of randomised controlled trials and cannot be used for other study designs. This creates concern in researchers who do not come from the medical field. Systematic reviews of non – randomised studies and of qualitative studies are common and guidelines for carrying out systematic review do not exclude qualitative studies.²³

Applicability of systematic review across different fields

As discussed above, systematic review as applied to medical research is not considered to be directly transferable to management and organisational research. The use of systematic review for management research presents more challenges. Systematic review requires the formulation of the research question before a literature review is undertaken to identify gaps in the search and this limits the type of research questions which could be addressed by management and social sciences.¹² Another concern is limited consensus regarding what counts as evidence, what constitutes good quality of evidence and on the

classification of the evidence. It is important that the approach adopted is made clear and that there is justification for all decisions taken.^{2,4,24}

Difficulties concerning the methodology of systematic review

There are various difficulties with the methodology of systematic reviews. The explicit and methodological requirements of a systematic review in relation to the question present limits which impact the outcomes of the review. The limits encountered should be made clear.⁴ Keywords used need to be carefully selected to ensure that they generate the information being sought through the research question.¹⁶ Although there is more than one reviewer, assessment can still be subjective. Systematic reviews in the field of management and organisation are likely to encounter difficulties when appraising the quality of sources of information such as lack of sufficient detail and not allowing assessment of quality of the source articles. Also in this sector, there are variations in methods and analyses amongst articles.^{7,10} Research synthesis may end up in ‘summing up’ of qualitative studies and rather than resulting in evidence of the effectiveness of an intervention it more likely gives and understanding of a process.⁷

Resource requirement for systematic review

Systematic reviews are laborious and resource intensive. They require considerably more work than traditional reviews.^{12,16} They are also considered to be bureaucratic.² Systematic reviews may take a long time (a number of months) and they require regular follow up to keep the review up-to-date.²⁵ They require a number of reviewers who need to have expertise, critical appraisal skills and pay attention to detail.^{4,7,11}

Quality of systematic reviews

Systematic reviews vary in quality. As with any type of research they may be done well or badly. The quality of systematic reviews can be judged for example by using critical appraisal checklists based on a validated index of the quality of review articles. Aspects determining quality include precautions to minimise biases and errors, assessment of validity, appropriateness of the different steps with respect to the review question, how comprehensive the search was, level of detail and appropriateness of the presentation.^{4,18,26}

Availability of primary research

There may be difficulties with the amount, quality and accessibility of the primary research. Moreover, the evidence may be dispersed.²⁴ Previous systematic reviews which address a similar type of question or which present previous gaps in knowledge in a particular field may be a good starting point for a systematic review, however no such systematic reviews may be found. If there are no or very limited trials, if the question/intervention is too complex to be tested by trials or if most trials are of poor quality and are excluded, it will not be possible to conduct a systematic review and to answer the review question and the results of the review remain inconclusive. There may not be enough good primary studies to obtain the required information about a particular question. Alternatively, if a large number of articles are found it may be difficult to comprehensively compile the studies.²⁵

Elimination of biases

Although systematic reviews include explicit inclusion and exclusion criteria this does not necessarily eliminate all bias. By including only randomised controlled

Key points

- Systematic review is of benefit to inform and improve evidence-based practice, decision making and academia.
- Systematic review is increasingly utilised in the field of medicine and other fields.
- Systematic review has a number of advantages over traditional literature reviews particularly in increased replicability and reduction of bias.
- The methodology of systematic review is guided by specific principles which make it more rigorous and transparent.
- There are still a number of difficulties with the conduct of systematic reviews.
- The uptake of systematic review to strengthen practice and decision making is encouraged.

trials there can be the introduction of an 'intervention-selection' bias.²⁴ Alternatively, if a review does not include all studies (non English, grey literature, and early literature) there can be distortion of the final picture.⁴ Inclusion of unpublished literature may be considered to reduce the rigour of the research and introduce bias through the introduction of weak evidence.²⁴ Over the period 1994 to 2014 the number of bibliographic databases searched in individual systematic reviews has increased from a mean of 1.62 to a mean of 3.73.¹⁷

Conclusion

Systematic reviews have the potential to inform different areas of practice by presenting the best available evidence so that this can be integrated with judgement and experience to support practitioners and scholars make better decisions. There are significant advantages of systematic review over the traditional literature review. While systematic review is an expected standard in the evaluation of medical interventions, in the field of management and organisational practice the use and adoption of the results of systematic reviews may be more difficult and there may be limited level of uptake by decision makers. The systematic review methodology used in the medical science can and should be adopted and adapted to fit management research. Motivation to use systematic review may be increased by explaining the benefits of this type of review. Moreover, reviews should be framed to address the specific question, problem and context that are relevant to practitioners. By augmenting the methodological rigour of the research, the legitimacy and quality of the resultant evidence from systematic reviews and the relevance and sensitivity to practitioners

and policy-makers, systematic review gives a reliable basis for practice and decision making.

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