

# Improving Systematic Literature Reviews: A Narrative Guideline to Structure the Analysis Stage

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**Abstract:** Systematic literature reviews (SLRs) have been used in various disciplines to explore existing research on a particular topic. SLRs are important for identifying research gaps, providing guidelines for practice and informing policy. There are several guidelines for conducting SLRs which focus mainly on providing methodological steps to ensure rigour and transparency. The initial steps of a SLR have detailed guidance. However, the analysis and evaluation steps lacks detailed guidance leading to quality challenges of reporting of their findings. With rigour during the analysis of the SLR, the findings could become more logical and relevant to practice and policy-making. The purpose of this paper is to develop guidelines for conducting analysis and synthesis during a SLR to improve the relevance and use of the findings as a basis for policy-making, practice and academia. The analysis guideline will show how findings from the SLRs can inform the regulations and standards of the different fields or industries. The paper will show how analysis is conducted in such that it assists practitioners to make informed decisions and know actions that need to be taken in their fields or industries. Lastly, researchers in academia usually conduct SLRs, and this paper will guide them in how to conduct SLR analysis based on their purpose and targeted outcome. A narrative review was used to identify the patterns to improve rigour and transparency during the analysis of a SLR. The findings from the narrative review show that the analysis process depends on the purpose and the targeted outcome of the SLR. If the outcome of the SLR is to identify research gaps, publication metric analysis should be included because it assists in identifying contextual, population and methodological gaps. On the other hand, to identify knowledge gaps, concepts should be identified, effects and interconnections should be determined. An extensive analysis should also be conducted to build a model and framework. The guidelines provided in this paper should assist researchers in improving the analysis process of a SLR, leading to usable findings.

**Keywords:** Systematic literature review, Guideline, Value of SLR, Analysis patterns, Outcomes of SLR

## 1. Introduction

Over the years, there has been an increase in the number of systematic literature reviews (SLRs). A search on Scopus shows an increase in the publication of SLRs from less than 5 000 per year in 2004 to over 25 000 per year in 2024. Additionally, Hoffmann, Allers, Rombey, Helbach, Hoffmann, Mathes and Pieper (2021) indicate that over the years, there has been an increase in SLRs from about 4 to 14 articles published per day to about 80 per day. This increase in published SLRs reveals the interest in synthesising research (Chalmers and Fox, 2015). The general outcome of SLRs is typically identifying potential research gaps which inform academics. However, SLRs should also provide insights for practice and inform policy-making (Chalmers and Fox, 2015; Munn, Peters, Stern, Tufanaru, McArthur and Aromataris, 2018). Highlighting what is known about a concept, phenomenon or intervention is just as important as when SLRs identify what is unknown (identifying research gaps) (Newman and Gough, 2020).

SLRs are criticised because they oversimplify findings in the synthesis and interpretation of results (Eysenck, 1994; Williams, Clark, Clark and Raffo, 2021) and because of the potential for the SLR reviewers to be biased in the article selection, analysis and interpretation of the findings (Uttley, Quintana, Montgomery, Carroll, Page, Falzon, Sutton and Moher, 2023; Snyder, 2019). The selection of articles should be thorough to ensure that the selected articles are of high quality. Another criticism of SLRs is that they do not consider readers such as practitioners, policy-makers and stakeholders (Chalmers and Fox, 2015). Powell and Koelemay (2022) state that on top of all these criticisms, more than 90% of SLRs are useless in the medical field.

The purpose of this paper is to address these criticisms by developing a guideline for analysing and synthesising the results of a SLR. It should be noted that SLRs remain important in providing insights for practitioners and informing policy-makers, stakeholders and academic researchers (Kirchherr, 2022; Munn *et al.*, 2018; Chong, Lin and Chen, 2022). Therefore, the analysis needs to ensure that valid information is reported. The SLR methodology for selecting articles has been well documented (Moher, Liberati, Tetzlaff, Altman and The, 2009; Chigbu, Atiku and Du Plessis, 2023; Cooper, Booth, Varley-Campbell, Britten and Garside, 2018; Kitchenham, Brereton, Budgen, Turner, Bailey and Linkman, 2009). However, there is still a gap regarding how analysis and synthesis can be conducted, which this article attempts to address. This is done through the development of an analysis guideline for SLRs, ensuring that they are beneficial to academic researchers, practitioners and policy-makers.

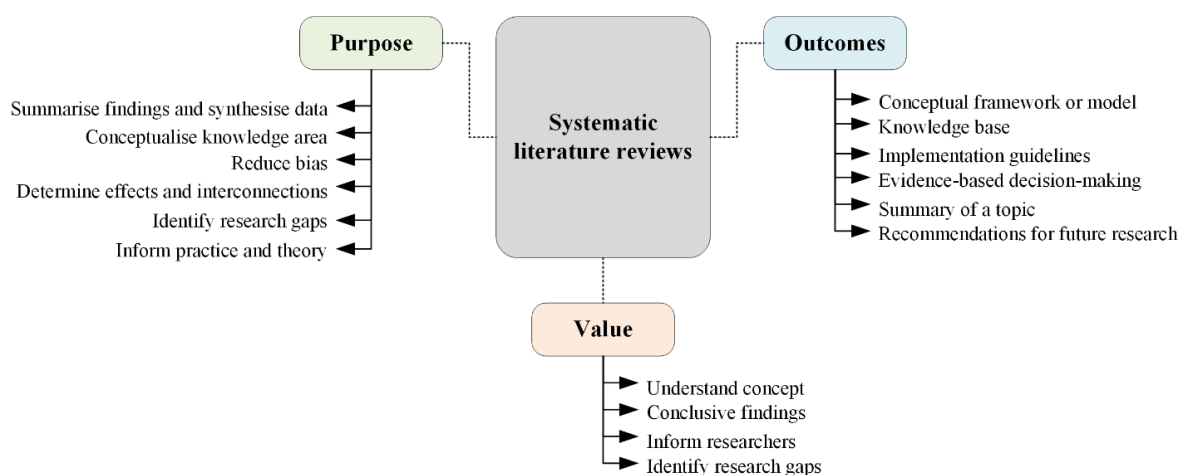
The structure of the paper is as follows: first, the background and literature on SLRs are discussed. Secondly, the method that guided the development of the analysis guidelines is covered. Lastly, the analysis process and outcomes of the developed strategies to utilise are presented.

## 2. Literature Review

SLRs are defined as replicable, transparent and quality-driven methods for synthesising research evidence (Chong *et al.*, 2022; Bearman, Smith, Carbone, Slade, Baik, Hughes-Warrington and Neumann, 2012; Snyder, 2019). The purpose of SLRs is to categorise ideas from different authors based on both similarities and differences regarding a concept or phenomenon (Panadero and Lipnevich, 2022). SLRs are important in mapping studies, identifying research gaps and bridging the gap between research and practice (Chong *et al.*, 2022). There are different types of SLRs, such as qualitative systematic reviews, scoping reviews and meta-analyses (Arksey and O'Malley, 2005). In qualitative systematic reviews, evidence is synthesised to obtain conclusions regarding a topic with a focus on precise research questions (Munn *et al.*, 2018). These reviews include a quality appraisal of articles where the selected articles are ranked using a quality ranking system such as the Critical Appraisal Skills Programme (CASP) (Xiao and Watson, 2017). Scoping reviews map and identify existing knowledge of a topic to clarify the subject, highlight research gaps and examine research methods in a specific area (Munn *et al.*, 2018). Unlike qualitative systematic reviews, scoping reviews do not focus on the quality of the selected articles and precise research questions (Arksey and O'Malley, 2005). The similarity between qualitative and scoping reviews is that they both follow a review protocol and are transparent in the search for and selection of articles (Munn *et al.*, 2018). Meta-analysis is a type of SLR that reports and interprets data from different studies using quantitative values (Plonsky and Oswald, 2011). The focus of this study is on qualitative systematic reviews and scoping reviews, as the results are subjective and need a structure to address the criticisms associated with these reviews.

### 2.1 Overview of SLRs

To understand the importance and the expectations of SLRs the purpose, value and outcomes were derived from literature. This section provides an understanding of the purpose, value and outcomes of SLRs. Figure 1 presents an overview of SLRs.



**Figure 1: Overview of SLRs**

The purposes of SLRs can be summarised as follows:

- *Summarise findings and synthesise data* (Arksey and O'Malley, 2005; Munn *et al.*, 2018): The first use of SLRs is synthesising data as findings are merged from different studies. Individual studies usually provide a partial picture of a particular topic. SLRs serve as a means of providing a holistic view by systematically combining studies (Mohamed Shaffril, Samsuddin and Abu Samah, 2021). They identify similarities and differences between different studies (Munn, Moola, Riitano and Lisy, 2014). They usually provide conclusive results compared to single studies, which usually have blind spots due to the limitations from the individual perspectives (Williams *et al.*, 2021).
- *Conceptualise a knowledge area* (Schreiber and Cramer, 2024; Burgers, Brugman and Boeynaems, 2019): Conceptualising a knowledge area in SLRs involves identifying key concepts, theories and trends and then understanding how different disciplines conceptualise the same construct.
- *Reduce bias* (Moosapour, Saeidifard, Aalaa, Soltani and Larijani, 2021; Powell and Koelemay, 2022): SLRs are important in avoiding bias because of the strict guidelines and protocol in conducting them (Grant and Booth, 2009). Examples of such guidelines include the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA), which defines the process for conducting SLRs (Moher *et al.*, 2009) and the protocol presented by Kitchenham *et al.* (2009) for SLR in software engineering. The defined protocol should be replicable and transparent (Williams *et al.*, 2021; Grant and Booth, 2009).
- *Determine effects and interconnections* (Smith, Devane, Begley and Clarke, 2011; Munn *et al.*, 2018; Xiao and Watson, 2017; Hammersley, 2020): SLRs help to analyse relationships between concepts, identify causal influences and map how different studies contribute to a comprehensive understanding of a research area. They assist with quality and create connections across different disciplines, which advances knowledge and understanding of a concept or research topic (Burgers *et al.*, 2019).
- *Identify research gaps* (Boell and Cecez-Kecmanovic, 2015): SLRs are also useful for academics as they can identify gaps that need to be addressed regarding a particular topic (Mohamed Shaffril *et al.*, 2021). Academics also become familiar with the research area, and they explore beyond their research areas by searching for articles for the SLRs (Mohamed Shaffril *et al.*, 2021).
- *Inform practice and theory*: SLRs are useful in informing practice and policy (Chong *et al.*, 2022). They can be used to provide guidelines for practice as they summarise knowledge in a comprehensive overview of how to apply interventions or particular concepts. An example is a SLR by Manikas, Ali and Sundarakani (2023) that gave policy-makers information on how to measure food security. SLRs allow practitioners, stakeholders and academic researchers to obtain information without reading individual articles (Pittaway, Robertson, Munir, Denyer and Neely, 2004).

SLRs also assist in better decision-making because of the synthesised information provided to practitioners and stakeholders (Powell and Koelemay, 2022). Examples of stakeholders include patients who may need information on a medical procedure, or customers who may need information on various products. According to Tricco, Cardoso, Thomas, Motiwala, Sullivan, Kealey, Hemmelgarn, Ouimet, Hillmer, Perrier, Shepperd and Straus (2016), SLRs should highlight the information that can be useful for decision-making. They add that the information should include contextual factors. Therefore, SLRs can help decision-making when they are clear and transparent on how their findings are important for policy-makers, practitioners and other stakeholders. SLRs also assist in decision-making by providing different perspectives regarding a topic because they are comprehensive and present findings from different studies (Hammersley, 2020).

Lastly, information from the SLR can assist in developing a curriculum for education and training in practice (Cavanaugh, Barbour and Clark, 2009). The systematic reviews help improve educational strategies (Cavanaugh *et al.*, 2009). For example, Sallam (2023) has studied how ChatGPT can be used in healthcare education.

The outcomes of the SLRs are as follows:

- *Conceptual framework/model*: The conceptual frameworks provide information for theory testing or application of a process (Williams *et al.*, 2021).
- *Knowledge base*: SLRs provide knowledge structure regarding a particular topic (Schreiber and Cramer, 2024).
- *Implementation guidelines*: SLRs should also provide guidelines for practitioners (Manikas *et al.*, 2023).
- *Evidence-based decision-making*: SLRs can be used to assist with decision-making for both practitioners and policy-makers (Munn *et al.*, 2018; West and Martin, 2024).

- *Summary of a topic*: Results are summarised (Williams *et al.*, 2021).
- *Recommendations for future research*: Recommendations for future research can be made through SLRs (West and Martin, 2024).

The values that can be derived from SLRs are that they:

- Lead to an understanding of the definition concept from different perspectives in multi-disciplinary studies and provide a consolidated definition in single-discipline studies (Burgers *et al.*, 2019; Schreiber and Cramer, 2024).
- Provide conclusive findings through testing validity and reliability of selected articles (Moosapour *et al.*, 2021).
- Inform researchers, practitioners and policy-makers regarding a particular topic (Hammersley, 2020; Xiao and Watson, 2017).
- Identify research gaps which guide researchers regarding potential future research (Arksey and O'Malley, 2005; Boell and Cecez-Kecmanovic, 2015).

## 2.2 Criticism of SLRs

Despite these contributions of SLRs, there are still some weaknesses and criticisms that are associated with them. These criticisms are discussed in Table 1, along with potential solutions.

**Table 1: Criticisms of systematic reviews and solutions**

Criticism	Description	Solution
<b>Methodological limitations</b>	The protocols and standards of systematic reviews are usually applied to medical studies and are limited in other fields (Uttley <i>et al.</i> , 2023).	Protocols and standards have been stipulated for other fields including social sciences, business studies and software engineering (Petticrew and Roberts, 2006; Kitchenham <i>et al.</i> , 2009; Tranfield, Denyer and Smart, 2003; Moher <i>et al.</i> , 2009)
<b>Time-consuming and resource-intensive</b>	The research can take up to 18 months and may need two or more reviewers to ensure validity (Williams <i>et al.</i> , 2021).	The use of automation for the selection process of the articles has been proposed (Tomczyk, Brüggemann and Vrontis, 2024).
<b>Bias in article selection and publication (Uttley <i>et al.</i>, 2023)</b>	The bias may be evident where results with null or negative results are not reported or published (Hammersley, 2020). Additionally, preferred articles are selected based on the author's preference.	Protocols and standards such as PRISMA and PICOC have been proposed to avoid selection bias for SLRs (Paul, Lim, O'Cass, Hao and Bresciani, 2021).
<b>Quality variation of the selected studies</b>	In some cases, the articles may not have the same quality in terms of the sample selected, the type of study and the analysis. The quality of the SLR depends on the articles selected in the review process (Boell and Cecez-Kecmanovic, 2015; Williams <i>et al.</i> , 2021).	Articles are selected using eligibility criteria (Munn <i>et al.</i> , 2014). The eligibility criteria allow for setting the inclusion and exclusion criteria (Moher <i>et al.</i> , 2009).
<b>Produce misleading results</b>	The results produced are usually based on the perspective of the reviewers and thus there is a need for transparent reporting (Powell and Koelemay, 2022; Crawford, 2025; Hammersley, 2020).	A few papers (Bandara, Furtmueller, Gorbacheva, Miskon and Beekhuyzen, 2015; Crawford, 2025) address the issue of misleading results due to misinterpretation of results.
<b>Lack of usability in industry or field</b>	The conclusions from some of the SLRs cannot be applied in the industry. The conclusions can only be valid if they are based on quality articles. The invalid conclusion (where research is not aligned with practice) also makes the industry uninterested in the results of the SLRs (dos Santos, Iwazaki, Felizardo, de Souza and Nakagawa, 2021; Yuan and Hunt, 2009).	A few papers (Crawford, 2025; Snyder, 2019; Bandara <i>et al.</i> , 2015) provide guidelines on how to conduct analysis to ensure that the articles provide evidence that can be used in the industry or field.

Table 1 shows that there is still a gap regarding the applicability of SLR results in relation to practitioners and beneficiaries. The gap shows the need for SLRs to be relevant to practice and to have analyses and conclusions that can be used in practice and policy-making. The structure and the guidance of how to do a SLR are well documented, e.g. PRISMA (Moher *et al.*, 2009; Snyder, 2019; Mohamed Shaffril *et al.*, 2021). However, there are only a few papers that show how to analyse the results of a SLR. (Bandara *et al.*, 2015) present a structure for

analysing literature using qualitative systematic reviews. Their recommendation does not provide enough detail on the information that needs to be retained for SLRs to be effective. This paper bridges this gap by explaining the process of analysing the results of a SLR for effective and relevant results.

### 3. Research Method: Narrative Review

A narrative review was used to collect existing SLRs from various sources by following an inductive approach. The purpose was to identify the analytical approach used by the SLRs. The narrative review is an unsystematic method of reviewing literature (Juntunen and Lehenkari, 2021). It was used with the purpose of obtaining the methods of SLR analysis of various disciplines rather than a specific discipline (Snyder, 2019). The articles selected for analysis were based on the purpose of this narrative review (Williams *et al.*, 2021).

This research aimed to create a guideline for conducting SLR analysis to produce valid and reliable outputs relevant for policy-making, practice and academia. To achieve this, existing SLRs (Appendix 1) assisted in determining the analysis approach and the outcomes of these analyses. In the review of the identified articles, the process of analysing SLRs were interpretive rather than predefined (Bandara *et al.*, 2015). This paper builds theory to guide the analyses of a SLR's results for valid, reliable output that can be used in academia, policy-making and practice. Figure 2 illustrates the steps followed in this study. These steps were informed by the inductive approach of Rose, Spinks and Canhoto (2014).

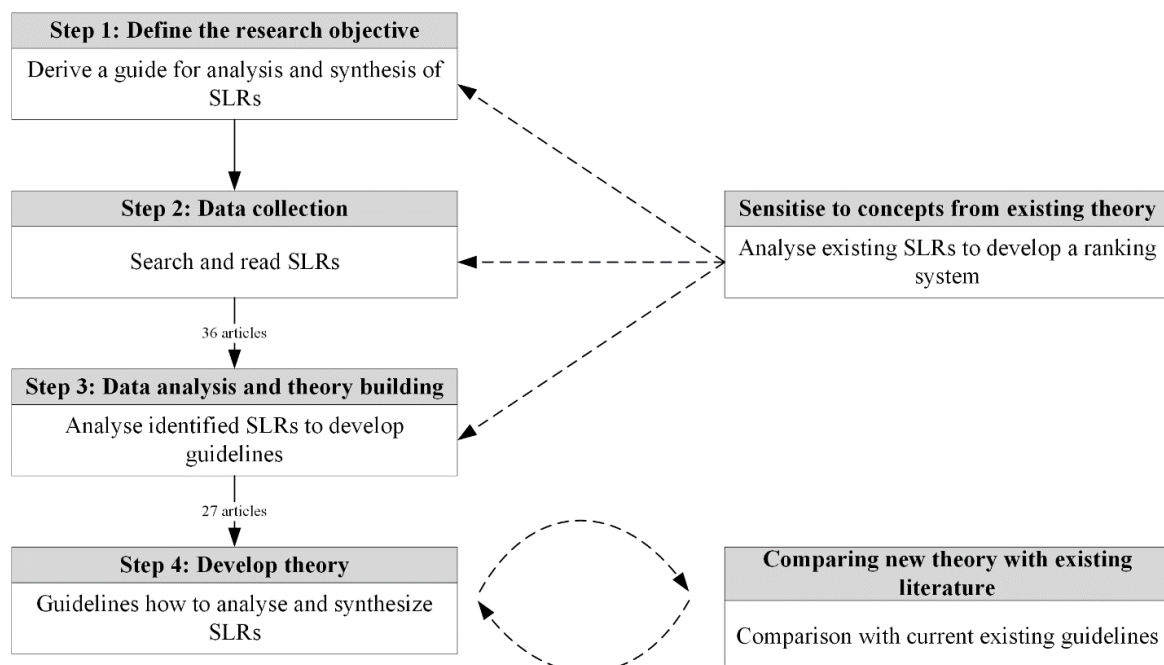


Figure 2: Application of the inductive research approach (Rose *et al.*, 2014)

The steps followed in the method of this study are discussed in the next sub-sections.

#### Step 1: Define the Research Objective

This research aimed to create a guideline for the analysis and synthesis of SLRs to produce valid and reliable outputs relevant for policy-making, practice and academia.

#### Step 2: Data Collection: Search and Read SLRs

Data was collected through iterative reading of existing SLRs. The process followed was studying, evaluating articles and critically assessing the articles (Boell and Cecez-Kecmanovic, 2015; Snyder, 2019). The steps followed in the searching and reading of the articles for recommending SLR analysis guidelines are as follows:

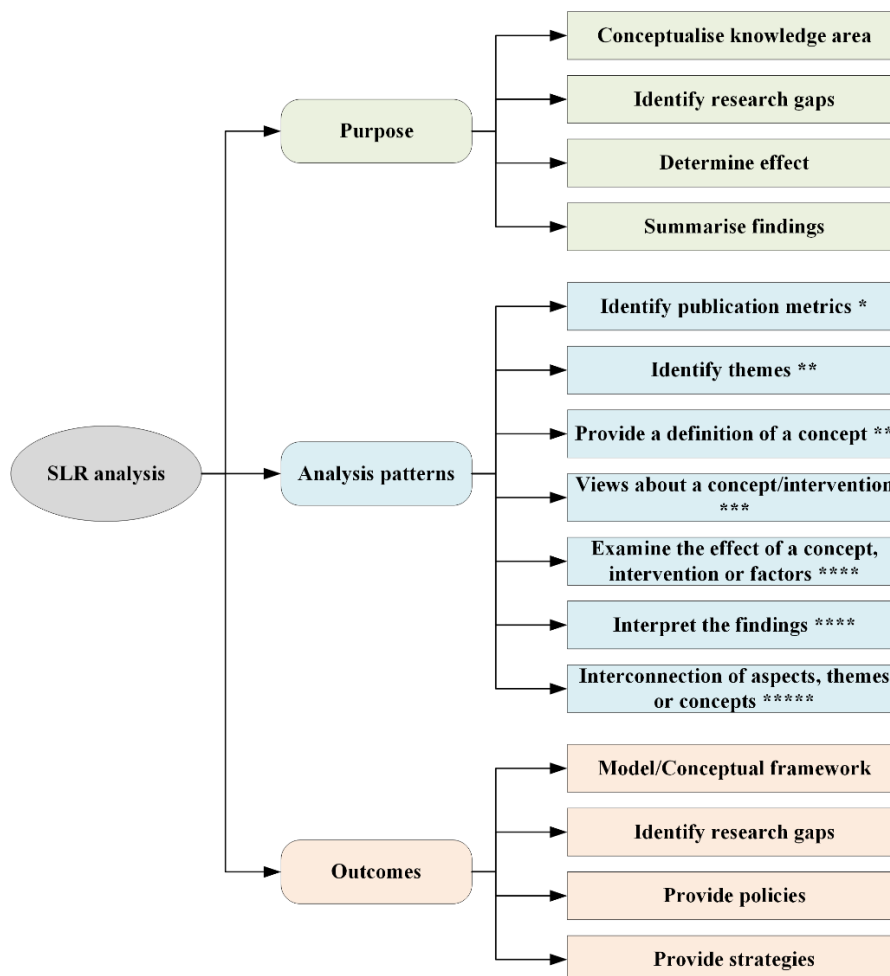
- The first step was to search for articles using the terms “*systematic literature reviews*” OR “*systematic reviews*” using Publish or Perish. The results were sorted by the number of citations. Since the focus of the research was to identify good practice in the analysis and synthesis during a SLR research study, all publications that only reported on the SLR process were excluded. This was done manually by researcher 1 through reviewing the titles starting from the highest cited to the lowest using the top

200 results. A few additional studies were found through snowball searches using Google Scholar by researcher 2.

- The purpose of the manual search was to ensure cross-discipline SLR studies that reported on the detailed steps followed during analysis and synthesis were included as part of the process.
- The set of existing SLRs used to develop good practises during the analysis and synthesis step of a SLR were 52.
- An excel spreadsheet was created with the intention of identifying the analysis process the studies followed. The researchers critically read the articles to identify the processes followed during the analysis and synthesis step of a SLR. 16 studies of the 52 conducted meta-analyses using quantitative analysis. These studies were excluded because the quantitative analysis process is known. 36 articles utilised qualitative analysis to develop findings from the SLR. The steps used during the qualitative analysis of each of the 36 studies were documented and compared across all 36 studies to identify patterns. The data was collected from 36 thematic SLR articles, as depicted in Appendix 1. Thematic SLR articles were the focus because their interpretation is subjective and needs a structure. After the collection of data, an analysis and theory-building process was followed.
- A ranking system was derived to enable the researchers to identify good practices used during the analysis and synthesis step. The items were assigned points based on the depth of the information provided by the item. The ranking system assisted in identifying the final 27 publications used to inform the development of the guideline.

*Step 3: Data Analysis and Theory-Building*

In this step, the general purpose, analysis patterns and outcomes were identified from the 36 SLR articles. These are depicted in Figure 3.



**Figure 3: Pattern for purpose, analysis patterns and outcomes**

Firstly, the purpose of each SLR was identified to understand the rationale of the specific SLR. Secondly, analysis patterns were identified. These were used to create a ranking system as indicated by the number of stars (\*) (see Table 2). The ranking system was used to select SLR articles that were comprehensive in their analysis. This selection was done on the 36 articles of step 2. Lastly, the outcomes were important in understanding the results obtained from the SLRs.

The identified SLR purposes are (i) to conceptualise a knowledge area, (ii) to determine the effect, (iii) to identify research gaps and (iv) to summarise research findings. The purpose of conceptualising a knowledge area is similar to what Burgers *et al.* (2019) and Schreiber and Cramer (2024) state when they show that SLRs seek to provide the definition of a concept, thus building a knowledge base for a concept. SLRs are also conducted to determine the effect of a phenomenon which helps understand the outcome. Identifying previous research and identifying gaps is also a common pattern for the purposes of the SLRs. This is in alignment with the assertion by Boell and Cecez-Kecmanovic (2015) that identifying research gaps is one of the purposes of SLRs. Lastly, SLRs are used to summarise research findings regarding a topic, which aligns with Arksey and O'Malley (2005) and Munn *et al.* (2018).

After the identification of the purposes of SLRs, the analysis patterns were identified. As stated previously, the analysis patterns were used to create a ranking system. The ranking system guided the selection of articles for analysis to identify articles that followed comprehensive analysis patterns. The ranking system is discussed in Table 2.

**Table 2: Ranking system used to score SLR analysis**

Analysis pattern	Meaning	Stars
<b>Identify publication metrics</b>	These include: <ul style="list-style-type: none"> <li>• Years of publication</li> <li>• Research type (qualitative, mixed methods or quantitative)</li> <li>• Contribution type (provide a model/framework, guidelines and recommendations)</li> <li>• Author, countries and affiliations</li> <li>• Publication type (journal, conference paper)</li> <li>• Field of study</li> <li>• By database</li> </ul>	1
<b>Identify themes</b>	When the SLR identifies the patterns in a study, it clusters them into different themes.	2
<b>Provide a definition of a concept</b>	The SLR seeks to conceptualise a term which has varying definitions. The conceptualisation provides clarity on how a term should be defined.	2
<b>Views about a concept/ intervention</b>	The SLR provides different perspectives about an aspect. The different perspectives may be used to assess why there are different findings, for example different contexts.	3
<b>Interpret review findings</b>	The SLR would have provided insights from the findings in the SLR instead of just presenting the findings from the results. The insights provide some key conclusions, strategies and policies from the findings.	4
<b>Examine the effect of a concept, interventions or factors</b>	The SLR looks at the results of an intervention or aspect. The results could be either positive or negative.	4
<b>Identify the interconnection of interventions, concepts and factors</b>	The SLR shows the relationship between aspects, themes or concepts.	5

The maximum score that an article could obtain was 21 if it included all the parts of the analysis pattern. The scores were allocated based on the value of the information provided by the analysis process. Identification of publication metrics was ranked at one star because the reporting on them is basic information, mostly for researchers (Abbasi, Martinez and Ahmad, 2022; Bekelman, Li and Gross, 2003; Crossan and Apaydin, 2010). The identification of themes and the provision of definitions were allocated two stars each because identifying themes is part of SLRs and definitions are identified to provide clarity for the reader (Farooq, Riaz, Abid, Umer and Zikria, 2020; Gulliver, Griffiths and Christensen, 2010). Views about a concept were allocated three stars because they provide different perspectives of the studies (Asghari, Rahmani and Javadi, 2019; Geraldi, Maylor and Williams, 2011). Examination of an effect of a concept, interventions or factors was allocated four stars

because this provides information to practitioners, policy-makers and researchers. For example, the SLR by Ingebrigtsen, Georgiou, Clay-Williams, Magrabi, Hordern, Prgomet, Li, Westbrook and Braithwaite (2014) revealed how leadership affects the adoption of technology in healthcare, which shows practitioners how to motivate IT adoption in the health sector. Interpretation of findings contributes to understanding the outcome of the SLRs and was therefore allocated four stars. The identification of interconnections was allocated five stars because it provides a comprehensive overview of a concept. From the ranking system, 27 of the original 36 SLR articles were selected because they ranked 12 stars or higher. The selected SLR articles are highlighted in green in Appendix 1.

The identified outcomes as per the 27 SLR articles can be summarised as follows:

- **Identify research gaps:** In the academic discipline, SLRs are used to identify research gaps. In the case where the only purpose of the SLR is to identify research gaps, the publication metric analysis provides information to do so. This analysis should be performed as it allows for the identification of the contextual, population and methodological gaps. Defining a concept, effects and interconnections can assist in identifying knowledge gaps regarding the interventions and tools needed in a research area. SLRs should not only identify research gaps but should also inform practice and policy. As stated by Moher *et al.* (2009), the purpose of SLRs is to discuss both what is known and unknown. Identifying research gaps is half the work as it only points to what is unknown. The purpose of a SLR should be to ensure that information on what is known can be used to inform practitioners and policy-makers.
- **Build model/conceptual framework:** The model or framework can be either for implementation or for research purposes. To build a model, the processes required include the definition of the concept, assessing effects and identifying interconnections within a subject area. The publication metrics analysis may be conducted. However, it is an option and may not contribute towards building the conceptual framework.
- **Inform policy:** A SLR informs policy when there are regulations proposed in a particular research area. To inform policy, the analysis performed includes a definition of concepts and an analysis of the effects and interconnections. Effects and interconnections help identify regulations to improve operations that either prevent or support an activity or tool, depending on the effect or relationship discussed.
- **Inform practice:** A SLR may have an outcome of informing practice where the focus is on the practical steps that are needed to implement or use a tool. To achieve this outcome the analysis performed is the definition of concepts, determining effects and the interconnections of the different concepts.

#### *Step 4: Develop a Theory*

The development of the analysis and synthesis theory is based on the patterns observed in the analysis process followed in the 27 SLR articles. Firstly, the main analysis and synthesis processes identified were the (i) identification of the publication metrics, (ii) definition of concepts, (iii) examination of effects and (iv) identification of interconnections. Identification of author views and themes were sub-processes. Lastly, the interpretation of findings was identified as the outcome of the SLR analysis process. The theory therefore is that the steps for analysis and synthesis of the SLRs are as follows:

- **Identify publication metrics:** The publication metrics report the article details. This provides information on how and where the research was conducted. In some articles, the publication details assist in showing the research gap, such as the lack of publication in some regions, the patterns of the research per year or a gap in the use of a particular research method. The publication metrics analysis is when the articles selected in a SLR are examined using publication metrics. In some cases, but not all, the publication metrics are reported. The publication metrics analysed depend on the purpose of the SLR and the preference of the authors. These metrics include details of the selected articles such as year, author list, location, methodology, model/framework, publication type, number of citations, journals, databases and fields. In articles related to an intervention, it may be important to analyse the effect of the intervention over the years. In some SLRs there may be a need to analyse methodologies. The types of metrics differ in the SLRs. Table 3 presents the publication metrics reported by the SLRs.

Table 3: SLR reporting on publication metrics

Author	Year	Author list	Journal/ publication channel	Field/ industry	Citations	Location/ affiliations	Methodology	Model/ framework	Database	Publication type
Aarseth, Ahola, Aaltonen, Økland and Andersen (2017)	✓		✓							
Abbasi et al. (2022)	✓									
Al-Okaily, Younis and Al-Okaily (2024)			✓	✓	✓	✓	✓	✓		
Benitti (2012)		✓					✓			
Crossan and Apaydin (2010)	✓		✓		✓		✓			
Farooq et al. (2020)	✓	✓					✓			✓
Gulliver et al. (2010)	✓					✓	✓			
Hidellaarachchi, Grundy, Hoda and Madampe (2022)	✓			✓					✓	
Iwaya, Iwaya, Fischer-Hübner and Steil (2022)	✓			✓		✓	✓			✓
Korber and McNaughton (2018)	✓			✓			✓			
Mittelmeier and Yang (2022)	✓	✓			✓					
Tremmel, Gerdtham, Nilsson and Saha (2017)		✓				✓				
Fosso Wamba, Akter, Edwards, Chopin and Gnanzou (2015)	✓		✓				✓			
Xiong, Lipsitz, Nasri, Lui, Gill, Phan, Chen-Li, Iacobucci, Ho, Majeed and McIntyre (2020)		✓				✓	✓			
Yigitcanlar, Kamruzzaman, Foth, Sabatini-Marques, da Costa and Ioppolo (2019)	✓		✓			✓				
Yli-Huumo, Ko, Choi, Park and Smolander (2016)	✓		✓	✓		✓				✓
Zawacki-Richter, Marin, Bond and Gouverneur (2019)	✓		✓			✓				

The report on the year of publication indicates the pattern and frequency of publication over the years (Abbasi et al., 2022; Aarseth et al., 2017; Crossan and Apaydin, 2010). The report on the journals shows the contribution of a particular journal in the research community and field of study. The report on industry or the field study is when the SLR focuses on the subjects that span different industries (Al-Okaily et al., 2024; Iwaya et al., 2022; Korber and McNaughton, 2018). On the other hand, some SLRs include information on whether they were published in academia or in the industry (Hidellaarachchi et al., 2022; Yli-Huumo et al., 2016). The number of citations shows the recognition of the article in the research community, which indicates the impact of an article (Al-Okaily et al., 2024; Crossan and Apaydin, 2010; Mittelmeier and Yang, 2022). The publication type is indicated in the SLRs that include different types of articles; in some SLRs the types of publications are journal articles, conference papers, book chapters, workshop papers, symposium papers and grey literature (Farooq et al., 2020; Iwaya et al., 2022; Yli-Huumo et al., 2016; Korber and McNaughton, 2018).

**Provide the definition of a concept:** Some SLRs contain a definition of a term. The conceptualisation of a term is done either to situate a study or to build a theoretical framework. Different elements of the concept are identified, and then findings are interpreted to provide a framework. In situating a study, a term is

conceptualised before identifying the effect of that concept. There was no consistent pattern in the analysis for defining concepts. The different SLRs that defined a concept as part of the analysis had several diverse steps, summarised as follows:

- **Step 1:** Identify all the definitions associated with the concept. In this step different approaches were used by the SLR authors. Geraldi *et al.* (2011), Sørensen, Van den Broucke, Fullam, Doyle, Pelikan, Slonska and Brand (2012) and Zawacki-Richter *et al.* (2019) listed the definitions from different articles.
- **Step 2:** Break down the terms that refer to the concepts. Iwaya *et al.* (2022) broke down the concept into different terms.
- **Step 3:** Compare and contrast the different definitions to identify differences and similarities. Sørensen *et al.* (2012) compared the different definitions of health literacy.
- **Step 4:** Cluster definitions based on themes. Fosso Wamba *et al.* (2015) clustered the definitions according to different themes. In all 21 articles, the definitions were grouped based on the themes from the selected articles.
- **Step 5:** Provide an overall definition of the concept based on all the identified definitions.

After defining the concepts, the SLRs determined the effects of the concept. The outcome of the effects is the building of the framework and guidelines for practice and informing policy.

**Examine the effect of a concept, factors or interventions:** The concept, intervention or factor is either a consequence of a certain concept, or the implementation of the concept has an outcome. Examining effects entails determining the results or outcomes of a concept. In general, there was a similar pattern in the steps followed leading to findings on the effect of a concept. The following were the general steps from the different SLRs which identified the effects of the concept:

- **Step 1:** Identify tools/interventions used. This step can take different forms. In some SLRs, it was technologies in a sector (Abbasi *et al.*, 2022; Abdulrahman, Faruk, Oloyede, Surajudeen-Bakinde, Olawoyin, Mejabi, Imam-Fulani, Fahm and Azeez, 2020; Asghari *et al.*, 2019; Farooq *et al.*, 2020), or attributes, knowledge, setting and costs (Benitti, 2012; Gulliver *et al.*, 2010; Hidellaarachchi *et al.*, 2022; Tremmel *et al.*, 2017; Ingebrigtsen *et al.*, 2014).
- **Step 2:** Identify the setting where the tool or intervention was applied. The settings identified include the location or industry (Abbasi *et al.*, 2022; Asghari *et al.*, 2019; Gulliver *et al.*, 2010).
- **Step 3:** Identify how the tool was used or how the intervention was applied. Some SLRs identified how a tool (renewable energy or big data) was used as a first step (Qazi, Hussain, Rahim, Hardaker, Alghazzawi, Shaban and Haruna, 2019; Fosso Wamba *et al.*, 2015).
- **Step 4:** Show how the tool or intervention affects the setting or another concept. In this step, both positive and negative effects are presented. The different articles showed the impact of a concept, tool or intervention on their settings.

The next step is to identify the interconnections of the concepts, factors and interventions.

**Identify interconnections:** The interconnections show the various relationships of the concept, intervention or factor with the other concepts. There are varying steps in the study of interconnections of the different aspects. The interconnections show the multiple relationships of concepts, settings and interventions which include both the enablers and the outcomes. The steps for determining the interrelationships of a concept are outlined as follows:

- **Step 1:** Identify the dimensions of a concept (Al-Okaily *et al.*, 2024; Sørensen *et al.*, 2012; Crossan and Apaydin, 2010; Xiong *et al.*, 2020). The step includes identifying the tools, activities, settings, definitions and concepts associated with the topic.
- **Step 2:** Determine the multiple relationships between the concepts (Moorhead, Hazlett, Harrison, Carroll, Irwin and Hoving, 2013; Zawacki-Richter *et al.*, 2019; Korber and McNaughton, 2018). This includes identifying the antecedents and the consequences of the application.
- **Step 3:** Develop a framework based on the interrelationships between the concepts (Crossan and Apaydin, 2010; Geraldi *et al.*, 2011).

#### 4. Discussion

The purpose of this article is to address the shortcomings associated with the analysis of SLRs. Various methodologies such as PRISMA and PICOC (Population, Intervention, Comparison, Outcome and Context)

explain the process of performing a SLR (Carrera-Rivera, Ochoa, Larrinaga and Lasa, 2022). However, the methodologies lack detail on how to analyse the results of a SLR, which is a criticism of SLRs. This article addresses this gap through a narrative review. Four potential outcomes of a SLR were derived as highlighted in Table 4. The analysis patterns of conceptualisation, effects and interconnections must be performed if the purpose of the SLR is to (i) build a model or conceptual framework, (ii) inform policy or (iii) inform practice.

**Table 4: SLR outcomes and associated analysis patterns**

Outcomes of SLR	① Basic	② Conceptualisation	③ Effects	④ Interconnection
Identify research gaps	✓			
Build model or conceptual framework		✓	✓	✓
Inform policy		✓	✓	✓
Inform practice		✓	✓	✓

Researchers need to determine upfront the outcome of the SLR and then apply the associated analysis patterns.

The analysis patterns are a contribution of this article and are summarised in Table 5.

**Table 5: Steps to apply analysis patterns**

		Analysis patterns		
		Conceptualisation	Effects	Interconnection
Steps	1	Identify definitions	Identify intervention(s) used	Identify dimensions of a concept
	2	Break definitions down into terms	Identify setting where intervention(s) was/were used	Determine multiple relationships between concepts
	3	Compare and contrast various definitions (step 1)	Identify how the intervention(s) was/were used	Develop a framework based on interrelations
	4	Cluster definitions based on themes	Indicate how the intervention affects the setting of another concept	
	5	Provide overall definition		

The steps associated with each analysis pattern should result in a SLR that provides insights into the phenomenon under investigation.

The analysis process depends on the purpose, and the outcome of the SLR guides the analysis pattern that needs to be followed. If the outcome of the SLR is to identify research gaps, the publication metric analysis should be performed as it enables the contextual, population and methodological gaps to be identified. The definition of a concept, effects and interconnections can assist in identifying knowledge gaps regarding the interventions and tools needed in a research area.

For SLRs to build a model or framework of the existing knowledge base or inform policy and practice, extensive analysis is required, as shown in Table 5. Many SLRs lack this detailed analysis.

## 5. Conclusion

This article focuses on the analysis part of a SLR, which has been highlighted by research as a weakness of SLRs. The critical review of 27 SLR articles resulted in the identification of the purpose, analysis patterns and outcomes of a SLR. Based on this, steps were derived and presented (Table 4 and Table 5) that can be used to improve the results and reduce bias.

This article contributes to current theory and literature in the following ways: Firstly, the article provides ways to create in-depth analysis and interpretation of the results. This is a weak spot of SLRs. Secondly, it addresses ways to remove bias that is associated with SLRs. Lastly, it lists criteria that other researchers can use to analyse SLR articles.

In conclusion, SLRs are essential for synthesising existing knowledge, identifying research gaps and ensuring evidence-based decision-making, making them a crucial tool for advancing scientific understanding and guiding future research.

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## Appendix 1: Reviewed Articles and Ranking

Through the ranking system (Table 2), 27 of the original 36 SLR articles were selected because they ranked 12 stars or higher. The selected SLR articles are highlighted in green as shown in this appendix. The maximum score that an article could obtain was 21 if it included all the parts of the analysis pattern. The scores of the ranking system were allocated based on the value of the information provided by the analysis process.

Author	Discipline	Purpose	Publication metrics*	Identify themes**	Define concept**	Views about a concept***	Interpret findings****	Effect of concept/ intervention****	Interconnection of concept/ theme*****	Total score
Aarseth et al. (2017)	Project management	To describe sustainability in project management	1	2		3	4		5	15
Abbasi et al. (2022)	Agriculture	To explore technologies used in agriculture	1	2			4	4	5	16
Abdulrahman et al. (2020)	Education	To investigate the impact of multimedia tools on learning and teaching		2			4	4	5	15

Author	Discipline	Purpose	Publication metrics*	Identify themes**	Define concept**	Views about a concept***	Interpret findings****	Effect of concept/ intervention****	Interconnection of concept/ theme*****	Total score
<b>Al-Okaily et al. (2024)</b>	Project management	To examine the relationship between project management practices and Industry 4.0	1	2			4		5	12
<b>Asghari et al. (2019)</b>	Technology	To explore the application of IoT		2		3	4	4	5	18
<b>Atatsi, Stoffers and Kil (2019)</b>	Organisational behaviour	To explore the relationship between behaviour and employee performance	1		2	3			5	11
<b>Bekelman et al. (2003)</b>	Healthcare	To identify financial conflicts of interest in biomedical research								
<b>Benitti (2012)</b>	Education	To investigate the use of robotics in education	1	2			4	4	5	16
<b>Berkman, Sheridan, Donahue, Halpern and Crotty (2011); (DeWalt, Berkman, Sheridan, Lohr and Pignone, 2004)</b>	Healthcare	To determine if low health literacy is related to poor healthcare		2			4	4	5	15
<b>Bilgaiyan, Sagnika, Mishra and Das (2017)</b>	Project management	To review the cost estimation of agile software development		2		3	1	4		10
<b>Crossan and Apaydin (2010)</b>	Management	To summarise studies on organisational innovation	1	2		3	4		5	15
<b>Daenekindt and Huisman (2020)</b>	Education	To map diverse themes in higher education		2			4		5	11
<b>Dybå and Dingsøy (2008)</b>	Project management	To summarise previous studies on agile software development	1	2			4			7
<b>Farooq et al. (2020)</b>	Agriculture	To examine the utilisation of IoT in agriculture	1	2			4	4	5	16
<b>Geraldi et al. (2011)</b>	Project management	To describe the complexity of projects		2	2	3	4		5	16

Author	Discipline	Purpose	Publication metrics*	Identify themes**	Define concept**	Views about a concept****	Interpret findings****	Effect of concept/ intervention****	Interconnection of concept/ theme*****	Total score
Gulliver <i>et al.</i> (2010)	Healthcare	To assess costs and diseases associated with adult obesity	1	2			4	4	5	16
Hidellaarachchi <i>et al.</i> (2022)	Engineering	To examine the effect of the human aspect on requirements engineering aspects	1	2			4	4	5	16
Ingebrigtsen <i>et al.</i> (2014)	Management, IT and healthcare	To determine the association between clinical leadership and successful IT adoption in healthcare		2			4	4	5	15
Innvær, Vist, Trommald and Oxman (2002)	Healthcare	To summarise facilitators and barriers to the use of research by policy-makers		2			4	4		10
Iwaya <i>et al.</i> (2022)	Organisation	To explore the organisational privacy, culture and climate	1		2		4	4	5	16
Korber and McNaughton (2018)	Healthcare	To review the incidence of post-transplantation diabetes	1	2		3		4	5	15
Manikas <i>et al.</i> (2023)	Food security	To assess food security measures	1	2		3			5	11
Matloob, Ghazal, Taleb, Aftab, Ahmad, Khan, Abbas and Soomro (2021)	Technology	To provide synthesised information regarding methods of software defect prediction	1	2			4			7
Mittelmeier and Yang (2022)	Education	Contribution of the <i>Higher Education Research and Development Journal</i> to internationalisation and the framing of the term	1	2		3		4	5	15
Moorhead <i>et al.</i> (2013)	Health	To examine relationship between physical activity, fitness and health	1	2					5	8

Author	Discipline	Purpose	Publication metrics*	Identify themes**	Define concept**	Views about a concept***	Interpret findings****	Effect of concept/ intervention****	Interconnection of concept/ theme*****	Total score
<b>Qazi et al. (2019)</b>	Energy	To highlight the world's energy needs		2		3	4	4	5	18
<b>Sallam (2023)</b>	Healthcare	To investigate the use of ChatGPT in healthcare education	1	2			4	4		11
<b>Sørensen et al. (2012)</b>	Healthcare	To examine the relationship between social relationships and mental health	1	2	2		4	4	5	18
<b>Tremmel et al. (2017)</b>	Healthcare	To assess costs and diseases associated with adult obesity	1	2			4	4	5	16
<b>Veerbeek, van Wegen, van Peppen, van der Wees, Hendriks, Rietberg and Kwakkel (2014)</b>	Healthcare	To explore the effect of physical therapy on stroke patients		2			4		5	11
<b>Fosso Wamba et al. (2015)</b>	Technology	To define Big Data	1	2	2		4	4	5	18
<b>Weinzierl, Zilker, Dunzer and Matzner (2024)</b>	Technology	To review how machine learning is used in business process management		2			4		5	11
<b>Xiong et al. (2020)</b>	Healthcare	To determine the effects of COVID on the general population	1	2			4		5	12
<b>Yigitcanlar et al. (2019)</b>	Sustainability	To explore if cities can be smart without being sustainable	1	2			4		5	12
<b>Yli-Huumo et al. (2016)</b>	Technology	To summarise studies on blockchain	1	2			4		5	12
<b>Zawacki-Richter et al. (2019)</b>	Education	To explore the use of AI in higher education	1		2		4		5	12