The Journal of Academic Librarianship 46 (2020) 102217

Contents lists available at ScienceDirect

The Journal of Academic Librarianship

journal homepage: www.elsevier.com/locate/jacalib

Meta-synthesis in Library & Information Science Research

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ARTICLE INFO

Keywords:
Meta-synthesis
Meta-ethnography
Research methods

ABSTRACT

The meta-synthesis method has received increased interest in social science research, but relatively few meta-synthesis studies have been conducted in the library and information science (LIS) field. The purpose of this study was to analyze 44 LIS-related meta-synthesis studies in terms of contribution, meta-synthesis methodology, and research topics. The results revealed that there are four types of contributions of meta-synthesis research: isolated findings, non-dynamic relationships, dynamic relationships, and models. Moreover, a variety of methods have been used to search, select, analyze, and synthesize the individual studies. Finally, although meta-synthesis studies have been conducted on some LIS topics (e.g., health informatics, library user services, and information management), it has been an undervalued method for other research topics. Recommendations are offered to encourage the use of this method and to guide researchers to conduct more rigorous meta-synthesis studies on LIS topics.

Introduction

Comprehensive literature reviews are essential to synthesize the accumulated scientific knowledge of a field, and the breadth and quality of the gathered literature can identify gaps and ongoing concerns in the literature. The systematic reviewing of empirical evidence also informs practice (i.e., Evidence-Based Practice). For example, health practitioners can critically summarize the available randomized controlled trails to make decisions for patient care, and academic librarians can gather existing evidence for decision-making related to collections and services.

A typology by Grant and Booth (2009) lists 14 review types and associated methodologies, including systematic reviews and meta-analyses. A systematic review involves well-established steps (e.g., inclusion criteria and quality assessment) to identify, appraise, and summarize all relevant studies on a particular topic (Xu, Kang, & Song, 2015), while a meta-analysis refers to a series of statistical techniques used to combine the effect sizes. Meta-analysis is often an optional part of a systematic review. Scholars in the Library and Information Science (LIS) field have been encouraged to use systematic review and meta-analysis methods in the field (Ke & Cheng, 2015; Xu et al., 2015). However, in a study on the diffusion of synthesis research methods in LIS, the authors found that qualitative synthesis was still in its infancy (Sheble, 2016).

Qualitative synthesis, or meta-synthesis, is a method used to synthesize the findings of multiple qualitative studies (Finfgeld-Connett, 2010), although, sometimes, both qualitative and quantitative studies are included in the analysis (Dixon-woods et al., 2006). As a counterpart to meta-analysis, meta-synthesis takes advantage of qualitative research and explores deeper insights to help achieve a broader understanding of a phenomenon across contexts, identify research gaps, generate new concepts and models, and inform policy and practice.

The first qualitative synthesis approach, meta-ethnography, was developed by Noblit and Hare (1988) in the field of education. Since then, qualitative synthesis has been widely used in psychology, medicine, nursing, and management. For example, 381 synthesis studies examining qualitative research were identified from 1994 to 2011 in the health field (Tong, Flemming, McInnes, Oliver, & Craig, 2012). However, in the field of LIS, a meta-synthesis approach has only been explored in a few areas. For example, using a meta-ethnographic approach, Duggan and Banwell (2004) analyzed 20 relevant studies and summarized the key factors in effective information dissemination. In addition, Everhart and Johnston (2016) combined six studies conducted by a research center supporting school librarian leadership. Given the relatively few studies that have been examined, Urquhart (2011) suggested that meta-synthesis would help to make more sense of information behavior research, citing women's information behavior as an example.

Given that the meta-synthesis method has the potential to benefit LIS research and practice, and that it is a relatively new method in the

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https://doi.org/10.1016/j.acalib.2020.102217
Received 23 May 2020; Accepted 7 July 2020
Available online 24 July 2020
0099-1333/

field, a study is needed on how this method is currently used and how to encourage its use. In particular, LIS researchers could benefit from the contributions of a meta-synthesis study. A better understanding of the characteristics of meta-synthesis approaches would also help researchers understand the application of these approaches. These concerns raise the following research questions:

RQ1. What are the research contributions of meta-synthesis studies in LIS?
RQ2. How has the meta-synthesis method been used by LIS scholars?
RQ3. What are the main research topics of meta-synthesis studies in LIS?

A framework investigating meta-synthesis in LIS research

Forms of contributions

Although the meta-synthesis method was developed to create new theoretical concepts and theory development, scholars are concerned about whether existing meta-synthesis research has reached its full potential. Based on two broad categories, Finfgeld-Connett (2014) identified four types of contributions that have been produced in meta-synthesis articles: isolated findings, non-dynamic relationships, dynamic relationships, and models (Table 1).

Isolated findings include broad categories and concepts that are iteratively grouped and labeled. The data analysis process appears to end abruptly without providing further associations and explanations for the discrete categories. Consequently, they are often presented separately in texts or in tables. For example, several themes are found and listed in the finding sections followed by supporting data but the relationships between themes are not provided or discussed. However, Finfgeld-Connett (2014) suggested that the categories grouped by a meta-synthesis approach are more efficient, convincing, and broad.

In terms of non-dynamic relationships, associated findings are reported, but there are no articulated relationships. This means that the integration of concepts is less complex (Kearney, 2001a) instead of being obvious. For example, based on the development of themes from coding and categorizing (i.e., isolated findings), an overarching theme is identified to gather other themes. These findings are still static since no interactions between the themes have been clearly presented. Findings within non-dynamic relationships are sometimes illustrated in figures where concepts overlap or have no directional arrows.

In contrast, findings with dynamic relationships provide complex interpretations and logical associations of individual themes (Kearney, 2001a). Pathways and interactions can be seen in the findings showing temporal or casual relations (Corbin & Strauss, 2008). For instance, the synthesized themes reveal the practice in different stages and constitute a process or a continuum. Some themes also simultaneously affect each other, providing explanations to the behavioral or emotional changes among human being. Dynamic relationships involving uni-directional and bi-directional relationships are frequently illustrated in figures using arrows.

Models have been defined as abstract concepts and their relationships (Corbin & Strauss, 2008) that offer comprehensive and theoretical explanations of phenomena in a particular context. Compared to the former types of contribution, models have the highest level of complexity and sophistication. In meta-synthesis research, model substantiation and model development can be achieved (Finfgeld-Connett, 2014; Everhart & Johnston, 2017). Model substantiation refers to the use of an a priori framework for data analysis, preferably with the intention of expanding and elaborating on the a priori framework. Accordingly, model development creates a new model with inductive synthesis and integration of multiple dynamic processes that are reciprocally connected (Finfgeld-Connett, 2014).

Meta-synthesis methodology

A meta-synthesis method involves several approaches (Table 2) that differ in the types and quantity of the included studies, the selection and assessment of relevant studies, and most importantly, the extraction and synthesis of the findings. Considering the variation in the use of terminology, we provide a critical review of the terms (Barnett-Page & Thomas, 2009).

Meta-ethnography (Noblit & Hare, 1988) is believed to underpin most existing meta-synthesis approaches, which refers to the synthesis of ethnographic and interpretive research. Researchers gather findings from a small number of qualitative studies and suggest three ways to integrate their findings. The first, *reciprocal translational analysis*, mutually translates studies to identify how the selected studies are similar. The second technique is *refutational synthesis*, showing that findings can still be translated into other findings even though there are disagreements among the findings. This process explores and explains the contradictions between studies. The third, *lines-of-argument synthesis*, addresses how researchers can arrange similarities and discrepancies among studies and put them into an interpretive order (Noblit & Hare, 1988; Tong et al., 2012).

Grounded theory has also been used to combine findings of qualitative research (Kearney, 2001b). It is a general method to develop theories from data by an iterative process (Corbin & Strauss, 2008). In grounded theory synthesis, primary studies are collected through theoretical sampling in addition to general searching. To analyze previous findings, procedural coding and theoretical coding, constant comparison, and memos are adopted.

Critical interpretive synthesis (CIS) is informed by meta-ethnography and grounded theory. However, it differs in that CIS can be applied to a large number of qualitative and quantitative findings. In order to include as many and various types of relevant documents as possible, a broad question and a broad search strategy is applied at the beginning, with modification later in the process (Dixon-woods et al., 2006).

Another approach is a meta-study (Paterson, Thorne, Canam, & Jillings, 2001). The major difference between a meta-study and the other methods is that a meta-study includes three components: 1) meta-data-analysis, similar to meta-ethnography, employing an interpretive comparison of similarities and differences of findings across studies; 2) meta-method, which investigates the research methods applied in primary studies; and 3) meta-theory, which scrutinizes the philosophical,

Table 1
Forms of contribution.

Forms of contributions		Description	Reference
Isolated findings		Findings iteratively grouped and labeled without associations.	Finfgeld-Connett, 2014
Findings in relationship	Non-dynamic relationships	Findings reported in obvious associations without being clearly articulated.	Finfgeld-Connett, 2014; Kearney, 2001a
	Dynamic relationships	Findings in complex and logical relations, such as temporality and causality.	Finfgeld-Connett, 2014; Corbin & Strauss, 2008; Kearney, 2001a
	Models	Findings integrated and contextualized into a comprehensive theoretical model.	Finfgeld-Connett, 2014; Corbin & Strauss, 2008; Everhart & Johnston, 2017

Table 2
Meta-synthesis approaches.

Approach	Description	Reference
Meta-ethnography	Synthesis of interpretive research, through reciprocal translational analysis, refutational synthesis, and lines-of-argument.	Noblit & Hare, 1988, Noblit, 2019, Tong et al., 2012
Grounded theory synthesis	Synthesis formulated using the grounded theory method.	Kearney, 2001b
Critical interpretive synthesis	Review and synthesis of multi-disciplinary and multi-method research.	Dixon-woods et al., 2006
Meta-study	Multi-faced synthesis consisting of meta-data, meta-method, and meta-theory analysis.	Paterson et al., 2001
Thematic synthesis	The development of initial, descriptive, and analytical themes through synthesis.	Thomas & Harden, 2008

cognitive, and theoretical perspectives underlying the studies.

Thematic synthesis (Thomas & Harden, 2008) applies thematic analysis that has been widely used in primary studies to synthesize findings at a broader level. As for data collection and selection, this approach applies a systematic search strategy that is similar to that of meta-analysis. Conceptual saturation and sensitivity analysis are also recommended. Specifically, conceptual saturation is a principal that the collection of primary studies depends on the range of concepts in the studies. For example, including 10 studies will not change the results when the concepts found in 5 studies are already saturated. In addition, sensitivity analysis is conducted after the whole synthesis to explore whether the integrated findings can be affected by primary studies of poorer quality, since some meta-synthesis researches include all relevant studies regardless of their quality. As for data analysis, thematic synthesis approach follows grounded theory, and initial codes and descriptive themes are inductively formed through constant comparison. The generation of analytical themes is also similar to further interpretations in meta-ethnography.

A meta-synthesis applies different techniques to collect literature (Table 3). These include literature searching (involving reference databases, key authors, key journals), references and citation tracking, monitoring, and theoretical sampling (Finfgeld-Connett, 2018). For example, researchers can monitor newly published articles through alerting services since a meta-synthesis often takes months to complete. They can also purposefully collect primary studies to meet the needs of theoretical development. In addition, Farnia, Jaulent, and Steichen (2018) reviewed three key papers (i.e., Cochrane reviews) to identify missed studies. Wozney et al. (2017) also searched various search engines including non-academic sources such as Google.

Inclusion/exclusion criteria are used to select eligible studies. According to PRISMA (Moher, Liberati, Tetzlaff, Altman, & the PRISMA Group, 2009), there are two types of eligible criteria: related topic and research characteristics. Luetkemeyer (2016) selected primary studies based on document type and whether they were peer-reviewed. Research funding has also been used as a criterion (Everhart & Johnston, 2017). Additionally, studies have been excluded based on their methodology (Lawrence, 2013).

Critical appraisal of the quality of primary studies is important in synthesis research. Only studies with high quality or at least with high quality sections are recommended to be included for further analysis (Dixon-woods et al., 2006). It should be noted that quality appraising tools cannot be used to assess an actual study but can only be used to evaluate what was reported about a study (Finfgeld-Connett, 2018). Majid and Vanstone (2018) identified some "high-quality" tools, such as Critical Appraisal Skills Program (CASP) checklist, Joanna Briggs Institute (JBI) Critical Appraisal Checklist and Consolidated Criteria for Reporting Qualitative Studies (COREQ). These tools differ in methods and purposes. For example, the CASP checklist for qualitative studies (CASP, 2018) consists of 10 questions considering results, validity, and transferability. The JBI checklist (JBI, 2016) involves 10 questions related to five aspects (i.e., congruity, reflexivity, voice of participants, ethics, and flow) while COREQ (Tong, Sainsbury, & Craig, 2007) critiques 32 structured statements in three domains (i.e., research team and reflexivity, study design, and analysis of findings). In addition, Catalano (2013) applied the Evidence Based Librarianship (EBL) critical appraisal checklist (Glynn, 2006) for assessment. The Mixed Methods Appraisal Tool (MMAT) has also been used (Radomski et al., 2019), which provides different sections to assess studies with different designs.

Research topics

Meta-synthesis has only recently received some consideration in LIS literature (Sheble, 2016). For example, Urquhart (2010) encouraged the use of meta-synthesis in information behavior research, suggesting that this method can illuminate researchers' understanding of concepts in the field. Bawden (2012) compared the methods for gaining qualitative understanding of documented information, and CIS was suggested as the most appropriate. Furthermore, meta-ethnography has been recommended for theory development (Everhart & Johnston, 2017). Currently, meta-synthesis research in LIS has only been conducted on a limited number of topics (Table 4).

Study design

Data collection

Web of Science (WoS) (SCIE, SSCI, A&HCI, CPCI-S, CPCI-SS&H, ESCI) and EBSCO (LISTA) was searched using the words "*meta synthesis*" *or* "*qualitative synthesis*" *or* "*meta ethnograph**" *or* ("*grounded theory*" *and* "*synthesi**") *or* "*thematic synthesis*" *or* "*critical interpretive synthesis*" *or* "*meta study*" in the field of "topic" and "all fields" respectively on April 17, 2019. The search in WoS was limited to the *Information Science & Library Science* journal category, which yielded 97 results, and 65 were found in LISTA. After removing 20 duplicates, 142 articles remained.

Table 3
Approach to building a body of literature for analysis, inclusion/exclusion criteria, and critical appraisal tool.

Methodology	Description	Reference
Approach to building a body of literature for analysis	Reference databases, key authors, key journals/proceedings, references and citations tracking, monitoring, theoretical sampling, key papers and search engines.	Finfgeld-Connett, 2018; Farnia et al., 2018; Wozney et al., 2017
Inclusion/exclusion criteria	Related topic, language, publication year, document type, peer-review status, funding and methodology.	Moher et al., 2009; Everhart & Johnston, 2016; Luetkemeyer, 2016; Lawrence, 2013
Critical appraisal tool	CASP, JBI, COREQ, EBL and MMAT.	Majid & Vanstone, 2018; Glynn, 2006; Radomski et al., 2019

Table 4
Research topics.

Research topic	As defined by	Example
Health informatics	"The interdisciplinary study of the design, development, adoption and application of IT-based innovations in healthcare services delivery, management and planning." (NLM, n.d.)	Wozney et al., 2017
Information behavior	"The currently preferred term used to describe the many ways in which human beings interact with information, in particular, the ways in which people seek and utilize information. Information behavior is also the term of art used in library and information science to refer to a sub-discipline that engages in a wide range of types of research conducted in order to understand the human relationship to information." (Bates, 2010, p.2381)	Catalano, 2013
Library user services	"… actively exploiting the collection to satisfy the information needs of library users." (Haider, n.d.)	Bales & Gee, 2012
Information literacy	"Skill in finding the information one needs, including an understanding of how libraries are organized, familiarity with the resources they provide (including information formats and automated search tools), and knowledge of commonly used research techniques. The concept also includes the skills required to critically evaluate information content and employ it effectively, as well as an understanding of the technological infrastructure on which information transmission is based, including its social, political, and cultural context and impact." (Reitz, n.d.-a)	Shenton, 2013
E-government	"The use of information and communication technologies, particularly the Internet, in government." (Chadwick, n.d.)	Dekker & Bekkers, 2015
Human-computer interaction	"A larger discipline that deals not only with the design of the screens and menus, but with the reasoning for building the functionality into the system in the first place. It is also concerned with the consequences of using the system over time and its effects on the individual, group and company." (PCMag Digital Group, n.d.)	Clemmensen, Kaptelinin, & Nardi, 2016
Information system	"A computer hardware and software system designed to accept, store, manipulate, and analyze data and to report results, usually on a regular, ongoing basis." (Reitz, n.d.-b)	Lawrence, 2013
Information management	"The skillful exercise of control over the acquisition, organization, storage, security, retrieval, and dissemination of the information resources essential to the successful operation of a business, agency, organization, or institution, including documentation, records management, and technical infrastructure." (Reitz, n.d.-c)	An et al., 2015

Forty articles remained after excluding 54 articles on non-LIS-related issues (which were mainly published in *Qualitative Health Research* and were related to clinical problems): 6 non-English articles, 10 book reviews or editorial comments, 12 articles discussing reviews and meta-analyses, as well as 17 articles searched in error (e.g., grounded theory research). Since our study aimed to analyze the empirical use of the method, we also excluded three purely methodological discussions about applying the meta-synthesis method in LIS (Everhart & Johnston, 2017; Urquhart, 2010, 2011).

The current analysis focuses on LIS-related issues in LIS-oriented journals. However, some related articles could have been published in non-LIS-oriented journals, making it impossible to collect a comprehensive set of articles due to interdisciplinarity. To find more relevant studies, the references and citations of the 40 previous articles and the three methodological articles were checked using *Google Scholar*, yielding four additional relevant articles. By reading the titles, abstracts, and references of included studies, additional search terms were identified (e.g., refutational synthesis and ecological triangulation) but no additional relevant studies were located using the updated search strategy. Finally, 44 LIS-related syntheses were aggregated in this study.

Content analysis

We first extracted the bibliometric information (authors, title, publication year and source) and sample size (the number of primary articles included) of each meta-synthesis study. To answer the research questions, we also coded the forms of contributions (RQ.1), meta-synthesis approach, literature search, inclusion/exclusion criteria, critical appraisal tools (RQ.2) and research topics (RQ.3) according to the framework.

The two authors each coded eight articles as a pilot study. Coding agreement of all variables (calculated by the Kappa coefficient) was reached for the following: forms of contribution (0.619), synthesis approach (0.733), literature search (0.847), inclusion/exclusion criteria (1.000), appraisal tools (1.000), and research topics (1.000). The main disagreements were related to the types of contributions, e.g., isolated findings organized by existing frameworks. Disagreements were discussed until the two authors reached a consensus. Then, one author coded the remaining articles independently, and consulted with the other author when questions arose. Other research topics, approaches, ways of searching, criteria, and tools that were not included in the framework were also extracted.

Results

Overview

A total of 44 synthesis studies related to LIS were examined. These studies were published mainly in *Journal of Medical Internet Research* (9), *Journal of American Medical Informatics Association* (2), *Journal of Documentation* (2), *School Library Research* (2), *Electronic Library* (2) and *Government Information Quarterly* (2). The syntheses were published from 2004 to 2019, with most published in the past five years (33, 75%).

The included synthesis studies examined different numbers of primary studies, ranging from 2 to 229. Meta-synthesis studies with a small sample size were very focused, and sometimes the raw data from these studies were available to the authors (Skågeby, 2012). However, the sample size of a meta-synthesis study also related to the type of approach used. For instance, Noblit and Hare (1988) noted that examining two to six studies is commonplace in a meta-ethnography whereas CIS can be applied to a substantial body of data (Dixon-Woods et al., 2006). To synthesize the findings of 229 articles, a citation network analysis was conducted simultaneously with meta-synthesis (Desrochers, Paul-Hus, & Pecoskie, 2017).

Forms of contributions

As shown in Table 5, 22 studies contributed isolated findings. For example, Derakhshan and Singh (2011) concluded that the integration of information literacy into the curriculum should be implemented from four separate aspects: collaboration, information literacy skills, information literacy pedagogy, and knowledge. Six studies provided findings on non-dynamic relationships such as a three-layer framework (macro, meso and micro) of knowledge management benefits

Table 5
The forms of contributions.

Forms of contributions	Number	Percentage
Isolated findings	22	50.0%
Non-dynamic relationship	6	13.6%
Dynamic relationship	6	13.6%
Model development	10	22.7%

(Yahyapour, Shamizanjani, & Mosakhani, 2015). Another six studies contributed findings on dynamic relationships. For instance, three time periods were identified to show the progression of technology changes to meet users' needs (Zimmerman & Chang, 2018). Allen, Vassilev, Kennedy, and Rogers (2016) also identified factors influencing the negotiation of self-management support in patient online communities.

A model was used in 10 synthesis studies, contributing to both model substantiation and model development. For example, concepts from 12 different stages models of e-government were synthesized into an expanded e-government development model (Lee, 2010). In addition, Almuftah, Weerakkody, and Sivarajah (2016) constructed a new model of information dissemination.

Meta-synthesis approach

As shown in Table 6, nearly half of the articles adopted a thematic synthesis approach (20, 45.5%) (e.g., Cox et al., 2017). Some studies used other methods to complement the thematic synthesis, such as principal component analysis and the Delphi method. For example, Sheikhshoaei, Naghshineh, Alidousti, and Nakhoda (2018) identified the maturity features of a digital library by assessing 68 studies using a thematic approach. The maturity features were then validated by experts using a three-round Delphi technique, after which a five-level capability maturity model was developed.

Twelve articles applied a meta-ethnography approach (27.3%). CIS was used in six studies (13.6%) to analyze a large amount of data from the findings of both qualitative and quantitative research (e.g., Catalano, 2013; Häusner & Sommerland, 2018). For example, Catalano (2013) developed concepts first based on quantitative data and then explained the concepts based on qualitative data. Two articles used meta-study research (4.5%), while only one study used the grounded theory approach (2.3%) (Schmidt-Kraepelin, Thiebes, Stepanovic, Mettler, & Sunyaev, 2019). Qualitative content analysis and text analysis (e.g., Desrochers et al., 2017) were also used for synthesis (3, 6.8%).

We investigated the distribution of these forms of contributions among different approaches (Table 6) and found that among 22 articles reporting isolated findings, 12 applied thematic synthesis and four used CIS. Another 10 models equally used meta-ethnography and thematic synthesis, and these two approaches included all types of findings.

Approach to building a body of literature for analysis

Searching in reference databases was the most popular method to search for literature (Table 7), including in general databases (e.g., Web of Science, Scopus) and professional databases (e.g., LISTA, PubMed, Cochrane Review Library). The second most common method was backward tracking through reference lists of the included articles and forward tracking of the citations that they cited. Fourteen studies found relevant literature through search engines (e.g., Byrne & Pickard, 2016; Khan, Kim, & Chang, 2018). Other studies (11, 25.0%) also restricted the search to key journals or key proceedings (e.g., Bales & Gee, 2012) and related web pages (Ekeland, Hansen, & Bergmo, 2018; Shenton, 2013). Five studies found relevant articles through key papers. For example, Gooch and Roudsari (2011) checked existing reviews. Additionally, authors and experts were directly contacted to find relevant papers in two studies.

Table 7
Preferences for literature search methods.

Literature search methods	Number	Percentage
Reference databases	36	81.8%
Reference and citation tracking	21	47.7%
Search engines	14	31.8%
Key journals/proceedings	11	25.0%
Key papers	5	11.4%
Key authors	2	4.5%
Theoretical sampling	1	2.3%
Personal knowledge and serendipity	1	2.3%
Pearl Harvesting Method	1	2.3%
Monitoring	0	0

Only one article reported theoretical sampling: Everhart and Johnston (2016) selected six articles that had common threads and could provide boundaries for theory development. In addition, new personal knowledge and serendipity (Desrochers et al., 2017) and the Pearl Harvesting Method (Chaushi, Chaushi, & Ismaili, 2015) were mentioned as techniques to find additional articles. However, no study in the data set monitored newly published papers in their synthesis.

Inclusion/exclusion criteria

As shown in Table 8, the most common criterion was the relevance of the research topics, including the examination of a target population. For example, Slater, Campbell, Stinson, Burley, and Briggs (2017) included studies on people between 15 and 24 years old to understand the experiences of mHealth technologies for noncommunicable chronic disease management among young adults.

Many researchers also selected literature according to the language (e.g., English) and years of publication. Sixteen synthesis studies selected samples by document type; journal articles, conference proceedings and grey literature were often included while book chapters, commentaries, and essays were excluded (e.g., Doblyte & Jiménez-Mejías, 2017). Thirteen synthesis studies also included research papers by methodology: considering qualitative findings (e.g., Yahyapour et al., 2015), both qualitative and quantitative findings (e.g., Ekeland et al., 2018), and comparative study designs (Syrowatka, Krömker, Meguerditchian, & Tamblyn, 2016). In addition, 10 studies reported including only papers from peer-reviewed journals (e.g., Clemmensen et al., 2016).

Table 6
Forms of contributions with different meta-synthesis approaches.

The number of studies	Isolated findings	Non-dynamic relationship	Dynamic relationship	Model	Total
Thematic synthesis	12	1	2	5	20
Meta-ethnography	2	3	2	5	12
Critical interpretive synthesis	4	2	0	0	6
Content analysis/text analysis	2	0	1	0	3
Grounded theory synthesis	1	0	0	0	1
Meta-study synthesis	1	0	1	0	2
Total	22	6	6	10	44

Table 8
Use of inclusion/exclusion criteria.

Criteria	Number	Percentage
Related topic	37	84.1%
Language	24	54.5%
Years of publication	19	43.2%
Document type	16	36.4%
Methodology	13	29.5%
Peer-review status	10	22.7%
Having abstracts	2	4.5%
The number of citations	1	2.3%
The reputations of the authors	1	2.3%
Full-text available	1	2.3%
Funding	1	2.3%
No inclusion/exclusion criteria	7	15.9%

Other criteria involved having abstracts (e.g., Urquhart & Yeoman, 2010), number of citations (Chaushi et al., 2015), reputations of the authors (Almuftah et al., 2016) and full-text availability (Ludwig, Arthur, Sculthorpe, Fountain, & Buchan, 2018). These special criteria were more often used for quality assessments. Specially, Everhart and Johnston (2016) reported that all of their included studies were supported by federal grant funding. Seven articles did not report how they selected the literature.

Critical appraisal

Most synthesis studies did not consider the quality or rigor of the investigations in the selected studies (25, 56.8%). Among these, Lee (2010) reported the reason for not considering these criteria. His research area, e-government, was a relatively new topic, and the research purpose was to identify the concepts underpinning the stage models. Therefore, the rigor of the model development process was not as critical as the relevance of the model (Lee, 2010).

CASP was the most frequently used tool, followed by MMAT, and EBL (Table 9). JBI and COREQ were adopted by only one study, respectively. However, these researchers applied other techniques to assess the quality of the included studies. Although some of the other studies did not apply standard checklists or tools, they evaluated the literature by considering if they were peer reviewed, how they were funded, and if they were in top-level journals (e.g., Clemmensen et al., 2016). Additionally, Klein and Myers' (1999) seven principles of evaluating interpretive research was also used for evaluation (Lawrence, 2013).

Research topics

As illustrated in Table 10, many synthesis studies included interdisciplinary studies related to health issues (14, 31.8%), such as patients' experiences with health technology (e.g., Cox et al., 2017) and the use of electronic health records among clinicians (Colicchio & Cimino, 2019). The social aspect of health issues has also recently become prevalent. For example, Allen et al. (2016) focused on patient online communities while Latulippe, Hamel, and Giroux (2017) studied social health inequalities.

Table 9
Use of critical appraisal tools.

Critical appraisal tool	Number	Percentage
No critical appraisal	25	56.8%
CASP	5	11.4%
MMAT	2	4.5%
EBL	2	4.5%
JBI	1	2.3%
COREQ	1	2.3%
Other appraisal strategies	8	18.2%

Table 10
Distribution of meta-synthesis research topics.

Research topic	Number	Percentage
Health informatics	14	31.8%
Library user services	6	13.6%
e-Government	5	11.4%
Information management	5	11.4%
Information literacy	4	9.1%
Information behavior	3	6.8%
Information system	2	4.5%
Human-computer interaction	2	4.5%
Research ethics	1	2.3%
e-Commerce	1	2.3%
Scholarly communication	1	2.3%

About 14% of qualitative synthesis research relates to library services focusing on the experiences of academic libraries with research data management (Perrier, Blondal, & MacDonald, 2018), individualized consultations (Fournier & Sikora, 2015) as well as school librarian leadership (Everhart & Johnston, 2016). In addition, a few synthesis studies examined collections (Bales & Gee, 2012; Caruso & Bradley, 2015).

There were an equal number of synthesis studies on e-government and on information management (5, 11.4%). Almuftah et al. (2016) evaluated e-government maturity models, and a 10-year retrospective study on stage models of e-government was also conducted (Lee, 2010). In the category of information management, An et al. (2015) studied the protection and effective management of personal information. Togia and Korobili (2014) focused on scholars' attitudes towards open access journals, while Duggan and Banwell (2004) constructed a model of effective information dissemination in a crisis.

Qualitative synthesis methods were used less in information literacy, information behavior, information system, and human-computer interaction. One meta-synthesis study was conducted on research ethics (Golder, Ahmed, Norman, & Booth, 2017), e-commerce (Zahra & Noruzi, 2018) and scholarly communication (Desrochers et al., 2017), respectively.

Discussion and recommendations

Forms of contributions

Syntheses studies on LIS-related issues have mainly reported isolated findings (N = 22, 50%, Table 5), focusing on separate aspects of a phenomenon. Although some studies simply "re-codified the known," others created new conceptualization considering the differences and similarities across contexts. For example, Perrier et al. (2018) translated the first-order constructs from various contexts into each other and then developed second-order and third-order constructs by constant comparison and interpretations. Based on the findings of the current analysis, researchers should move beyond simply re-organizing and re-categorizing existing qualitative research findings and employ them in relationships (Finfgeld-Connett, 2014). In particular, researchers should employ temporal and causal relationships to illustrate the dynamic processes and impact of variables on behavior and experience.

The results of some meta-synthesis studies extended the a priori model (e.g., Lee, 2010). However, Finfgeld-Connett (2014) argued that using an a priori framework is less valuable when the framework is well established because the synthesis of new concepts and interpretations might not be achieved as it is hampered by the existing knowledge. Some LIS-related syntheses used existing frameworks combined with open techniques, particularly in some thematic synthesis studies (e.g., Luetkemeyer, 2016), which combined an inductive formation of descriptive themes and a generation of analytic themes guided by a framework (Thomas & Harden, 2008). To encourage higher-level

contributions, scholars should refine and expand existing frameworks or create new ones.

Possible relationships between the types of contributions and meta-synthesis approaches were also found. For example, most of the studies adapting thematic synthesis made isolated contributions ($N = 12$, 60%, Table 6). Moreover, CIS generally reported isolated results or results in static relationships, which is possibly due to the inclusion of a larger number of quantitative and qualitative evidences (e.g., An et al., 2015; Bales & Gee, 2012). Finally, meta-ethnography and thematic synthesis studies provided four forms of contributions (e.g., Everhart & Johnston, 2017; Farnia et al., 2018; Luetkemeyer, 2016; Yahyapour et al., 2015), thus revealing their methodological maturity, extensive use, and value.

Preferred methodology recommendations

Based on the findings of the current study, this section provides recommendations on the preferred methodology in conducting a meta-synthesis research, involving meth-synthesis approaches, approach to building a body of literature for analysis, inclusion/exclusion criteria and quality appraisal tools.

Meta-synthesis approaches

Thematic synthesis has been the most frequently used approach, probably because thematic synthesis is relatively comprehensive as it is informed by both meta-ethnography and grounded theory. When first presenting this approach, Thomas and Harden (2008) provided systematic steps and detailed techniques with a workable example, making it rather simple to follow. A meta-ethnographic approach has also been used to some degree, through which novel and more powerful insights have been provided (Lawrence, 2013). Meta-ethnography can also preserve the richness of individual studies while still allowing for synthesis because it investigates similarities and differences across studies. In addition, thematic synthesis and meta-ethnography have been effective in providing all forms of synthesis contributions.

CIS supports both a large amount and diverse types of literature. Studies applying CIS collected data from website documents, interviews, surveys, and experiments and attempted to integrate the results from a number of different but interrelated qualitative and quantitative sources. Therefore, CIS is most proficient in providing a systematic understanding of complicated issues (Bales & Gee, 2012), such as library collections and services, personal information management, and meta-data management. In contrast, grounded theory synthesis has seldom been applied in LIS. The insufficient use of this approach may be due to the lack of grounded theory studies on a similar topic. Another synthesis approach that has not received adequate attention by LIS scholars is realist synthesis (Pawson, 2002), which was not included in Barnett-Page and Thomas' (2009) review. The aim of realist synthesis is to differentiate and accumulate evidence on the success and failure of a program mechanism across domains. It has been highly encouraged by both practitioners and policymakers.

Approach to building a body of literature for analysis

Meta-synthesis studies on LIS-related issues have adopted various methods to search for relevant literature, with most studies applying more than one method. However, a broader search strategy, more databases, and a longer time span would provide a more comprehensive pattern. Thus, LIS researchers conducting meta-synthesis studies could benefit from their expertise in recall. On the other hand, meta-synthesis investigations usually take months to complete. Therefore, monitoring is needed to identify possible articles published after the search date but before finishing the meta-synthesis process.

More relevant articles can also be found through key authors and key papers such as large reviews or professional reviews, but using these methods means identifying a specific research topic and an expert on the topic. Theoretical sampling is also recommended in that it requires purposefully selecting research reports in accordance with the needs of theory development. Search engines are often used due to their popularity and capacity to identify non-peer-reviewed literature (Finfgeld-Connett, 2018). However, their search functions are less sophisticated than those within academic databases.

Inclusion/exclusion criteria and quality appraisal tools

The inclusion and exclusion of searched articles are often based on topic relevance, methodology, and language. Several synthesis studies recognized that their results were limited to the articles selected for inclusion (e.g., Colicchio & Cimino, 2019). Similarly, most meta-synthesis studies did not use tools to assess the quality of the included articles. Although some provided reasons for not analyzing quality, the synthesis results could be questioned in terms of the rigor of their methodology and the strength of their findings if no quality assessment was applied (Perrier et al., 2018). Therefore, including diverse and high-quality evidence should be prioritized.

As for critical appraisal tools, the CASP checklist has been widely used in health informatics and some traditional LIS studies, particularly because it is easy to understand and use for novice researchers (Majid & Vanstone, 2018). Several prompts are given after each question in CASP to help researchers think about the issues. Glynn (2006) also developed the EBL checklist to determine the validity, applicability, and appropriateness of a study. This tool is specific to librarianship and general enough to effectively assess both qualitative and quantitative studies considering the population, data collection, study design, and results. In particular, EBL has been used in the investigations of students' information behavior and digital library maturity models. However, more work is needed to test its applicability.

The process of systematic collection, selection, appraisal, examination, and synthesis of previous literature is often time-consuming and laborious, requiring collaborations among multiple authors with different expertise. However, as Sheble (2016) indicated, the diminished reward for a single author in a co-authored synthesis might be a reason qualitative synthesis methods have not been used extensively.

Preferred and possible research topics

There is growing interest in evidence-based practice in LIS, suggesting that decision-making and service provision should be informed by high quality research evidence (Urquhart, 2010). As demonstrated in the results, the application of a meta-synthesis approach in LIS is increasing, with most synthesis studies being published in the past five years. This shows the possible value of this method in addressing LIS-related issues as well as the promising application in this field. This study also suggests possible journals and proceedings to publish meta-synthesis research.

Many of the synthesis studies were mainly conducted by LIS communities associated with health information, which aligns with Sheble's (2016) findings. As for traditional LIS issues, meta-synthesis methods have been used to guide library service and information management. The prevalence of meta-synthesis studies related to these three topics is probably because it can help inform policy and practice. For example, meta-synthesis research can help practitioners formulate evidence-based guidelines and implementation practices.

Meta-synthesis approaches can benefit information behavior research by identifying similarities and differences in the information behavior of certain user groups (Urquhart, 2011). This is supported by Catalano (2013) who argued that a synthesis study is necessary because some information behavior studies are individual or only related to a particular context. The richness of information behavior studies also suggests the benefits of meta-synthesis studies (Urquhart, 2011).

Martin and Jayakar (2013) reported that their motivation for conducting a synthesis study was that there was no consensus on how to

measure the performance of telecommunications governance. This suggests the potential use of meta-synthesis in constructing indices and in scientific evaluation, given that it provides a systematic approach to examine and combine various measurements in previous studies.

The meta-synthesis method has also been applied in theory development for topics such as library service, e-government and information literacy. Everhart and Johnston (2017) suggested that a meta-synthesis study can facilitate theory building in LIS. It can also be used to compare, interpret, and put together various existing frameworks, identify new metaphors, and create new conceptualizations.

Conclusions

This study examined the application of meta-synthesis in LIS research. The results suggest that this method is increasingly being applied, particularly in the past five years. Dynamic and casual relationships as well as models are highly recommended when producing meta-synthesis contributions, and these research contributions are partly contingent on the approaches adopted. Based on the results of this analysis, researchers are encouraged to understand the characteristics of meta-synthesis approaches and choose appropriate methods based on their research purpose and research data. Multiple methods for a literature search, screening, and assessment are also significant to ensure the quantity and quality of primary data. Lastly, many synthesis studies were conducted mainly by LIS communities associated with health issues, but this method has been undervalued in other topics such as information behavior, information system, and human computer interaction.

Author contributions

Juan Xie: Conceptualization; Formal analysis; Investigation; Roles/Writing - original draft.

Qing Ke: Conceptualization; Formal analysis; Investigation.

Ying Cheng: Conceptualization; Funding acquisition; Writing - review & editing.

Nancy Everhart: Methodology; Writing - review & editing.

Declaration of competing interest

None.

Acknowledgements

This research is financially supported by a research grant from the National Social Science Fund of China (grant number: 17BTQ014). The first author thanks the China Scholarship Council for financially supporting her visit to Florida State University.

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