Understanding and spotting research gaps through a systematic literature review

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***Abstract*: Various researchers have established the need for researchers to position their research problem in the research gap of the study area. This does not only indicate the relevance of the study but it demonstrates the significant contribution it would make in the field of study. The purpose of this paper is to conduct a systematic literature review on the concept of research gaps and provoke a discussion on the contemporary literature on types of research gaps. The paper discusses the various approaches for researchers to identify, align and position research problems, research design, and methodology in the research gaps to achieve relevance in their findings and study. A systematic review of the current literature on research gaps might assist beginning researchers in the justification of research problems. Given the acceptable tenet of developing a research agenda, design, and development on a research gap, many early career researchers especially (post)graduate students have difficulties in systematically identifying research gaps as a basis for conducting research work. The significance of this paper is two-fold. First, it provides a systematic review of literature on the identification of research gaps to undertake research that would challenge assumptions and underlying existing theories in a significant way. Second, it provides a theoretical discussion on the importance of developing research problems on research gaps to structure their study.**

***Keywords*: research gap; systematic review; research problem; PRISMA; journal articles; beginning researchers**

I. INTRODUCTION

Finding study gaps seem to be a difficult task for most beginning scholars. There were no systematic or defined methods for defining or characterizing research gaps for a long time (Miles, 2017). The perception of research gaps seems to be subjective. What can be perceived to be a non-gap by a researcher, may be another researcher's gap. The bulk of this disagreement about study gaps is based on interpretation. A Philosophy of Doctorate (Ph.D) or Masters thesis must make a significant, novel and scientific contribution of knowledge to the field of research. This so-called significant, novel, scientific contribution of knowledge is expected to address a research gap identified in the literature, research question or problem that has not been addressed in the researcher's area of interest (Müller-Bloch & Kranz, 2015a). Identification of where and how evidence falls short is critical for the formulation of a relevant research problem as well as giving direction on how to answer such research questions (Robinson et al., 2011). It is a struggle for many beginning researchers like doctoral students to identify and define exactly what constitutes a research gap in their studies (Miles, 2017). But several pieces of literature have made efforts to identify and define what constitutes a research gap (Carey et al., 2015; Miles, 2017; Robinson et al., 2011). Few studies have focused specifically on how researchers can systematically spot research gaps in research problems through specified approaches to construct significant research questions to contribute philosophically significant knowledge in their study field.

This paper seeks to systematically review the various articles on research gaps to identify the different approaches to identify a research problem in literature to conduct a study that could contribute significant knowledge to fill a conceptual, theoretical, empirical or methodological gap in the field of study. The systematic review shall be guided by the PRISMA framework for systematic reviews and employ peer-reviewed journal articles from electronic databases since they have become the first stop for literature searches and constitute the predominant source of published literature collections (Xiao & Watson, 2019).

PRISMA is Preferred Reporting Items for Systematic Reviews and Meta-Analyses and is an evidence-based minimum set of items developed by a group of experts to ensure the best of standards for reporting in systematic reviews and meta-analyses.

This paper is guided by the following research questions:

i. What are the various explanations of the concept 'research gap'?
ii. How are research gaps classified and defined in contemporary literature?
iii. What are the approaches to identifying research gaps in literature?

It is the firm belief of the reviewers that a systematic review on these questions might be very helpful to beginning researchers especially (post)graduate students in the identification of research problems and positioning of research gaps for their research activities.

II. RESEARCH METHODOLOGY

Inclusion criterion

This systematic review included studies that provide relevant information on the identification of research gaps in literature and the classification of research gaps. Literature reviews on specific topics not related to research gap identification through literature were excluded from the study. However, studies from all disciplines such as education, psychology, medicine, planning, and management and computer science were included to underscore the interdisciplinary significance of research gap identification in literature.

Identification of Literature

The literature search was started by first identifying major databases used by researchers across various disciplines. These were Google Scholar, ERIC and Scopus journal databases as these were the most frequently used online storage sites. To automatically crawl the various databases to identify related articles with the search keywords and phrases, Harzing's Publish or Perish Windows GUI Edition (7,30,3280.7752) was used to search Google Scholar, Crossref, Scopus and Web of Science.

The literature search was then conducted using the keywords or phrases, "research gaps", "identifying research gaps", "identification of research gaps", "types of research gaps", "research gaps types", "research gaps review", "review on research gaps", and "systematic review on research gaps". The preliminary relevance of each manuscript was determined by the article title. If the title seems to suggest a description of research gaps review, types of research gaps in literature or systematic review on research gaps, the full reference of the article is then obtained including details such as author, year, title, and abstract for further evaluation. Technological advancement has impacted the procedures for archiving and retrieval of academic information, the search was limited to articles published between 2011 and 2021 (articles published in the last 10 years) to enable the study to build the review on the recent literature on online databases.

The first search on Google Scholar using the broad keywords "research gap", and "types of research gaps" yielded search results of 4,880,000. When the phrase "identifying research gaps" was entered into the search, a total of 2,380,000 hits were shown. After reviewing the search results, a total of thirty-three potentially relevant articles were found. The keywords were then refined. A search on Science Direct using the keywords "identifying research gaps" yielded a thousand results. After the screening of the titles, a total of twenty-two articles were identified to be relevant to the topic for the research. A search on ERIC using the keywords "research gaps" yielded 10,783 articles, "types of research gaps" yielded 7,347 and "research gaps review" yielded a total of 1,345 articles. The researchers discovered 22 publications relevant to the idea of research gaps and categories of research gaps after doing an initial title screening. In total, 97 prospective articles were found from three sources, with 12 duplicates later ruled out.

Screening for inclusion

The abstracts of the 85 studies were read to further decide their relevance to the topic for the study – systematic review on research gaps. The screening for inclusion also took into consideration peer-reviewed articles published between the periods of 2011 and 2021. Only articles published within this period were included in the study. The 85 articles were further assessed based on the inclusion criteria and relevance of the article from the abstract after twelve duplicates were removed. The titles and abstracts were screened for relevance by two independent reviewers (Muka et al., 2020). A total of 38 articles were deemed relevant and full texts for these articles were obtained for quality assessment.

Quality and Eligibility Assessment

The full-text articles were skimmed through to evaluate for quality and eligibility. Journal articles and webpage articles on academic websites were deemed reputable and credible high-quality research information and therefore included in the study. Most articles were excluded because they lack information on the scientific identification of research gaps.

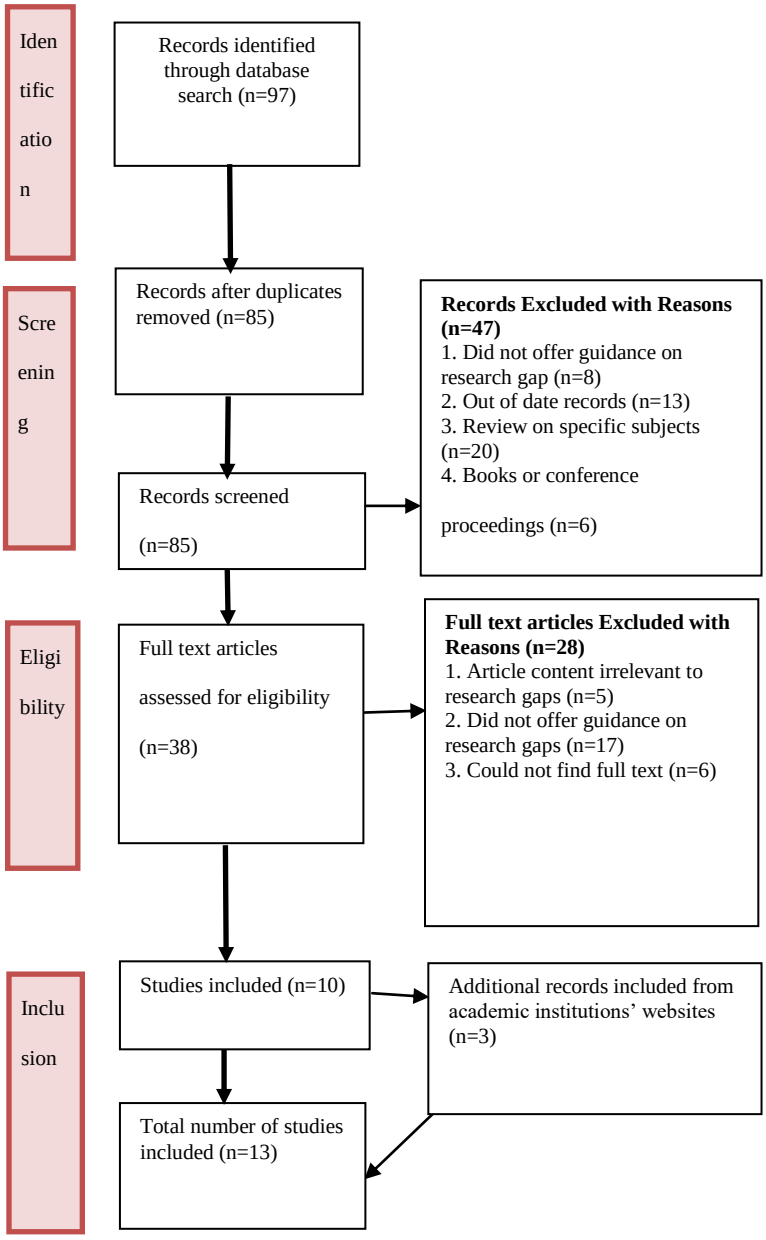
After careful reading and review, a total of 47 articles were excluded at this stage; eight were excluded because they lack guidance on the identification of research gaps; 20 were excluded because their subject matter was centered on other specific topics and 13 articles were observed to be out of the specified date range for the study. After the quality and eligibility evaluation, 38 studies from the initial search were selected for consideration in the next stage of full-text analysis.

Data Extraction and Analysis

From each article, the two reviewers individually extracted information from each article on research gap explanation, types or classification and definition of research gaps and the approaches to identifying research gaps in literature. They further excluded twenty-eight articles in the full-text analysis and data extract

ion stage; full-text for six articles could not be obtained, 17 did not offer guidance on research gaps while five articles had content irrelevant to the objectives of this study. After reviewing a few articles together, they came to a consensus regarding the exact information to extract from the articles. They maintained consultation and communication throughout the extraction process to resolve disagreements.

Table 1: PRISMA flow diagram for inclusion and exclusion of articles for the systematic review



The Concept of Research Gap

A research gap is the piece of information or knowledge in the research literature regarding an area of research interest that has not yet been explored or is under-explored. It can also be a problem not properly addressed as a result of insufficient data to support claims or an area of research not ventured and as such missing in the literature. A research gap may be an issue for which there is inadequate or missing information to draw an empirical conclusion (Snilstveit et al., 2016). The information on a research gap is so critical to the soul of research that researchers, funders, and advocates use it to understand areas of uncertainty to initiate research (Robinson et al., 2011). To identify a research gap, the goal is to find a 'space' or an opening in literature for contributing new research in a research area. Citation analysis, systematic reviews, the introductory section of research articles, and the discussions for future studies section of published articles can be used to identify research gaps. The best scientific approach is to gather a broad range of research articles on the research problem to identify the methods, approaches, research objectives and discussions that have been addressed already on the problem (Miles, 2017; Müller-Bloch & Kranz, 2015; Nyanchoka et al., 2019). This would guide the researcher to avoid repeating what has already been addressed in research on the problem of interest. The discussions and future research sections of research articles should be used to understand what researchers have found and where they point out future or additional research areas.

The research gap is an issue that has not been adequately addressed by research. This may be attributed to a lack of adequate empirical evidence to support the research argument, as well as a literature void, which is a lost or unfinished piece of data in the scientific literature that has not been investigated or ventured into yet (Robinson et al., 2011). It may be anything from a population of samples of various sizes, shapes, and other characteristics such as gender, religion, setting, race or age. It may occur as a result of an inability to comprehend the operation of specific devices, novel technical developments, or the examination of a newly discovered organism (Müller-Bloch & Kranz, 2015). The authors argue that research gaps may include identification of contradictions of findings in literature on particular phenomenon.

The identification of research gaps to formulate research problems would lead to research results that would contribute unique knowledge that would have a methodological, theoretical, conceptual and empirical bearing on the study field. A deeper understanding, identification and study of research problems is a cardinal issue in research and it is against this that the paper attempts to guide amateur researchers on research gap spotting.

Types of Research Gaps

In the review of relevant literature on the motivating issue for a study, new researchers must focus on some types of research gaps. The focus will guide the spotting of research gaps for their research. Müller-Bloch and Kranz (2015) created a research gap model based on the Robinson et al. (2011) paradigm. After undertaking extensive research and conducting literature reviews, they established their theoretical model on research gaps. Hypothesis on research issues served as the foundation for their structure. Six types of research problems have been identified and described by Jacobs (2011). These issues are similar to the study gaps identified by Müller-Bloch and Kranz (2015). Robinson et al., (2011) identified five types of research gaps as Population,

Intervention, Comparison, Outcomes, and Setting (PICOS). These research gap types however seem to lean towards the conduct of medical health research. According to Müller-Bloch & Kranz, (2015), there are six research gaps that researchers need to focus on to identify research problems to guide their research. These are Contradictory Evidence Gap, Knowledge Void Gap, Action-Knowledge Conflict Gap, Methodological Gap, Evaluation Void Gap; and Theory Application Void Gap. Miles (2017) proposed a research gaps model developed on the research gaps of Robinson et al., (2011) and Müller-Bloch & Kranz (2015). This new research model is made of seven core research gaps renamed as Evidence Gap, Knowledge Gap, Practical-Knowledge Conflict Gap, Methodological Gap, Empirical Gap, Theoretical Gap, and Population Gap. Miles (2017) argues that all research problems must address at least one of these seven research gaps to be considered as a problem worthy of research resources.

In the views of Robinson et al., (2011) and Miles (2017), the population gap, which refers to the size of respondents from which data was drawn for the study, could be a type of research gap for researchers, Müller-Bloch & Kranz (2015) believes otherwise. Population gap as a type of research gap refers to underserved populations that are under-researched. It might not have been adequately represented in research in evidence or prior research in terms of gender, ethnicity, age or race (Miles, 2017). The differences in the number and types of research gaps as indicated in this literature does not only indicate contradictions but sets confusion on the minds of beginning researchers in their journey to academic research as to what should exactly constitute research gaps and how these gaps must be identified in the literature.

In a research report, researchers are required to communicate at least in a statement the gap in scientific knowledge that the research attempts to fill. A gap statement can be found in the introduction section, purpose statement, or justification section of a research proposal to communicate the intent of the study. When reading literature for gaps, researchers must consider the relevance of vocabulary and text formulations in publications when they are reading literature for the objective of identifying gaps. Expressions in literature such as "…has/have not been…", "…is required/needed…", "…the key question is/remains…", "…it is important to address…", etc are important indicators of the direction toward which the study was directed.

Knowing where gaps exist in literature and the reasons that cause their existence might help in translating these gaps into particular research needs, as well as prioritizing and conducting relevant research to address these gaps. Early career researchers must master this critical skill to undertake meaningful impactful research in their chosen fields (Paul et al., 2021).

The Generic Approach

Though a good knowledge and deeper understanding of *what* types of research gaps exist for identifying research problems, the critical challenge with beginning researchers is the *process* of identifying the research gap. The systematic review process revealed in the literature some of the systematic procedures to apply in identifying research problems in any of these research gap types from the literature review for a study. Citation overview, systematic analyses, the methodology part of research papers, and eventually the discussions and future research directions can all be used by researchers to identify research gaps (Moeini, 2014; Munn et al., 2018; Nyanchoka et al., 2019b; Rayees, 2017; Robinson et al., 2011c; Xiao & Watson, 2019b) in the generic approach.

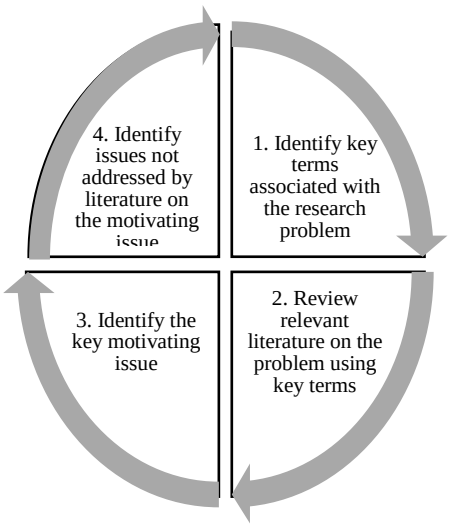


Figure 1: Steps to guide research gap identification

Identify key terms associated with the research problem

Identifying the major terminologies associated with the research problem is a sure approach to identifying literature associated with studies in the field. The synonyms of these terminologies might be used as alternative search words for the terminologies to identify closely related studies.

Review relevant literature on the problem using key terms

Gather relevant literature such as peer-reviewed journal articles, conference papers and books from digital databases and other sources to conduct a systematic, scoping, descriptive or narrative review to discover patterns and gaps in the literature (Patel et al., 2016). The review would also deepen the knowledge and understanding of the researcher on what has already been studied in the field and what gaps may be available to be field.

Identify the key motivating issue

The identification of the key motivating issue narrows the scope and focus of the study on a specific overarching

researchable issue. This enables the researcher to avoid vagueness in the research area and then focus their resources on the main research problem.

Identify issues on the motivating issue not addressed in literature

The pieces of information lacking in the literature and the problems not adequately addressed in literature must be identified at this final stage. They can be issues relating to theories, concepts, population, (Robinson et al., 2011) or contradictions (Müller-Bloch & Kranz, 2015) in the findings of the research reviewed.

III. RESULTS FROM THE SYSTEMATIC REVIEW

The researchers explored the definitions of research gap, classifications of research gaps and the approaches to identifying research gaps in published journal articles. These themes were categorized in a table to indicate the sources in which they can be located in journal articles. It was observed from the review that there are eight different approaches for the identification of research gaps and the most frequent gap identification approach mentioned in the literature was systematic reviews. The review also revealed nine types of research gaps that could be identified in the conduct of literature reviews and the descriptions provided (Table 1).

Table 2: Research gaps, research gap types and approaches to identifying research gaps in the systematic review

Research Gap	Types of Research Gap	Procedures/Approaches to Identifying Research Gaps
A missing piece of information or knowledge in research literature not yet explored or under explored (Moeini, 2014; Rayees, 2017; Robinson et al., 2011)	**Evidence gap:** Evidence is missing from a body of research on a particular topic (Miles, 2017; Müller-Bloch & Kranz, 2015) **Knowledge gap:** Knowledge might not exist in the actual field on theories and literature (Miles, 2017; Müller-Bloch & Kranz, 2015) **Practical-Knowledge gap:** Actual behavior of practitioners is different from their advocated behavior in research (Miles, 2017; Müller-Bloch & Kranz, 2015) **Methodological gap:** A variation in research methodology methods required to generate new insights or avoid distortions in findings (Miles, 2017; Müller-Bloch & Kranz, 2015) **Empirical gap:** Research findings need to be empirically verified (Miles, 2017; Müller-Bloch & Kranz, 2015) **Theoretical gap:** Application of theory to research is lacking (Miles, 2017; Müller-Bloch & Kranz, 2015) **Population gap:** Research on a population is inadequately represented (Robinson et al., 2011) **Conceptual gap:** Difference in theory and conceptual views (Jacquet & van der Does, 2020) **Theory Application void:** Theory must be applied to research to generate new insights (Miles, 2017; Müller-Bloch & Kranz, 2015)	**Scoping Reviews:** Research synthesis to map the literature on a particular topic or research area and provide an opportunity to identify key concepts (Nyanchoka et al., 2019; Peters et al., 2015) **Systematic Reviews:** Researcher reviews selected literature over a period of time (Moeini, 2014; Munn et al., 2018; Nyanchoka et al., 2019; Rayees, 2017; Robinson et al., 2011; Xiao & Watson, 2019) **Forward and Backward Referencing:** Identifying and examining references of works cited in an article and also locating follow-up research on the topic (Rayees, 2017) **Future Research and Limitations:** Compilation of future research and limitations of different articles to systematically analyze (Rayees, 2017) **Problematization:** Identifying and challenging the assumptions underlying existing theories (Sandberg & Alvesson, 2011) **Content Analysis:** Interpreting texts, images, and documents to make inferences (Moeini, 2014; Rayees, 2017) **Citation Analysis:** Citations of publications are analyzed for patterns of use (Moeini, 2014; Rayees, 2017) **Meta-Analysis:** Integrating the findings of previous studies through statistical analysis of literature (Rayees, 2017)

The identification and establishment of a research gap lay the foundation for solidifying a research problem and the research design. Research gaps are so crucial in the conduct of scientific research that beginning researchers are always minded to master the skill to identify gaps to justify the existence of the missing piece to be filled by their research. The systematic review on the identification of research gaps and the types of research gaps emphasizes its critical role in the scientific research endeavour.

IV. CONCLUSIONS

There is huge expectation and positive struggle among beginning researchers in the firm conceptual understanding of research gaps, research gap types, and approaches to identifying these gaps in prior research to design a study that would impact on the field. This study attempts a systematic literature review of contemporary research articles on research gaps to discuss its conceptual understanding to assist beginning researchers to have a deeper appreciation of its role in research. The researchers reviewed the various types of research as presented in literature and the approaches researchers could undertake to identify gaps in the literature. They believe that the paper would provoke a deeper reflection and discussion of research gaps and research problems among the academic community.

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