PHDRQ Model for Identifying Research Gaps and Formulating a Research Question During Ph.D. Program in India

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ABSTRACT

Purpose: *To develop a holistic and comprehensive model for scholars to systematically and scholarly identify research gaps and then formulate a research question during their Ph.D. program.*

Design/Methodology/Approach: *Postmodernism philosophical paradigm; Inductive research approach; Observation data collection method; Longitudinal data collection time frame; Qualitative data analysis.*

Findings/Result: *As long as the Ph.D. scholars can understand all six steps of the PHDRQ model and make mindful choices in each step they will be able to convert a complicated Ph.D. journey into an intellectually challenging and interesting journey thereby generating original and significant research outputs. A research question well formulated is half answered and most importantly the moment scholars mindfully formulate their research question 50% of their Ph.D. journey is complete.*

Originality/Value: *Of course, we have not invented anything new in the PHDRQ model. But, for sure we have discovered a systematic way of arranging all the available steps of identifying research gaps and formulating a research question in a well-thought-through process flow that is appropriate and applicable for scholars admitted to Ph.D. programs across any discipline.*

Paper Type: *Conceptual model.*

Keywords: Research Methodology; Research Design; Research Process; PhD; Ph.D.; Coursework; Doctoral Research; PHDRQ Model; Research Question; Research Topic; Postmodernism.

1. BACKGROUND :

One thing Ph.D. scholars must always remind themselves of throughout their Ph.D. journey is the fact that they will be awarded a Ph.D. degree for doing doctoral-level research. Doing doctoral-level research and generating research outputs such as research articles and a thesis determines the probability of success in getting a Ph.D. degree. However, the journey of doctoral-level research begins with a research question. It is thus inevitable and imperative that Ph.D. scholars understand the step-by-step process of identifying research gaps and formulating a research question in depth before even starting any of the steps in their Ph.D. journey.

The doctoral-level research which is the single most important requirement of the Ph.D. program is cognitively demanding and intends to create researchers who can create new knowledge or interpret existing knowledge about reality by using different perspectives and philosophical paradigms. Knowledge sharing requires autonomy, quality time, a stress-free brain for deep thinking, and the freedom to look for more meaningful findings. This is the single most important reason for making doctoral-level research flexible wherein the scientific world gives autonomy to Ph.D. scholars to formulate their question and answer it within 3-6 years. Nevertheless, only 50% of scholars admitted to Ph.D. in India completed, that too in ten years period. Various research studies have identified factors affecting the Ph.D. success rate across the world. To name a few a) scholar-supervisor/guide

relationship; b) mentorship; c) dissertation process; d) role of the department; e) role of peer qualities; f) transformational learning experience provided; g) level of curiosity and interest in reviewing the existing literature; h) planning and time management skills; i) level of creative thinking and writing skills; j) amount of freedom in the research project; k) level of a supportive environment for Ph.D. scholars' well-being; l) higher-education practices; m) supervisors' research capabilities and gender; n) expectations set by the research environment; o) Ph.D. scholars' expectations; p) support network; q) level of Ph.D. scholars' socialization with the research community; r) Ph.D. scholars' navigation system; s) different terminologies for various components of doctoral-level research are given by different disciplines creating undue confusion in scholars' minds; t) data collection methods which just play the role of data collection and it is just one of the steps of the doctoral-level research process being portrayed as the research methodology/design [1-47].

In addition to these factors, another important factor that contributes to the complications of the Ph.D. journey is beginning the journey on the wrong foot. Among various steps in the doctoral-level research process, the first step *(key input in the research process)* plays an important role which in other words is a result of scholars' genuine interest in a fact/phenomenon/reality/truth/dependent variable, intensive review of existing literature, locating an important research gap, and finally formulating a research question. Scholars must note that all the other steps in the doctoral-level research process are to be used to just answer the research question which is formulated by them during step 1 and most importantly the entire research environment/system must guide the scholars in answering the research question. *The probability of completing the Ph.D. program without complications is higher if the formulation of a research question is accomplished with a higher level of focus and interest by the scholar*. Because, if a scholar can complete the formulation of the research question then he/she will have a higher level of visibility about the choices to be made in the succeeding steps which will enable the scholar to design a robust and realizable research methodology to fulfill the key requirement of the Ph.D. program i.e., doing doctoral-level research [48].

In reality, a majority of stakeholders in the research education system have a lower level of clarity about the most important step of the doctoral-level research process i.e., formulating a research question. In addition to this lower clarity, a majority of them guide the Ph.D. scholars to begin the journey with a 'research topic' which is simply an output of research question formulation. This lower level of clarity and the beginning of the Ph.D. journey with the wrong foot is making it difficult for Ph.D. scholars to complete the journey successfully. We believe that if the scholars can begin their Ph.D. journey by allocating a higher level of focus and time toward formulating a research question their journey will be with a very lower level of complications and with a higher level of success rate. But this reality is knowingly or unknowingly, intentionally, or unintentionally suppressed by a majority of stakeholders in the research education system in India. In other words, this *suppressed reality* has resulted in creating humungous confusion about the research topic and research question among Ph.D. scholars in India.

2. OBJECTIVE :

A majority of research scholars (including a few ones who have completed their Ph.D.) have a predisposition in their minds that a 'research question' and 'research topic' are the same. We strongly recommend Ph.D. scholars come out of this false assumption. The research topic is a result of an effort to convert a complicated research question into an understandable, appealing, persuasive, and most importantly generalizable title for a research article or thesis. We suggest scholars convert their research question into a research topic only after the successful completion of research question formulation which is a step-by-step process. *A research question is a question that is yet to be answered or an answer that is yet to tested or verified*. A good research question seeks to improve knowledge about a fact/phenomenon /reality/truth/effect/dependent variable/outcome variable, and it is usually narrow and specific. Formulating a research question is the first and most significant step of the Ph.D. journey. If the key objective of a Ph.D. scholar is to complete their Ph.D. in time and without any complications then they have to spend a significant amount of time framing/formulating the research question. Charles Kettering's quote *"A Problem Well Stated is Half Solved"* suits this context. A research question well formulated is half answered and most importantly the moment scholars formulate their research question 50% of their Ph.D. journey is complete [48]. *Owing to such importance the key objective of this study is designing a step-by-step process of formulating a research question that would enable*

Ph.D. scholars in India to create an original question leading to an original answer.

3. PHDRQ MODEL FOR IDENTIFYING RESEARCH GAPS AND FORMULATING A RESEARCH QUESTION :

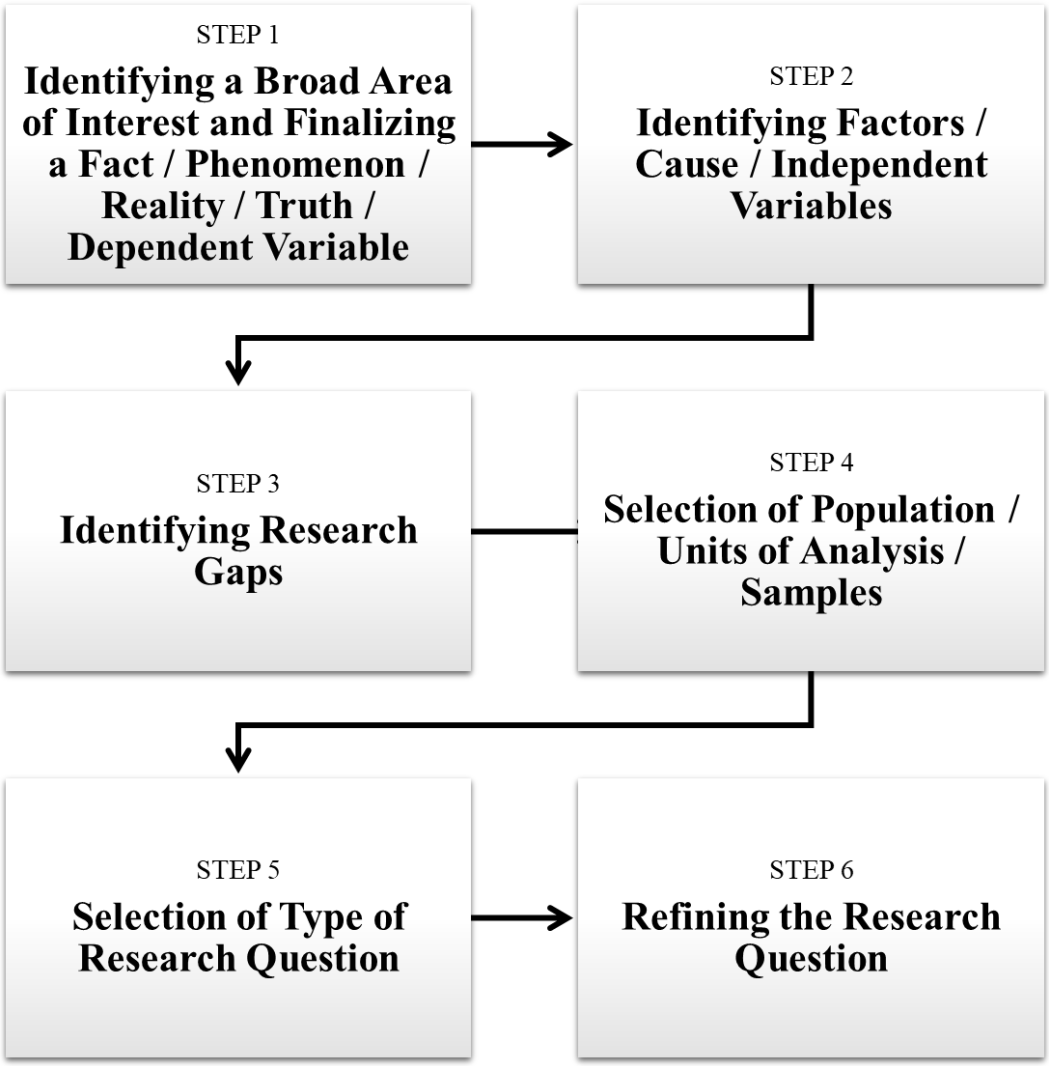

Fig. 1: PHDRQ model

The research question plays an important role in determining the research methodology/design in addition to providing clarity and a higher level of visibility about the research [48-65]. Based on our experience in research, teaching, and supervising/guiding research scholars in India and to avoid many confusions concerning the research question we have designed six steps research question formulation process which is named as PHDRQ (Formulating a Research Question during Ph.D.) model. The PHDRQ model is illustrated in figure 1.

We recommend Ph.D. scholars follow each step of the PHDRQ model to simplify their Ph.D. journey. Under any circumstances/context, they are suggested not to skip any of these six steps. Of course, we have not invented anything new in the PHDRQ model. But, for sure we have discovered a systematic way of arranging all the available steps of identifying research gaps and formulating a research question in a well-thought-through process flow that is appropriate and applicable for scholars admitted to Ph.D. programs across any discipline. In addition, the PHDRQ model would enable Ph.D. scholars in formulating a realizable research question. There are several books, materials, blogs, articles, etc that are produced by many authors about identifying research gaps. However, they have attempted to focus on a specific step of the research question formulation. Developing the PHDRQ model is an attempt to collate all the existing knowledge about identifying research gaps and formulation of research question that is useful for Ph.D. scholars (to-be-doctorates). If the Ph.D. scholars can understand and follow

every step of the PHDRQ model, they will be able to formulate a realizable research question and answer the same scholarly thereby completing their Ph.D. program without any complications and with great joy.

4. STEPS IN PHDRQ MODEL :

In addition to shedding light on all six steps, a closer look at each of them reveals how the PHDRQ model functions as a whole.

4.1. Step 1 - Identifying a Broad Area of Interest and Finalizing a Fact / Phenomenon / Reality / Truth / Dependent Variable:

We believe that the term 'interest' has a lot of weightage in a Ph.D. program. *"Interest is a powerful motivational process that energizes learning, guides academic and career trajectories, and is essential to academic success. Interest is both a psychological state of attention and affect toward a particular object or topic, and an enduring predisposition to reengage over time"* [66]. Ph.D. scholars need to first identify their broad area of interest (genuine) and then narrow down their interest to just one Fact / Reality / Phenomenon / Effect / Outcome Variable / Endogenous Variable about which they are passionate. We have listed below a few tricks to identify a broad area of interest and finalize a Fact/ Phenomenon/Reality/Truth/Dependent Variable.

- **Option 1** – Choosing the Fact / Reality / Phenomenon / Dependent Variable / Effect / Outcome which always left the scholars curious during their Post-graduation (PG) / Maters degree program.
- **Option 2** – If the scholars are already into teaching/academics, then choose the Fact / Reality / Phenomenon / Dependent Variable / Effect / Outcome which always left them curious while teaching their students.
- **Option 3** – If the scholars are practicing (working in fields other than academics), then choose the Fact / Reality / Phenomenon / Dependent Variable / Effect / Outcome which always left them curious while working/practicing.
- **Option 4** – Ph.D. scholars can also choose a Fact / Reality / Phenomenon / Dependent Variable / Effect / Outcome which always left them curious personally in their life. This choice might not be related to their area of specialization during PG/Masters and might lead to a Multi-disciplinary research question.

As step 1 of PHDRQ is based on the scholar's genuine interest, they should complete this step without any external support. Hereafter in this article, we will use the term 'Dependent Variable' to denote the Fact / Reality / Phenomenon / Effect / Outcome Variable / Endogenous Variable.

4.2. Step 2 - Identifying Factors / Cause / Independent Variables:

'Literatura' in Latin means *writing formed with letters*. Literature broadly is any collection of written work, an overview of previously published works on a specific dependent variable, and a survey of books, scholarly articles, and other authentic sources relevant. Understanding the existing literature ensures the research question formulated by the scholar is correct and they are headed in the right direction.

The moment scholars have finalized a dependent variable of their genuine interest and passion in step 1, they need to now understand it in depth. Scholars are advised to take the help of any indexing agencies to find out existing literature (existing knowledge) about their dependent variable through a preliminary literature review process. One of the easiest, most user-friendly, free, and open-access indexing agencies is 'Google Scholar'. To ensure search engine optimization, scholars need to type their dependent variable in the search bar of Google Scholar using the quotation mark ("__") as shown in figure 2. Forgetting to use the quotation mark might push the search engine to end up showing results that are not too narrow about their dependent variable as shown in figure 3. One can notice that the number of articles found by Google Scholar is 8,26,000 (figure 3) when not using the quotation mark and the number is 30,900 (figure 2) when using the quotation mark for a dependent variable 'human lifespan' (example).

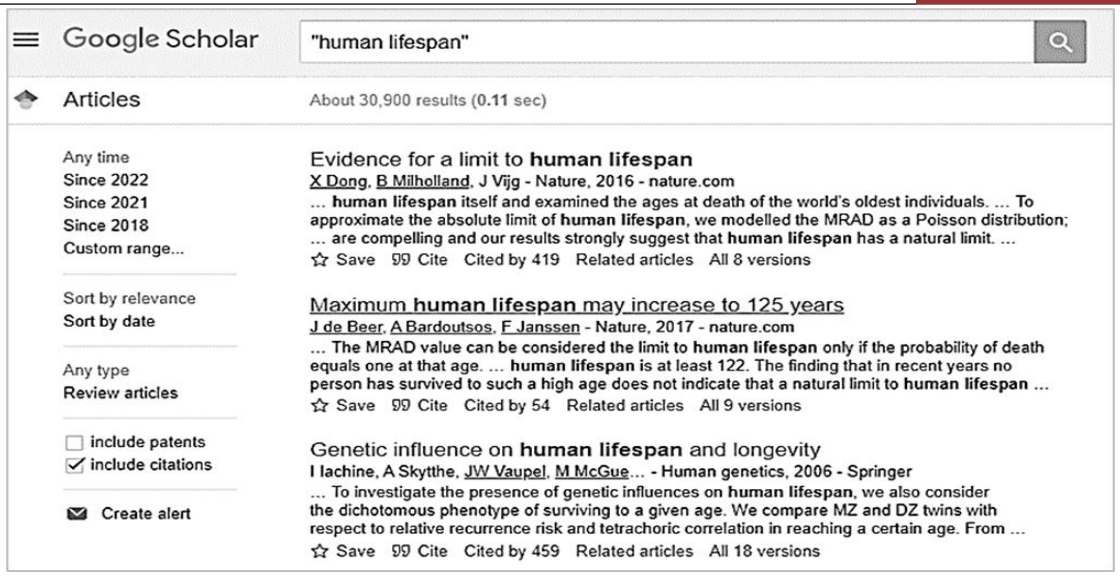

Fig. 2: Searching for existing knowledge about the dependent variable (with quotation mark)

Scholars must also be aware that their dependent variable might also have many other terminologies. They need to ensure making a list of all such terminologies and search for articles using all such different terminologies. Figure 4 shows such an example. 'life span' is also known as 'life expectancy' in the literature. Once scholars have searched all the articles related to the dependent variable they now need to look at the title of each of these articles and download those articles that are appropriate and are within their area of interest. This task might be tedious, and scholars may find it difficult to select the appropriate articles. However, they can also do the selection and deselection process even after downloading and reading the articles. Scholars are then recommended to read all the articles downloaded (they must ensure they are using their 'quality time' while reading them) and make a list of all the Factors / Causes / Independent Variables / Input Variables / Exogenous Variables that are already identified in the existing literature by other researchers and they have some or the other relationship with their dependent variable. Hereafter in this article, we will use the term 'independent variable' to denote the Factors / Causes / Independent Variables / Input Variables / Exogenous Variables.

In addition to listing all the independent variables already identified by other researchers, another key objective of the preliminary literature review is understanding the characteristics of independent variables such as whether they are i) observable or unobservable?; ii) directly measurable or unmeasurable?; iii) universal or local?; iv) formative or indicative or confirmatory?

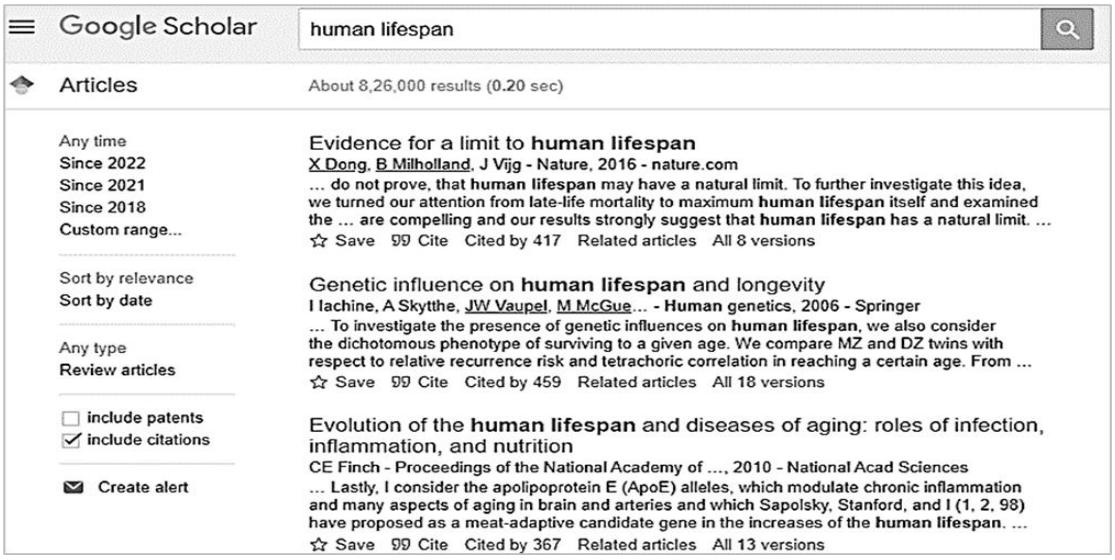

Fig. 3: Searching for existing knowledge about the dependent variable (without quotation mark)

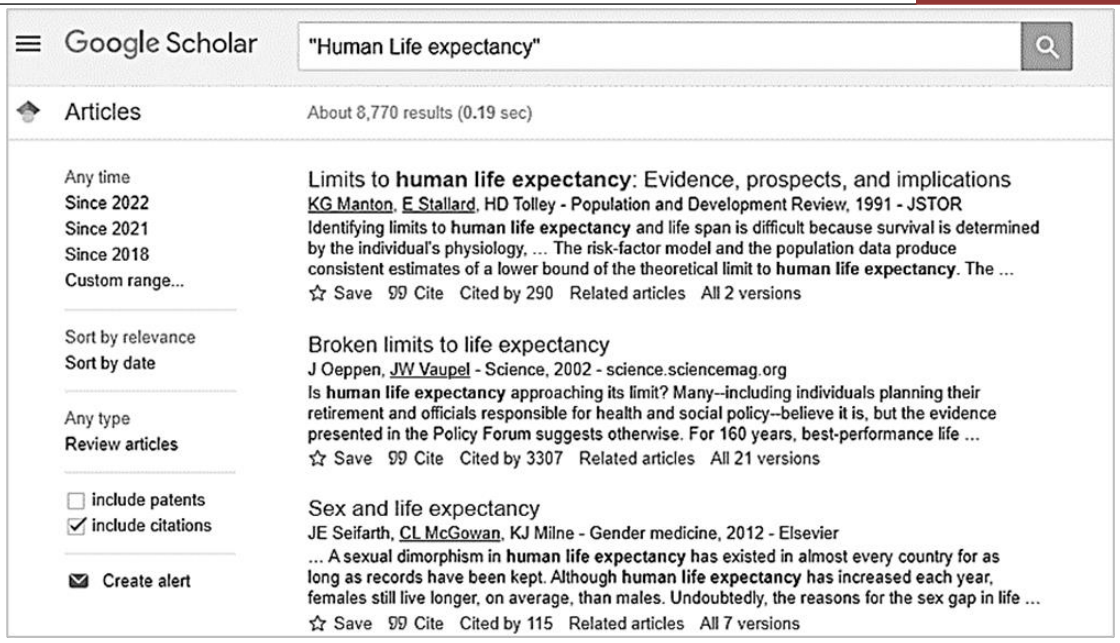

Fig. 4: Searching for existing knowledge about the dependent variable (with alternate terminologies)

Scholars will be able to understand why it is important to know the characteristics of independent variables when they reach the data collection and analysis stage of their doctoral-level research process. To enable Ph.D. scholars to collect data concerning independent variables in a systematic manner we have created a template as shown in figure 5. Scholars are recommended to collect data about all the independent variables individually in this form.

The ultimate aim of the preliminary literature review is to choose the independent variables of the research question. Scholars will now be in a better position to choose them as they have already listed them and understood their characteristics. Out of many independent variables that they might have found during the preliminary literature review they can now choose one or more based on any one or more of the following criteria.

- Level of research carried out by previous researchers on independent variables.
- Most researched independent variables.
- Most ignored independent variables.
- Oldest independent variables.
- Most recent independent variables.
- Trending independent variable.
- Your genuine interest.

Dependent Variable	:
Independent Variable	:
Relationship	: Direct/Indirect
Direct Observability	: Observable/Unobservable
Direct Measurability	: Measurable/Unmeasurable
Applicability	: Local/Universal
Capability	: Formative/Indicative/Confirmatory
Geographical Scope	: Local/Regional/National/International/Global
Discipline	:
Unit of Analysis/Sample	:
Year of Study	:
Authors	:
Title of the Paper/Book	:

Fig. 5: Preliminary literature review data collection template

4.3. Step 3 – Identifying Research Gaps:

Once the scholars have finalized the dependent and independent variables of their research question in step 1 and step 2 of the PHDRQ model respectively, now scholars have to identify research gaps concerning their chosen variables. The scholarly way of finding research gaps can only be achieved by doing a mega literature review. In this step, scholars need to read once again all the research articles that they have downloaded during the preliminary literature review (step 2) and collect data about many other components of the previous research. To enable scholars to collect data concerning all these components in a systematic manner we have created a template as shown in figure 6. After the completion of the mega literature review data collection in the recommended template, scholars need to evaluate the mega literature review data file to find the research gaps limited to their independent variables. We have listed below a few tricks to identify research gaps.

- List the anomalies i.e., something that is not addressed in the previous research about the chosen dependent and independent variables.
- List the gaps in each of the following components of previous research;
    - **Gap 1:** Location of study/Geographical Scope of the study
    - **Gap 2:** Population
    - **Gap 3:** Unit of Analysis/Sample
    - **Gap 4:** Research philosophical paradigms (Positivism; Interpretivism; Critical Realism; Postmodernism; Pragmatism)
    - **Gap 5:** Research approaches (Deductive; Inductive; Abductive)
    - **Gap 6:** Data collection methods (Experiment; Survey; Action Research; Grounded Theory; Ethnography; Case Study; Archival; Mono; Mixed; Multi)
    - **Gap 7:** Data collection method choices (Mono-method; Mixed-method; Multi-method)
    - **Gap 8:** Data collection time frames (Cross-Sectional; Longitudinal)
    - **Gap 9:** Sample size (Small; Medium; Large)
    - **Gap 10:** Sampling technique (Non-random; Random)
    - **Gap 11:** Data analysis techniques (Qualitative; Quantitative; Mixed)

The possible combination of the above eleven components indicates that there are probably 50 ways (minimum) of answering the same research question or providing a solution to the same research problem concerning any dependent and independent variables. This is how knowledge is developed about just one dependent variable. Ph.D. scholars might presume that there is already enough research done on their dependent variable. However, the reality is research is an ongoing process that takes a lot of time to understand just one dependent variable in depth. The in-depth evaluation will surely lead scholars to identify at least one research gap.

Year of Study	:
Authors	:
Title of the Paper/Book	:
APA Citation	:
Location of Study	:
Unit of Analysis/Sample	:
Philosophical Paradigm	: Positivism / Interpretivism / Critical Realism / Postmodernism/Pragmatism
Approach	: Deductive / Inductive / Abductive
Strategy/Method	: Archival / Observation / Meta-analysis / FGD / Action Research / Ethnography / Grounded Theory / Case Study / Phenomenology / Survey / Experiment
Choice	: Mono / Mixed / Multi
Time Horizon	: Cross-sectional / Longitudinal
Sample Size	:
Sampling Technique	: Non-probability (Non-random) / Probability (Random)
Data Collection Instrument	:
Data Analysis Techniques	:
Independent Variables	:
Dependent Variables	:
Key Findings	:
Limitations	:
Scope	:

Fig. 6: Mega literature review data collection template

4.4. Step 4 – Selection of Population / Units of Analysis / Samples:

In this step, Ph.D. scholars are required to finalize the population and units of analysis in which they are interested in understanding the variables they have selected in previous steps. Scholars are advised to limit the population based on their capability to collect data in the later stages of research. There is no standard rule about the size of the population in doctoral-level research. Scholars must avoid finalizing the population based on their level of initial enthusiasm and focus only on the accessibility of data.

The PHDRQ model at the end of step 4 delivers the following three key components of a research question.

- Dependent variable
- Independent variable/s
- Population / Units of analysis / Samples

4.5. Step 5 – Selection of Type of Research Question:

In this step, Ph.D. scholars are required to combine their dependent variable, independent variable/s, and population/units of analysis/samples to define their doctoral-level research question based on the research gap they have found during step 3 of the PHDRQ model. Scholars can formulate their research question in three different ways detailed below. However, they must ensure they know their competence level while choosing one or more types of research questions for their Ph.D.

Type 1 - Descriptive Research Question: This type of research question is formulated when scholars are interested in primarily describing their dependent variable or what is going on or what exists. For example, if scholars want to know what percent of the population would vote for a political party in the next Parliamentary election, they are simply interested in describing something. Typically, these research questions do not look for finding a relationship between dependent and independent variables and are hence suitable for the preliminary stages of research. However, for Scholars of Ph.D. in Literature Studies this type of research question is most common.

Type 2 - Relational Research Question: If scholars are interested in finding the relationships between their dependent and independent variables they can define their research question as relational. For example, a public opinion poll that compares what proportion (dependent variable) of Males and Females (independent variable) say they would vote for a Political Party (unit of analysis/sample) in the next Parliamentary election is essentially studying the relationship between gender and voting preference. While formulating a relational type of research question, scholars must remember to support their research question along with possible scenarios of relationships (also known as hypotheses/logical assumptions) such as i) there is no relationship between gender and voting preference (null hypothesis); ii) preference to vote is higher in male voters (research/alternate hypothesis 1); iii) preference to vote is higher in female voters (research/alternate hypothesis 2).

Type 3 - Causal Research Question: If scholars are interested in determining whether one or more independent variables cause or affect one or more dependent variables of their choice then they need to formulate a causal research question. For example, if we did a public opinion poll to determine whether a recent political advertising campaign (independent variable/cause) changed voter (units of analysis/samples) preferences (dependent variable/effect), we would essentially be studying whether the campaign changed the proportion of voters who would vote a Political Party in the next Parliamentary election. While formulating a causal type of research question, scholars must remember to support their research question along with possible scenarios of causal relationships such as i) there is no relationship between campaign and changes in the proportion of voters (null hypothesis); ii) campaign increases the proportion of voters (research/alternate hypothesis 1); iii) campaign decreases the proportion of voters (research/alternate hypothesis 2).

A few highly competent Ph.D. scholars may also think of these three research questions as being cumulative. In other words, a relational study presupposes that you can first describe (by watching or measuring) each of the variables you're trying to associate. Additionally, a causal study presupposes that you can both explain the cause-and-effect variables and demonstrate how they are connected. Of

the three types of research questions, causal research questions are likely the most difficult and time-consuming.

4.6. Step 6 - Refining The Research Question:

Before scholars finalize their research question they need to perform one last task which is modifying and refining their research question to achieve a manageable focus. Scholars must make sure that the research question is i) clear enough for their audience to understand without further explanation (clarity); (ii) focused enough to be answered completely in the space allotted for writing (focus); (iii) expressed in as few words as possible (conciseness); (iv) not answerable with a simple yes or no, but rather requires synthesis and analysis of ideas and sources before the composition of an answer (arguable); v) can be answered within prescribed timelines using available resources, and limited to your competence (manageability). Some examples of good and bad research questions are listed below.

- ***Unclear Research Question:*** What measures should social networking sites take to remedy the damage they cause?
- ***Clear Research Question:*** What steps should social networking sites like Facebook and Twitter have been doing to safeguard users' private information?
- ***Unfocused Research Question:*** What is the effect on the environment from pollution?
- ***Focused Research Question:*** What is the most significant effect of water pollution caused by industries on the lives of people living in the vicinity of industrial areas?
- ***Too Simple Research Question:*** How are doctors addressing diabetes in India?
- ***Appropriately Complex Research Question:*** What main genetic factors predict whether Indians will develop diabetes, and how can these commonalities be used to aid doctors in the prevention of diabetes?

5. CONCLUSION :

Ph.D. scholars must be aware of the fact that they are allowed to make any choice from step 1 to step 5 of the PHDRQ model. Formulating a doctoral-level research question must be purely based on the scholars' genuine interest and existing literature. No one will challenge the type of research question scholars have formulated as long as they can justify and defend their research question with the help of existing literature about the variables and population/units of analysis/samples of their research question. Scholars are recommended to dedicate at least one year of their Ph.D. journey after the coursework to formulating their research question. Many times, scholars will be tempted to choose a research question/problem based on trending topics or their Research Supervisor/Guide's interest, or their Institute's research area of interest, etc. It is fine to go with this option as long as scholars have verified the credibility of such a research question/problem by performing the preliminary and mega literature review tasks themselves explained in the PHDRQ model. By any chance whatsoever if scholars miss following any steps of the PHDRQ model then the probability of completing the Ph.D. program is very low.

It is the responsibility of every stakeholder in the research environment and system to ensure that the scholars are made aware of the steps involved in formulating a doctoral-level research question in addition to the importance of a research question in the Ph.D. journey. Designing robust coursework that is intended to build confidence in carrying out a high-quality preliminary and mega literature review is an appropriate way of fulfilling this responsibility. In addition, scholars must understand that formulating a doctoral-level research question is a step-by-step process and most importantly it remains the same for all disciplines. The only change is the acceptable type of research questions set by each discipline are different (dominance). As long as the Ph.D. scholars can understand all six steps and make mindful choices in each step they will be able to convert a complicated Ph.D. journey into an intellectually challenging and interesting journey thereby generating original and significant research outputs. A research question well formulated is half answered and most importantly the moment scholars formulate their research question 50% of their Ph.D. journey is complete.

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