

A Proven Map to Success with Engineering Research and Dissertation

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Abstract: *The lack of knowledge and confidence level, on the research progress as well as for bringing the research dissertation in quality sometimes makes the research scholars under trouble for the completion of their Post graduate or Doctoral degree. The current article is focusing on guiding the research scholars for their consistent research progress and in turn, to help them to get more confidence for the construction of their dissertation with a proper way of writing skills. This article summarizes the step-by-step procedure for the students and scholars their smooth way of carrying their research work.*

Keywords: Advisor, Advisee, Arksey and O'Malley's Frame work, Coding, Categorizing, Memoing, Scoping

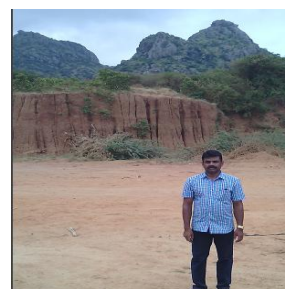
1. Introduction

Research and Dissertation, in general, is a challenging task for the students. The requirements, persistence and resilience are the major requirements for the successful research and its dissertation [1]. Dr. Subash Thanappan is a precursor to follow the rules and regulations systematically connected with the successful completion of his Masters and PhD degrees in the reputed institutions in India [22], [23], [24]. As the Master's and Doctoral Students are independent on their research, the guidelines are very important for them to follow their research work systematically and to complete their tasks on-time. According to Alena James E and Tracesec Slater (2013), a map for writing the dissertation is prime importance for finishing their tasks faster [8].

2. Research Progress

2.1 Reconnaissance / Preliminary survey

The researcher must investigate the current existing problems in a town or city where he/ she intend to carryout his/her research. Select the major problem in an area (Air, Water, Soil, Landslide, Erosion, Traffic congestion, Industrial pollution etc) which is of very keen to solve instantly. The reconnaissance survey must include investigating all the on-going activities, the cause for the problem, and the existing major negative impacts upon the problem. This survey can be done either through the structured questionnaire or the direct interview with the community / people affected / people interested / some experts / visual observation etc. The reconnaissance / preliminary survey help the researcher to highlight on one particular issue in an area. As much as possible, the number of photographs showing the raw data must be collected upon the visual observation and the site visit. The visual observation and investigation has been carried out by Dr. Subash Thanappan for his Doctoral research is shown in Fig 1(a) and 1(b).



1(a) Visual Observation



1(b) Site Investigation

Figure 1: Reconnaissance survey for the Research

2.2 Selection of the Advisor

According to Ray (2007), the advisor selection is a major task and the most significant decision by the students [21]. The relationship between Advisor and Advisee is a core element to the research success, say Simy Joy et al (2015), [20]. The Advisor must be selected such that the research area matches with their specialization. It is more advisable that the students / scholars must choose their advisors. According to Simy Joy et al (2015), the advisor must be capable of guiding the students / scholars with their own interest, personality, ability to graduate students fast and the career prospects for the students [20]. The Final Advisor – Advisee pairing is entirely depending on the faculty factors, faculty gender, faculty career stage, student factors, student nationality and the departmental factors as shown in Table -1.

2.3 Criteria for the Selection of Thesis Title

According to Sandeep B Bavdekav, 2016, Title selection is an important part in the early stage the research as it is the gate way to the contents [19]. As much as possible, the title must be simple, easy to read, interesting for the readers, and should be free from jargon, too many technical words, numbers and chemical formulas, say Jay N Shah, 2014, [14]. The title must be selected such that it grabs the attention, accurately describes the contents of the manuscript, and makes people want to read further (Amar A Sholapurkar, 2011; Sukhminder Jit Singh Bajwa, 2016), [1], [25].

Table 1: Factors influencing the pairing of Advisor - Advisee

<p>Faculty factors</p> <ul style="list-style-type: none"> - Available funding - Area of research - Personality - Ability to help students graduate them fast - Career prospects for advisee - Faculty Gender (Visibility, Commitment to research, Style of interpersonal interactions) - Faculty career Stage (Recent and Old area of research, Track record, Pressure to perform) 	<p>Departmental factors</p> <ul style="list-style-type: none"> - Pairing practices - Limits on number of students - Rewards for advising <p style="text-align: center;">↓</p>
<p>Students factors</p> <ul style="list-style-type: none"> - Qualification credentials ↗ - Level of interest - Behavior (Attitude) - Ability to contribute the research - Nationality - Linguistic capabilities 	<p>“Final Advisor – Advisee pairing”</p>

The waste words in the title like “A study of ...”, “Investigations of...”, “Analysis of...”, “Observations on...” etc must be avoided from the title. Also 10-15 words are appropriate for the title of the research, say Jay N Shah, 2014, [14].

An effective title should:

- Convey the main topics of the study.
- Unite the ideas to form one in-depth perception in a new way.
- View at the holes in the concepts in the published work of the professionals and other scholars.
- Embrace your creative side.
- Ahead of committing the idea, put it to the test.
- Create a swipe file (Scrap book) that includes a variety of resources and list of keywords.

2.4 Selection of Course work for Advisee

Especially for Doctoral researchers, the course work is a basic component, comprises of both compulsory and elective courses. After admission in PhD, a research scholar shall be required to undertake course work for a minimum period. For

example, Research Methodology is a compulsory subject for the scholars in order to plan, conduct and evaluate basic research. Furthermore, the course work enables the scholars the great knowledge upon their research area.

2.5 Enhancing the Scoping as a part of searching the Literature using Arksey and O’Malley’s Frame work

As the statement given by Helena ML Daudt et al (2013), the main goal of this scoping study is to examine the extent, range and nature of the research activity and to identify the research gaps in the pioneer literatures on the same area or theme work [10]. Arksey and O’Malley’s frame work shows 6 stages under the scoping studies. It includes:

- Identifying the Research Questions
- Identifying the relevant literatures
- Selection of the literatures
- Charting the relevant data / information
- Collecting, summarizing and reporting the results
- Consultation exercise – stakeholders to inform and validate the study findings, according to H Arksey and O’Malley L, 2005, [9]. Brace C, 1996 strongly point out that as the reviewing literature is on-going activity throughout the research process, it must be recorded in order by the Advisee [6].
- Always must start with the recent sources (Text books, magazines, Journals, Government reports, Internet web pages etc).
- After examining the title, if the literature matches for the study condition, copy the Abstract, References and Methodology, and Discussions.
- List out all the references in order in the reference list
- After reading the collected papers frequently, if it is relevant, type the information in the abstract page [6].

2.6 Organizing the Methodology Part

Methodology part includes both Qualitative and quantitative methods. According to Thome, 2000; Vinitha Ravindran, 2019, Data analysis using qualitative research method is an iterative and multifarious process as shown in Fig 2. The methodology part includes the Primary data collection, Collection of samples, ingredients, and the laboratory testing, Use of models, Analysis using statistical method etc [26], [28]. According to Kallet and Richard H (2004), the methodology section of a research paper answers two main questions: How was the data collected or generated? And, how was it analyzed? The writing should be direct and precise and always written in the past tense [11]. All the collected data can be stored, compiled, and retrieved using some software tool like Geographical information system (GIS) as stated by Subash Thanappan et al in his previous research works [22], [23], [24]. In short, the methodology section describes ‘actions to be taken’ to investigate a research problem and the rationale for the application of specific procedures or techniques or tests used to identify, select, process, and analyze information applied to understanding the problem, thereby, allowing the reader to critically evaluate a study’s overall validity and reliability. The reader wants to understand that the data was collected or

generated in a way that is consistent with accepted practice in the field of study according to Cooper D.R et al, 2003, [7]. For example, if the scholar / students use a multiple choice questionnaire, readers need to understand that it offered respondents a reasonable range of answers to choose from. The responses from the respondents can be compiled using Mean, Average and Percentage values to arrive at the conclusion. There are generally four basic steps to qualitative data analysis. It includes:

1. Preparation of data

The collected data / information from the individual through interviews, questionnaire should be transcribed and edited. The researcher may now decide on units of data that can be analyzed for the further help in organizing.

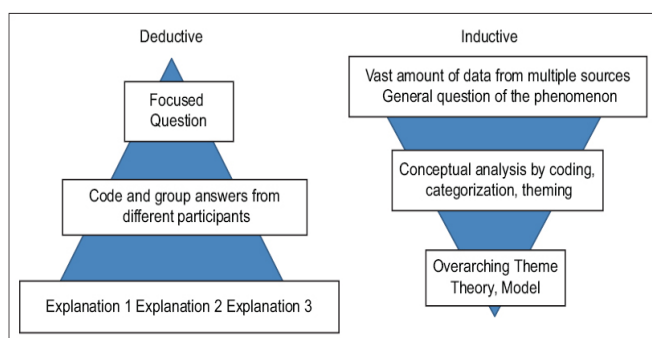


Figure 2: Approaches to Qualitative Data Analysis

2. Reading and reflecting

According to Bradley et al (2007), for the initial understanding of narrative, repeatedly reading the transcribed and edited data as a whole, and reflecting on what the participants are sharing is very important for the researchers [4]. According to JM Morse and L Richards, 2002, the reflection may start at the time of the interview itself [17]. Nevertheless, repeatedly reading the transcribed text upon the interview gives a clear understanding of context, situations, events and actions related to the phenomenon of interest before the data can be analyzed for concepts and themes.

3. Coding, categorizing and memorizing

As per the statement uttered by MJ Mayan, 2009, the organized way of sorting and categorizing the collected data and information is the next step to be done by the researcher for analysis to progress and for the proper understanding about the phenomenon or the concepts embedded in the phenomenon [18].

Coding: According to MJ Mayan, 2009, the first essential step for sorting and organizing the data and information is what's called "Coding" [18]. Coding refers to the 'labels' given to phrases, expressions, behaviors, images and sentences as the researcher goes through the data. There are two kinds of coding. They are 'Open coding' and 'Focused coding' in the first level and second level respectively. BG Glaser, 1978 say open coding involves with sifting the 'initial data' from the initial questionnaire or interview survey line by line and creating in vivo or interpretive codes [5]. Questions

such as what are all the difficulties for the crop production? What are the major causes for those issues? - will help in the initial coding of data and may reveal gaps in the data or raise questions. These gaps and questions will help the researcher to locate the sources from where further data are to be collected. The subsequent direct interview or the multiple questionnaires is what's called 'Focused coding', focusing on the specific issues raised or found in the first step coding. Focused codes are more directed, selective and conceptual and are employed to raise the sorting of data to an analytical level, according to K Charmaz, 1983, [12].

Categorizing: According to JM Morse, 2008, categorizing the data involves grouping of the similar codes together and formulating it such that it is easily understandable for the researcher to set within which the related data can be clubbed [16].

Memoing: The definition given by A Strauss, and J Corbin, 1998 say the elaborations of thoughts out of the data sorted and categorized before is what's called 'Memoing'. In general, it is 'the researcher's record of analysis, thoughts, interpretations, questions and directions for the further data collection [3].

4. Developing themes, conceptual models and theory

According to the pioneer researchers UH Graneheim and B Lundman, 2004, the interpretation of the latent content in the texts is the fourth main step to be followed by the researcher. In this phase, the researcher is trying to connect the deconstructed part with the behavior, actions and reactions related to a phenomenon [27].

2.7 Results and Discussion part on Research Report

According to Anesley and M Thomas (2010), while formulating the result section, it is imperative to keep in mind that it is not proving anything [2]. The findings upon the methodology part can only confirm or reject the hypothesis underpinning the study. Nevertheless, the act of articulating the results helps one to make them understanding the problems from within, to break it into pieces, and to view the research problem from the various perspectives. The style of Result and Discussion part can be arranged such that all the result findings upon the research work should be compared with the literature collected and recorded by the researcher how it is related with. This comparison would help the researchers to come for the final conclusion to prepare their dissertation [2].

2.8 Submission of Progress Report

The Advisee must submit their progress report to the Advisor and present their findings through Power point at least once in 3 -6 months. The progress report can support the advisee to enhance their level of research by getting suggestions from the advisor and the expert's team. This would definitely support the researcher to complete their research work faster.

The need for the progress report is to access the level and stage of the researcher / advisee by the advisor or those who

directly involved with their work to answer for the following questions.

- Are the researcher working on the project and making progress?
- What findings the researcher has made so far?
- What kind of challenges the researcher has?
- Can the Researcher manage their plan and schedule?
- Will the researcher be completed their work on time?

- Study Area
- Objectives
- Detailed Research Methodology
- Results and Discussion (Comparing the research findings with the pioneer research)
- Conclusions and Recommendations
- References
- List of Publications
- Appendix (if appropriate)

2.9 Publications for Researchers

According to J Beall, 2013, all the findings upon the research work must be published by the researchers in each stage through the well reputed presumed predatory journals [15]. According to Kelly D Cobey et al, 2019, the motivations and experiences of the researchers are directly reflected from their publications through the presumed predatory journals [13]. Also the publication of the researcher's work through such journals makes them very simple for the preparation of the final dissertation with very low level or acceptable level of plagiarism.

2.10 Successful Research Proposal / Dissertation

It is the responsibility of the students / researchers to write the dissertation in a good standard of clear English using appropriate academic terms and citation and referencing conventions.

The Research proposal should fulfill the following:

- Title
- Abstract
- Background Summary
- Introduction to the Topic
- Preliminary Literature Review
- Detailed Research Methodology
- Time table (Work Plan)
- References
- Appendix (if appropriate)

The Dissertation upon the completion of the research work should fulfill the following as shown in Fig 3:

- Cover Page (Title, Name of the Researcher, Degree to be awarded, Name of the Advisor, University Emblem, University Name and Address, Month & Year of Submission)
- Declaration
- Bonafide
- Acknowledgement
- Abstract (Brief note on the importance of the study and the findings)
- Table of Contents
- List of Tables
- List of Figures
- List of Abbreviations
- List of Notations, Symbols
- Introduction
- Preliminary Literature Review

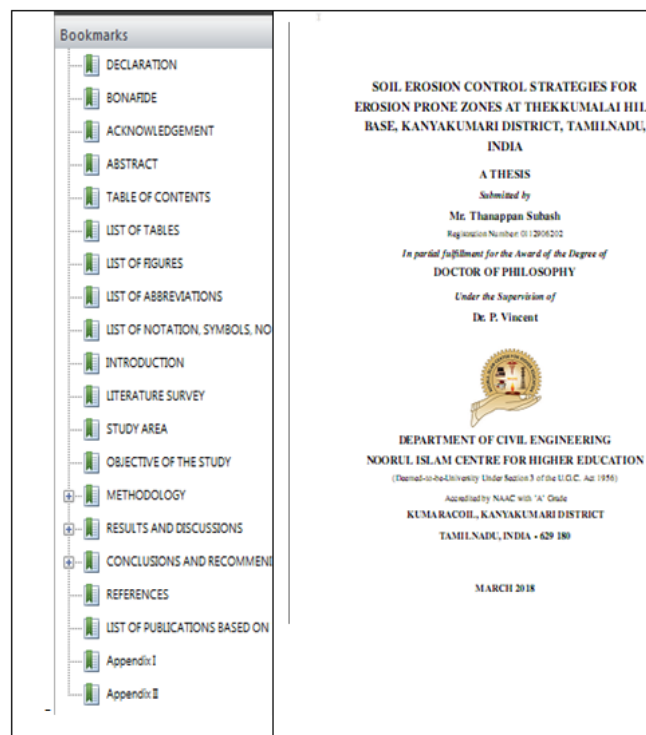


Figure 3: Book Mark showing the style of Dissertation

3. Conclusions

1. The current article could definitely help the on-going researchers, students, and the academicians to develop their research activities for the better career development.
2. The current article might avoid the confusions among the people those who directly involved with their research work on how to proceed with their research.
2. This article is the base for the Students / Scholars / Advisees for the successful completion of their research work on-time and to produce their effective dissertation.

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