TEMPLATE & GUIDELINES FOR

MASTER &PH.D. THESIS

A thesis submitted in fulfillment of the requirements for the award of degree of

Doctor of Philosophy / Master / M.Phil.

in

Artificial Intelligence

By

Umair Ali Khan

Roll No. PCS-001/11

Department of Artificial Intelligence

Faculty of Science

Quaid-e-Awam University of Engineering, Science & Technology, Nawabshah.

2022

DECLARATION

I hereby certify that this dissertation constitutes my own product, that where the language of others is set forth, quotation marks so indicate, and that appropriate credit is given where I have used the language, ideas, expressions or writings of an- other. I declare that the dissertation describes original work that has not previously been presented for the award of any other degree of any institution.

Signature: _____

Name: _____

Date: _____

DEDICATION

This thesis is dedicated to my parents, friends and teachers for their continuous support and motivation.

CERTIFICATE

This thesis, written by **Mr. Umair Ali Khan** under the direction of his supervisors and approved by all the members of the thesis committee has been presented to and accepted by the Dean, Faculty of Science, in fulfillment of the requirements for the degree of Doctor of Philosophy in Artificial Intelligence.

_____   _____

Name of Supervisor   Name of Co-Supervisor

_____   _____

Name of Internal Examiner   Name of External Examiner

_____   _____

Name Dean concerned   Name of Director (PGS)

Dean,   Director

Faculty of Science   Postgraduate Studies & Research

Date: _____

ACKNOWLEDGMENTS

Acknowledgments are optional. If included, please consider the following general guidelines for acknowledging contributions to your project:

- It is the responsibility of a student to acknowledge sources of his or her ideas and information. For example, if a student publishes a paper written for a particular professor, that individual should be acknowledged.

- The significant contribution of any individual or group to a published work should be acknowledged within that work, by inclusion of the name of the individual or the group and, if appropriate, by a brief identification of the nature of the contribution. This recognition may be in the form of an acknowledgmentin the body of the work, or in a prominent footnote.

- When possible, the nature of the acknowledgment should be agreed upon in writing by the contributor and principal author, prior to submission of the work for publication. If there is to be remuneration for a publication, those who contributed significantly to the work should be so informed and a contractual agreement reached prior to publication concerning the distribution of the compensation.

- Acknowledging the support of family and friends

- Acknowledgments should not extend more than one page.

TABLE OF CONTENTS

Chapter 1:   Introduction & Background   **13**

Chapter 2:   Literature Review   **17**

LIST OF TABLES

LIST OF FIGURES

Symbols

x = position

v = velocity

a = acceleration

t = time

F = force

Nomenclature/Abbreviations

ADC = Analog to Digital Converter

DAC = Digital to Analog Converter

ABSTRACT

The abstract should briefly tell the reader what the dissertation is about. It is a concise summary of the important points of the report. The student should summarize the key points of the document, including the problem, the research question, the methodology, and the results. The abstract should be about 500 words and should not exceed more than two pages. It is recommended that you write the abstractafter you have completed your report.

Thesis Format and Layout

0.1 General

0.1.1 Templates and Format

The recommended templates of Master and Ph.D. thesis for Quaid-e-Awam University are available in LaTeX and MS-WORD format on the official website. It is recommended that the LaTeX template be used for better formatting. For using the LaTeX template, following guidelines should be followed.

1. Download the LaTeX template from QUEST's website.

2. Create a free account at Overleaf (https://www.overleaf.com which is an online platform for LaTeX.

3. Import the LaTeX template in Overleaf.

4. Edit the template as per your thesis's contents

For more information on using Overleaf, please see the guidelines at https://www.overleaf.com/learn.

0.1.2 Size & Quality of Paper

The thesis should be prepared on standard A4 size (210 mm x 297 mm) good quality white paper (at least 80 gm). The same paper should also be used for Figures, Tables, Charts and for mounting photographs, if any. The paper used in entire thesis should be plain without any borderline, logos, insignia, monograms etc.

0.1.3 Language

The entire thesis must be written in English language. The spelling throughout the thesis be either in American or British language.

0.1.4 Typing & Printing

The entire thesis must be computer typed and printed through laser printer with black ink.

0.2 Thesis Organization

A thesis/Dissertation/project report is mainly organized into three parts.

1. Preliminary Pages

2. Main body / text

3. References

There is another optional part of Appendices which is to be placed in the end of the thesis.

0.3 Preliminary Pages

The following pages are to be placed in the order given below before the text of the thesis. These pages should be numbered in lower Roman numerals, consecutively, starting (i) from the title page and the numbers should be placed centrally at bottom of each page. All the pages must start with new page.

0.3.1 Title Page

The title page must include the title of the thesis, full name of the candidate, the statement of award of the thesis, name of university etc.

0.3.2   Declaration Page

A declaration signed by the student on originality of the work presented by him/her in the thesis/dissertation be provided on this page.

0.3.3   Dedication Page

If a candidate desires to dedicate his / her thesis to any person or organization, it should be so stated on this page. However, the dedication should not contain any number, photograph or chart or maximum of a 100 words.

0.3.4   Certificate Page

A certificate signed by the thesis examiners, including the candidate's Supervisor, Director Postgraduate Studies & Research and Dean of the concerned Faculty, indicating the approval of the thesis, should be put on this page.

0.3.5   Acknowledgement

A brief acknowledgment, in just one page, only to those persons and organizations who have assisted the candidate in his / her thesis work, or provided relevant data / information / laboratory or research facilities and tools etc. should be given on this page (Maximum of 500 words).

0.3.6   Table of Contents

It should contain the numbers and headings of all the preliminary pages following the Table of Contents, chapters, sections and subsections of the text, including references and appendices, described consecutively, and should indicate the page where the item starts. It should be typed with single line spacing, and with the same font size of both the capital and lower case characters / letters as followed in the text of the thesis.

0.3.7 List of Tables

The number and heading of each table, including the page number where it appears in the text, should be provided, consecutively and chapter-wise, in this list and should be typed with single line spacing.

0.3.8 List of Figures

The number and caption of each figure, including the page number where it is located in the text, should be provided, consecutively and chapter-wise, in this list and should be typed with single line spacing.

0.3.9 List of Abbreviations

This list should contain all the abbreviations used in the thesis and should be typed with single line spacing. The abbreviations must be listed in the alphabetical order.

0.3.10 Nomenclature

All standard notations in English or Greek characters appearing frequently in the text should be described in the list of notations in alphabetical order with the notations in capitals preceding those in lower case characters. All other notations appearing only once in the text need not be given in this list but should be defined at the place where they appear in the text. This list should be typed with single line spacing.

0.3.11 List of Appendices

The number and title of each appendix including the page number where it is located should be provided, consecutively, in this list and should be typed with single line spacing.

0.3.12   Abstract

The abstract may be written using single line spacing. The abstract is differentfrom synopsis or summery of a thesis. It should be brief and should not be of more than two paragraphs, preferably one paragraph. The abstract should not be of more than 500 words and it should state the field of study, provide identified, research methodology adopter, scope of study, result and a very brief conclusions.

0.4   Main Body/Text

Text must be divided into chapters. Each chapter must start on a new page and should continue with sections and subsections on successive page. The sections and subsections should be given appropriate titles and numbers. The text may be written in paragraphs which should not be too long. The paragraphs should repose the continuity.

Table 2: Thesis format

Font:	Times New Roman
Size:	12
Spacing:	1.5
Heading (main)	17
Heading (Sub)	14
Chapter Number & Title	24.5

0.5   Limit of Pages

The minimum and maximum number of pages/words for ME/MS & PhD thesis would be as follows excluding references, figures, tables and preliminary pages.

Degree	Minimum Pages	Maximum Pages
ME/MS Thesis	80 Pages or 40,000 Words	200 Pages
PhD Thesis	120 Pages or 60,000 Words	300 Pages

The text includes:

1. Introduction

2. Literature review

3. Research Methodology

4. Data collection

5. Results and discussions

6. Conclusions and suggestions

7. Any other necessary information.

0.5.1   Fonts & Spacing

The main text of thesis must be typed following font size and style, unless specified otherwise or any other font and or size as approved by the ASRB from time to time.

0.5.2   Chapters & Subsections

1. Each chapter must start on a new page and be typed continuously with sections and sub-section on successive pages. The sub sections are not indented and should not be more than four levels.

2. The chapter number and heading should be typed centered on the page in bold in lower case with the first character of the first word in capital without underlining. The chapter heading should be placed below the chapter number. Thechapter number should be in Arabic numerals, e.g.,

3. The section number and heading must be typed from the left margin in bold letters without underlining. The section number must consist of the chapter number followed by a number, both in Arabic numerals.

4. The sub-section numbers and headings must be typed from the left margin in bold lower case characters with the first character of the first word in capital without underlining. The sub-section must consist of the chapter number followed by section number and one additional number representing the sub- section, all in Arabic numerals.

5. Any further sub-section numbering, if needed, must be done with additional Arabic numerals without bold letters.

0.6   Margins

Margins of left=4cm, right=2.5cm, top=4cm, bottom=2.5cm should be set on A4 page.

0.7   Tables

1. Each table must be typed following the place where it is referred first, preferably on the same page, or if it cannot be accommodated in the remaining space on the same page then on the following page, with single, one- and a half or double line spacing as is found convenient to accommodate the table on one page within the specified margins.

2. A long table which cannot be accommodated on one page, even with single line spacing and / or reduced to an easily legible size may be continued on the next page under the same table number with proper indication at the bottom of the page.

3. The heading of the table must be in bold lower case letters with the first character of the first word in capital without underlining. The number and heading of the table should be typed above the table itself.

4. All the tables belonging to each chapter must be numbered in the same way as the sections of the chapter, the first number indicating the chapter number and the second the table number in sequence, both in Arabic numerals.

5. If any table is referred on a page other than that where it is placed, it should be referred with its number and the page where it is placed, e.g., Table 4.1 on P.36.

0.8   Figures

1. Each figure must be drawn and placed within the specified margins following the place where it is referred first, preferably on the same page, or if it cannot be accommodated in the remaining space on the same page then on the following page.

2. The number and caption of each figure should be typed under it with bold letters in the same way as the headings of tables described above.

3. If any figure is referred on a page other than that where it is placed, it should be referred with its number and the page where it is placed, e.g., Figure. 4.1on P.43.

0.9   Photographs

1. Each photograph, colored or black and white, must be placed within the specified margins following the place where it is referred first, preferably on the same page, or if it cannot be accommodated in the remaining space on the same page then on the following page.

2. The number and caption of each photograph should be typed under it withbold letters in the same way as for figures.

3. If any photograph is referred on a page other than that where it is placed, it should be referred with its number and the page where it is placed, e.g. Plate 4.1 on P.54.

4. The photographs should be mounted using non-liquid stick glue on the same size and quality of paper as that of the thesis.

0.10 Large Size Drawings, Charts, Figures, & Tables

Any drawing, chart, figure or table, which cannot be accommodated with clarityon the normal size of the thesis page, even with easily legible reduced size, may be prepared on a larger size paper / sheet, which should be folded and enclosed in a special pocket attached permanently inside of the bound back of the thesis.

0.11   Equations

All equations belonging to a chapter in the text should be numbered in the same way as the figures and tables. Each equation should start on a separate line with a larger than the normal spacing between the equation and the text above and below it, e.g.,

$$Ax + By = C \tag{1}$$

The equation should be referred to in the text as Equation 1.

0.12   Pagination of Text

The pages in the text should be numbered in Arabic numerals, consecutively, starting from the page where the first chapter begins. The page number printed centrally at bottom of the all pages.

0.13   References

1. All the references quoted in the entire thesis must be placed at the end of the text and listed author-wise in the number format (i.e. [1]). The year of publication, in round brackets, should follow the full name(s) of the author(s). the standard method of describing the publications referred in the text should be followed.

2. The publications should be referred in the text by the last name of the first author followed by the number in squire brackets.

0.14   Submission of Thesis

Three copies of the draft of the thesis on an ordinary white A4 size paper should be submitted to the Director (PGS) through the candidate's thesis Supervisor in a lose form/folder ring file or tap binding for evaluation by the thesis examiners. After successful defense of the thesis in the thesis examination, and after incorporating the changes/corrections recommended by the thesis examiners to their satisfaction, the certificate page should be got signed by the examiners and the concerned university officers. The thesis should then be bound and submitted along-with the soft copy to the Director (PGS) in sufficient number for distribution as under:

1. One copy to be retained by the Controller of Examinations.

2. Two copies to be sent to the library.

3. One copy to be sent to the Supervisor

4. One copy to be sent to the Co-Supervisor (if any)

5. One copy to be sent to each of the thesis examiners through the Controller of Examinations.

6. One copy to be sent to HEC by the Controller of Examination

Table 3: Colors of Thesis Bindings

SNO.	Degree	Color
i.	ME/MS Thesis	Navy Blue
ii.	Ph.D Thesis	Pea Green

0.15 Book Binding

Thesis should be hard bound with front cover of color as mentioned above: The binding must be bonded properly as per the specimen available with the Directorate of Postgraduate Studies. The writing of face cover and the spine should be in white letters and white logo/monogram.

Chapter 1

Introduction & Background

This is a thesis template recommended for the Master and Ph.D. programs in Quaid- e-Awam University of Engineering, Science & Technology, Nawabshah for submitting Dissertation Defense. We recommend using IEEE (Institute of Electrical and Electronics Engineers) style for citations. This is how an interesting paper to cite looks [1].

1.1 Introduction

The introduction is the first chapter of your thesis or dissertation and appears right after the table of contents. It's essential to draw the reader in with a strong beginning. Set the stage for your research with a clear focus, purpose and direction. The introduction should include:

- Topic and context: what does the reader need to know to understand the dissertation? Focus and scope: what specific aspect of the topic will you address?

- Relevance and importance: how does the research fit into existing work on thistopic?

- Questions and objectives: what does the research aim to find out and how?

- Overview of the structure: what does each chapter of the dissertation contribute to the overall aim?

Although the introduction comes at the beginning of your dissertation, it doesn't have to be the first thing you write in fact, it's often the very last part to be completed (along with the abstract).

It's a good idea to write a rough draft of your introduction near the beginning of the research to help guide you. If you wrote a research proposal, you can use this as a template, as it contains many of the same elements. But you should revise your introduction throughout the writing process, making sure it matches the content of your chapters.

1.1.1 Topic and context

Begin by introducing your topic and giving any necessary background information. It's important to contextualize your research and generate interest — aim to show why the topic is timely or important (for example, by mentioning a relevant news item, academic debate, or practical problem).

1.1.2 Focus and scope

After a brief introduction to your general area of interest, narrow your focus and define the scope of your research. For example:

- What geographical area are you investigating?

- What time period does your research cover?

- What demographics or communities are you researching?

- What specific themes or aspects of the topic does your dissertation address?

1.1.3 Relevance and importance

It's essential to show your motivation for doing this research, how it relates to existingwork on the topic, and what new insights it will contribute.

Give a brief overview of the current state of research, citing the most relevant literature and indicating how your research will address a problem or gap in the field.You will conduct a more in-depth survey of relevant sources in the literature review section or chapter.

Depending on your field, the importance of your research might focus on its practical application (e.g. in policy or management) or on advancing scholarly understanding of the topic (e.g. by developing theories or adding new empirical data). In many cases it will do both.

Explain how your dissertation:

- Helps solve a practical or theoretical problem

- Addresses a gap in the literature

- Builds on existing research

- Proposes a new understanding of the topic

1.1.4   Questions and objectives

This is perhaps the most important part of your introduction — it sets up the expectations of the rest of your dissertation. How you formulate your research questions and objectives will depend on your discipline, topic and focus, but you should always clearly state the central aim of your research. You can briefly mention the research methods you used to answer your questions, but if you are including a separate methodology chapter, don't go into too much detail here.

If your research aims to test hypotheses you can formulate them here, along with a conceptual framework that posits relationships between variables. Sometimes the hypotheses will come later in the dissertation, after your literature review.

1.1.5   Overview of the structure

To help guide your reader through the dissertation, end with an overview of its structure, summarizing each chapter to clearly show how it contributes to your central aims. It is best to keep the overview concise. One or two sentences should usually be enough to describe the content of each chapter.

If your research is more complicated or does not follow a conventional structure, you might need up to a paragraph for each chapter. For example, a humanities dissertation might develop an argument thematically rather than dividing the research into methods/results/discussion. If your structure is unconventional, make it clearhow everything fits together.

Reference symbols: x, v, a, t, F

Chapter 2

Literature Review

A Ph.D. or Master thesis generally beings with a literature review which usually serves as the first chapter of your dissertation. This provides an opportunity for you to show that you understand the body of academic work that has already been done in relation to your topic, including books, articles, data and research papers. You should be prepared to offer your own critical analysis of this literature, as well as illustrating where your own research lies within the field – and how it contributes something new / significant to your subject.

2.0.1 What is a Literature Review

A literature review is usually one of the first things you'll do after beginning your PhD. Once you've met with your supervisor and discussed the scope of your researchproject, you'll conduct a survey of the scholarly work that's already been done in your area.

Depending on the nature of your PhD, this work could comprise books, publications, articles, experimental data and more. This body of work is collectively known as the 'scholarly literature', on your subject. You won't have to tackle any novels, poetry or drama during this review (unless, of course, you're actually studying a PhD in English Literature, in which case that comes later).

The purpose of the PhD literature review isn't just to summarize what other scholars have done before you. You should analyze and evaluate the current bodyof work, situating your own research within that context and demonstrating the significant original contribution your research will make.

2.0.2   Planning your PhD literature review

Your supervisor will be able to give you advice if you're not quite sure where to begin your review, pointing you in the direction of key texts and research that you can then investigate. It's worth paying attention to the bibliographies (and literature reviews!) of these publications, which can often lead you towards even more specialist texts that could prove invaluable in your research. At the same time, it's important not to let yourself fall down an academic rabbit hole – make sure that the books and articles you're surveying are genuinely relevant to your own project. You should aim to include a broad range of literature in your review, showing the scope of your knowledge, from foundational texts to the most recent publications.

The note-taking process is crucial while you're in the early stages of your literature review. Keep a clear record of the sources you've read, along with your critical analysis of their key arguments and what you think makes them relevant to your research project.

2.0.3   Structuring a Literature Review

When you begin to write your PhD literature review, it's important to have a clear idea of its outline. Roughly speaking, the literature review structure should introduce your topic and explain its significance. Evaluate the existing literature with reference to your thesis. Give a conclusion that considers the implications of your research for future study. The main body of your literature review will be spent critiquing the existing work that scholars have done in your field.

There are a few different ways you may want to structure this part of the review, depending on the subject and the nature of your dissertation:

- Chronologically – If your research looks at how something has changed over time, it may make sense to review the literature chronologically, tracking the way that ideas, attitudes and theories have shifted. This might seem like

quite a simple way to structure the review, but it's also imperative to identify the common threads and sticking points between academics along the way, rather than merely reeling off a list of books and articles.

- Thematically – If your dissertation encompasses several different themes, you might want to group the literature by these subjects, while also emphasizing the connections between them.

- Methodologically – If you are going to be working with experimental data or statistics, it could be a good idea to assess the different methods that previous scholars have used in your field to produce relevant literature.

Whichever technique you use to structure your literature review, you should take care not to simply list different books, articles and research papers without offering your own commentary. Always highlight the similarities (and differences) between them, giving your analysis of the significance of these relationships, connections andcontrasts.

Chapter 3

Research Methodology

In your thesis or dissertation, you will have to discuss the methods you used to do your research. The methodology chapter explains what you did and how you did it, allowing readers to evaluate the reliability and validity of the research. It should include:

- The type of research you did

- How you collected your data

- How you analyzed your data

- Any tools or materials you used in the research

- Your rationale for choosing these methods

The methodology section should generally be written in the past tense. Academic style guides in your field may also provide detailed guidelines on what to include for different types of studies. For example, there are specific guidelines for writing an APA methods section.

The steps of writing research methodology are mentioned in the following sections.

3.1 Step 1: Explain your methodological approach

Begin by introducing your overall approach to the research. Your methodological approach should address the following questions.

- What research problem or question did you investigate? For example, did you aim to systematically describe the characteristics of something, to explore an under-researched topic, or to establish a cause-and-effect relationship? And what type of data did you need to achieve this aim?

- Did you need quantitative data (expressed in numbers) or qualitative data (expressed in words)?

- Did you need to collect primary data yourself, or did you use secondary data that was collected by someone else?

- Did you gather experimental data by controlling and manipulating variablesor descriptive data by gathering observations without intervening?

- Why is this most suitable approach to answering your research questions? Is this a standard methodology in your field or does it require justification?

- Were there any ethical considerations involved in your choices? What are the criteria for validity and reliability in this type of research?

3.2   Step 2:   Describe your methods of data collection

Once you have introduced your overall methodological approach, you should give fulldetails of your data collection methods.

3.2.1   Quantitative methods

In quantitative research, for valid generalizable results, you should describe your methods in enough detail for another researcher to replicate your study. Explain how you operationalized concepts and measured your variables; your sampling method or inclusion/exclusion criteria; and any tools, procedures and materials you used to gather data.

3.3   Step 3: Describe your methods of analysis

Next, you should indicate how you processed and analyzed the data. Avoid going intotoo much detail—you should not start presenting or discussing any of your resultsat this stage.

3.3.1   Quantitative methods

In quantitative research, your analysis will be based on numbers. In the methods section you might include:

- How you prepared the data before analyzing it (e.g. checking for missing data,removing outliers, transforming variables)

- Which software you used to analyze the data (e.g. SPSS, Stata or R)

- Which statistical tests you used (e.g. two-tailed t-test, simple linear regression)

3.3.2 Qualitative methods

In qualitative research, since methods are often more flexible and subjective, it's important to reflect on the approach you took and explain the choices you made. Discuss the criteria you used to select participants or sources, the context in which the research was conducted, and the role you played in collecting the data (e.g. were you an active participant or a passive observer?).

3.4 Step 4: Evaluate and justify your methodological choices

Your methodology should make the case for why you chose these particular methods, especially if you did not take the most standard approach to your topic. Discuss why other methods were not suitable for your objectives, and show how this approach contributes new knowledge or understanding. You can acknowledge limitations or weaknesses in the approach you chose, but justify why these were outweighed by the strengths.

3.5 Tips for Writing a Strong Methodology

Remember that your aim is not just to describe your methods, but to show how and why you applied them and to demonstrate that your research was rigorously conducted.

3.5.1 Focus on your objectives and research questions

The methodology section should clearly show why your methods suit your objectives and convince the reader that you chose the best possible approach to answering your problem statement and research questions. Throughout the section, relate your choices back to the central purpose of your dissertation.

3.5.2 Cite relevant sources

Your methodology can be strengthened by reference to existing research in the field, either to:

- Confirm that you followed established practices for this type of research

- Discuss how you evaluated different methodologies and decided on your approach

- Show that you took a novel methodological approach to address a gap in the literature

3.5.3 Write for your audience

Consider how much information you need to give, and don't go into unnecessary detail. If you are using methods that are standard for your discipline, you probably don't need to give lots of background or justification. But if you take an approach that is less common in your field, you might need to explain and justify your methodological choices. In either case, your methodology should be a clear, well-structured text that makes an argument for your approach, not just a list of technical details and procedures.

3.5.4 Discuss obstacles

If you encountered difficulties in collecting or analyzing data, explain how you dealtwith them. Show how you minimized the impact of any unexpected obstacles. Pre- empt any major critiques of your approach and demonstrate that you made the research as rigorous as possible.

A sample figure below shows the format of adding figures in the thesis.

Figure 3.1: A sample figure

Chapter 4

Data Collection

In order to successfully collect empirical data, you have to choose first what type of data you want as an outcome. There are essentially two options, qualitative or quantitative data. Many people mistake one term with the other, so read some articles that shines a light on the differences between qualitative and quantitative research to avoid this confusion. Boiled down, qualitative data means words and quantitative means numbers. Whichever one adapts best to your research will define the type of methodology to carry out, so choose wisely.

4.1   Qualitative Vs. Quantitative Data

In the end, having in mind what type of outcome you intend and how much time you count on will lead you to choose the best type of empirical data for your research.

Table 4.1: Qualitative vs. quantitative research

Data type	What is it?	Methodology
Qualitative	Information that cannot be measured. It may involve multimedia material or non-textual data. This type of data claims to be detailed, nuanced and contextual.	Observations, interviews, focus groups
Quantitative	Information that can be measured and written with numbers. This type of data	Surveys, tests, existing databases

	claims to be credible, scientific and exact.	

Once you gather enough theoretical and empirical data, you will need to start writing. But before the actual writing part, you have to structure your thesis to avoid getting lost in the sea of information.

4.2   Data Collection Methods

Regardless of the topic of your dissertation or thesis, it is highly likely that at some point you will need to collect data. Below are some common data collection methods. Remember, you will want to collect data in a way that fits your research design and questions.

4.2.1   Self-Report

Self-report is a type of research design in which participants give their responses to a given set of questions. The most common types of self-report are interviews or questionnaires. One major limitation of self-report versus other data collection methods is that accuracy of responses cannot be determined, and there are many circumstances in which participants are likely to lie.

4.2.2   Observation

Observation is a method of collecting data in which members of research teams observe and record behaviors. Data collected during observation are explicit and quantifiable. However, observation has many limitations. First, researchers who use observation can only observe behaviors; therefore, observation cannot be used to collect data about attitudes, beliefs, thoughts, covert behaviors, etc. Another limitation of observation is that it is a known fact that being observed changes behavior.

Observation can be either formal (e.g., structured in a laboratory setting) or casual (e.g., in the natural environment), and the observer may either be a participant (e.g., member of the group being observed) or a nonparticipant (e.g., not a member of the group being observed).

4.2.3 Physiological Measures

Physiological measures can be used to collect data related to the body, such as heart rate, fMRI, EEG, CAT, breathing rate, etc. These types of data are useful because they are quantifiable and accurate. However, these types of data are sometimes used as secondary measures of latent constructs, which may not always be accurate. For example, someone with a high heart rate may be perceived as being anxious, but itis possible that that person just walked up a flight of stairs.

4.2.4 Interviews

Interviews are one of the data collection methods for qualitative research. Interviewsconsist of meeting with participants one on one and asking them open-ended questions. Interviews can be structured or semi-structured. In a structured interview,the researcher has a predetermined set of questions to ask and does not deviate from those questions. In a semi-structured interview, the researcher will have prepared questions but has the freedom to ask additional follow up questions as he or she seesfit.

4.2.5 Focus Groups

Focus groups are another example of data collection methods of a qualitative study. Using focus groups to collect data is similar to using interviews because focus groups allow participants to freely answer questions; however, as implied by the name, focusgroups consist of multiple people all being asked questions at the same time.

Chapter 5

Results & Discussion

When writing a dissertation or thesis, the results and discussion sections can be both the most interesting as well as the most challenging sections to write. You may choose to write these sections separately, or combine them into a single chapter, depending on your university's guidelines and your own preferences. There are advantages to both approaches.

Writing the results and discussion as separate sections allows you to focus first on what results you obtained and set out clearly what happened in your experiments and/or investigations without worrying about their implications. The Results section should set out your key experimental results, including any statistical analysis and whether or not the results of these are significant.

You should cover any literature supporting your interpretation of significance. It does not have to include everything you did, particularly for a doctorate dissertation.However, for an undergraduate or master's thesis, you will probably find that you need to include most of your work. If you are unsure whether to include certain results, go back to your research questions and decide whether the results are relevantto them. It doesn't matter whether they are supportive or not, it's about relevance.If they are relevant, you should include them.

Having decided what to include, next decide what order to use. You could choose chronological, which should follow the methods, or in order from most to least important in the answering of your research questions, or by research question and/or hypothesis. You also need to consider how best to present your results: tables, figures, graphs, or text. Try to use a variety of different methods of presentation, and consider your reader: 20 pages of dense tables are hard to understand, as are five pages of graphs, but a single table and well-chosen graph

that illustrate your overall findings will make things much clearer.

Make sure that each table and figure has a number and a title. Number tables and figures in separate lists, but consecutively by the order in which you mention them in the text. If you have more than about two or three, it's often helpful to provide lists of tables and figures alongside the table of contents at the start of your dissertation. Make sure that you including information about the size and direction of any changes, including percentage change if appropriate. Statistical tests should include details of p values or confidence intervals and limits.

While you don't need to include all your primary evidence in this section, you should as a matter of good practice make it available in an appendix, to which you should refer at the relevant point.

5.1   Discussion Section

This section has four purposes, it should:

- Interpret and explain your results

- Answer your research question

- Justify your approach

- Critically evaluate your study

The discussion section therefore needs to review your findings in the context of the literature and the existing knowledge about the subject.

You also need to demonstrate that you understand the limitations of your research and the implications of your findings for policy and practice. This section should be written in the present tense.

Chapter 6

Conclusion & Future Work

The conclusion chapter is typically the final major chapter of a dissertation or thesis. As such, it serves as a concluding summary of your research findings and wraps up the document. While some publications such as journal articles and research reports combine the discussion and conclusion sections, these are typically separate chapters in a dissertation or thesis. As always, be sure to check what your university's structural preference is before you start writing up these chapters.

A core function of the conclusion chapter is to synthesize all major points covered in your study and to tell the reader what they should take away from your work. Basically, you need to tell them what you found, why it's valuable, how it can be applied, and what further research can be done.

Whatever you do, don't just copy and paste what you've written in your discussion chapter! The conclusion chapter should not be a simple rehash of the discussion chapter. While the two chapters are similar, they have distinctly different functions. To understand what needs to go into your conclusion chapter, it's useful to under- stand what the chapter needs to achieve. In general, a good dissertation conclusion chapter should achieve the following:

- Summarize the key findings of the study

- Explicitly answer the research question(s) and address the research aims

- Inform the reader of the study's main contributions

- Discuss any limitations or weaknesses of the study

- Present recommendations for future research

Therefore, your conclusion chapter needs to cover these core components. Importantly, you need to be careful not to include any new findings or data points. Your conclusion chapter should be based purely on data and analysis findings that you've already presented in the earlier chapters. If there's a new point you want to intro- duce, you'll need to go back to your results and discussion chapters to weave the foundation in there.

References

[Journal Paper]

[1] Author(s) Initial(s). Surname(s), "Title of the article," Abbrev. Title of Journal, vol. x, no. x, pp. xxx–xxx, Abbrev. Month, Year.

Example: T. Kaczorek, "Minimum energy control of fractional positive electrical circuits", Archives of Electrical Engineering, vol. 65, no. 2, pp.191–201, 2016.

[Conference Paper]

[2] Author(s) Initial(s). Surname(s), "Title of paper," in Abbrev. Title of Conf. Proceedings, Place of Conference/Publication, (vol., no. if available), Year (only if not already stated in the title), pp. xxx–xxx.

Example: S. r. Ayyubi, Y. Miao, and H. Shi, "Automating standalone smoke alarms for early remote notifications," in 13th Intern. Conf. on Cont. Automa. Robotics & Vision (ICARCV), Marina Bay Sands Singapore, Dec. 2014, pp. 675–680.

[Book]

[3] Author(s) Initial(s). Surname(s), Title of the Book, x^{th} ed. City/Country of Publisher, Publisher, Year of Publication, pp. xxx–xxx.

Example: R. E. Ziemer and W. H. Tranter, "Principles of Communications: Systems, Modulation and Noise," 7th ed. Hoboken, NJ: Wiley, 2015, pp. 13–17.

[Book Chapter]

[4] Chapter Author(s) Initial(s). Surname(s), "Title of chapter in the book," in Title of the Published Book. City of Publisher, (U.S. State or Country if the City is not 'well known'): Publisher, Year of Publication, ch. x [chapter number], or sec. x [section number], pp. xxx–xxx

Example: N. B. Vargafik, and J. F. Malloy, "Radiative transfer," in Convective Heat. Melbourne: Engineering Education Australia, 2011, ch. 9, pp. 379–398.

Appendix A

This is Appendix A

An appendix is a section at the end of a dissertation that contains supplementary information. An appendix may contain figures, tables, raw data, and other additionalinformation that supports the arguments of your dissertation but do not belongin the main body. It can be either a long appendix or split into several smaller appendices. Each appendix should have its own title and identification letters, and the numbering for any tables or figures in them should be reset at the beginning of each new appendix.

Appendix B

This is Appendix B

When writing the main body of your dissertation, it is important to keep it short and concise in order to convey your arguments effectively. Given the amount of research you would have done, you will probably have a lot of additional information that you would like to share with your audience. This is where appendices come in. Any information that doesn't support your main arguments or isn't directly relevant to the topic of your dissertation should be placed in an appendix. This will help you organize your paper, as only information that adds weight to your arguments will be included; it will also help improve your flow by minimizing unnecessary interruptions.

Note, however, that your main body must be detailed enough that it can be understood without your appendices. If a reader has to flip between pages to make sense of what they are reading, they are unlikely to understand it. For this reason, appendices should only be used for supporting background material and not for any content that doesn't fit into your word count, such as the second half of your literature review.