The Research Design and Methodology Workflow Manual for Doctoral Students

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FOREWORD

In the ever-evolving landscape of higher education, the ability to conduct rigorous and meaningful research is both a foundational skill and a transformative journey for doctoral students. As academic disciplines become increasingly interdisciplinary and data-driven, the need for accessible, structured, and pedagogically sound guidance has never been more urgent. This Open Educational Resource (OER), The Research Design and Methodology Workflow Manual for Doctoral Students, answers that need with clarity, purpose, and innovation.

Supported by a grant from National University, this project reflects a commitment to academic equity, excellence, and student empowerment. By removing barriers to essential research resources, this manual democratizes knowledge and provides a roadmap for students navigating the complex stages of the doctoral research process—from identifying a research problem to selecting appropriate methodologies, aligning theoretical frameworks, and executing ethical, evidence-based inquiry.

Designed with both novice and experienced researchers in mind, this manual offers step-by-step workflows, real-world examples, and decision-making tools that align with current scholarly expectations. Whether used as a primary learning tool, a supplemental guide, or a reference during dissertation development, it encourages critical thinking, methodological precision, and scholarly integrity. We are proud to present this OER as a living document—one that will continue to evolve in response to the changing needs of doctoral students and the broader academic community. We thank National University for its generous support, and we invite educators, mentors, and students alike to explore, adapt, and contribute to this collaborative resource.

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CHAPTER 1 – ACADEMIC WRITING AND SCHOLARSHIP

Academic writing is a style of writing used at the graduate level to demonstrate research and related arguments formally and rigorously. The body of knowledge that is produced through academic inquiry and research is also known as scholarship or the demonstration of knowledge as an aspiring thought leader in one's field. Doctoral students develop scholarship throughout their doctoral journey, which culminates in the dissertation, a published body of work that signifies their accomplishments. Every assignment completed in the doctoral program is an opportunity to fine-tune academic writing, analyze existing knowledge, engage in critical discourse, and develop well-supported arguments.

The goal of academic writing is to ultimately contribute to the field of study by providing new insights that add in a meaningful manner to the extant body of knowledge or literature. This is accomplished by pouring over the research journals and literature on the topic of inquiry, ensuring that any information cited is **from within the last five years**. This ensures that currency and recency are used to form an understanding of what is relevant today in the topic of inquiry. Through analysis of the information, engaging with peer-reviewed literature and the interpretation of evidence, following experts in the field, and factoring that knowledge into your body of understanding, academic growth occurs. These skills are developed throughout your entire doctoral journey and beyond. Each assignment in the classes taken as a doctoral student is an opportunity to further hone academic writing and scholarship skills. Your professor facilitates your growth by providing feedback that can be used to refine and improve your academic writing and scholarship. As your knowledge grows, your writing should represent academic scholarship through what you write, how you present ideas, the depth of analysis of the topic, and the extent to which the work of other researchers and scholars is cited to support insights presented in your written and verbal formation of understanding. This is how contributions to the field of study provide new insights, through the analysis of existing knowledge (extant literature), and the engagement in critical discourse through the use of well-supported arguments.

THE ACADEMIC PAPER

The academic paper is designed to address the assignment in class and adheres to a typical format unless otherwise specified in the assignment instructions. The paper typically has a title page, a references page, an introduction, a body, and a conclusion. Each section has a distinct purpose and contributes to the overall structure and coherence of the paper.

ACADEMIC PAPER OUTLINE AND STRUCTURE WITH EXAMPLES

I. INTRODUCTION

1. **Hook**: Capture the reader's attention with an engaging opening sentence.
    - **Example**: "In an era defined by rapid technological advancements, the ethical implications of artificial intelligence have become a global concern."
2. **Background Information**: Provide context and relevance for the topic.
    - **Example**: "As AI technologies continue to permeate various industries, debates surrounding their ethical use, privacy concerns, and potential biases have intensified."
3. **Purpose Statement**: Clearly state the purpose or argument of the paper.
    - **Example**: "The purpose of this paper is to explore the ethical challenges posed by AI in healthcare, education, and law enforcement and make the case that proactive regulatory frameworks are essential to ensure equitable and fair outcomes."

It is important to remember that the doctoral student is neither expressing a personal opinion on the topic nor discussing their own experience in the field. Once the Ph.D. is earned, then the ability to demonstrate oneself as a thought leader worthy of opining on a subject is possible.

II. BODY

1. **Main Idea/Argument 1**: Present the first point supporting the topic, including evidence and analysis.
    - **Topic Sentence**: "AI in healthcare has revolutionized diagnostics, but it raises significant ethical concerns regarding patient data privacy."
    - **Supporting Evidence**:
        - Statistic: "A 2022 study found that 70% of healthcare organizations experienced data breaches due to AI systems."
        - Example: "For instance, Google's DeepMind faced backlash when it used patient data without explicit consent."
    - **Analysis**: "These cases highlight the urgent need for stricter data protection laws in AI-driven healthcare."
2. **Main Idea/Argument 2**: Develop the second point with evidence and analysis.
    - **Topic Sentence**: "In education, AI-driven tools risk perpetuating biases that disadvantage marginalized communities."
    - **Supporting Evidence**:

        - Study: "A recent MIT study revealed that AI grading systems displayed a 15% higher error rate for students from non-dominant ethnic groups."
        - Example: "Automated essay scoring systems have been criticized for penalizing non-standard language use."
    - **Analysis**: "These outcomes necessitate ongoing audits of AI tools to prevent systemic inequities in education."
3. **Main Idea/Argument 3**: Explore the final supporting point.
    - **Topic Sentence**: "Law enforcement applications of AI, such as facial recognition, pose significant risks of racial profiling."
    - **Supporting Evidence**:
        - Case: "The wrongful arrest of Robert Williams, misidentified by a facial recognition system, underscores these concerns."
        - Study: "According to the ACLU, facial recognition software misidentifies people of color at rates 5-10 times higher than white individuals."
    - **Analysis**: "These errors reveal the necessity of halting widespread implementation until AI algorithms are thoroughly refined."

III. CONCLUSION

1. **Restate Thesis**: Summarize the main argument without repeating it verbatim.
    - **Example**: "As AI technology continues to advance, addressing its ethical implications in healthcare, education, and law enforcement is crucial to fostering fairness and equity."
2. **Synthesis of Key Points**: Recap the main points discussed in the body.
    - **Example**: "The potential for data breaches in healthcare, biases in educational tools, and risks of racial profiling in law enforcement highlight the urgent need for ethical oversight."
3. **Call to Action/Closing Thought**: End with a thought-provoking statement or a call for further action/research.
    - **Example**: "By implementing robust regulatory frameworks and fostering interdisciplinary collaboration, society can harness the benefits of AI while mitigating its ethical challenges."

This structure ensures clarity, flow, and effective communication of ideas. In each part of the paper, it is important to provide credit to the original authors. In-text citations acknowledge the intellectual contributions of others and give proper credit to the original authors of ideas, theories, or data.

THE IMPORTANCE OF CITING SOURCES

In-text citations are critical components of academic writing for several reasons.

1. Providing Credit to Original Authors
2. Supporting Your Argument

3. Allowing for Verification
4. Enhancing Academic Integrity
5. Avoiding Plagiarism
6. Building Credibility as a Thought Leader

Providing credit to original authors is important to acknowledge the intellectual contributions of others and give proper credit to the original authors of ideas, theories, or data. Citing reliable sources strengthens your argument by demonstrating that your claims are backed by evidence. In-text citations enable readers to trace the sources of information to verify accuracy and explore further. Proper citations demonstrate honesty and transparency in research, distinguishing your original thoughts from borrowed ideas. Plagiarism, whether intentional or unintentional, is a serious offense in academia and professional settings. Including a citation when summarizing a research study ensures you avoid presenting someone else's ideas as your own. Referencing reputable sources demonstrates that you've done thorough research, lending authority to your writing. Citing peer-reviewed journals or well-known experts in the field makes your work more convincing and reliable. In summary, in-text citations play a pivotal role in maintaining academic rigor, fostering intellectual honesty, and ensuring clarity in scholarly communication. They connect your work to the broader academic conversation, enhancing its credibility, impact, and trustworthiness.

ACADEMIC WRITING – STYLE AND TONE

In academic writing, **style** and **tone** are essential elements that significantly affect how the message is conveyed and received by the audience. They contribute to the clarity, credibility, and professionalism of the work. Style and tone in academic writing ensure that your arguments are presented professionally, objectively, and clearly. They uphold the integrity of the work, engage the audience, and position the writer as a credible contributor to the scholarly community.

1. ESTABLISHING PROFESSIONALISM

- **Why It's Important**: Academic writing requires a formal style and tone to convey information professionally. A casual or overly personal tone can undermine the seriousness of your work.

- **Example**:
  - CASUAL: "I think AI is kind of a big deal these days."
  - FORMAL: "Artificial intelligence has emerged as a transformative technology in recent years."

2. DEMONSTRATING OBJECTIVITY

- **Why It's Important**: Academic writing should prioritize facts and evidence over personal opinions or emotional language. An objective tone ensures that the

arguments are unbiased and grounded in evidence.

- **Example**:
  - SUBJECTIVE: "I feel that data mining is the best tool for improving marketing strategies."
  - OBJECTIVE: "Studies indicate that data mining significantly enhances marketing strategies by providing actionable insights" (Smith, 2021).

3. ENSURING CLARITY

- **Why It's Important**: Using a clear and precise style helps readers understand complex concepts without unnecessary confusion. Ambiguous language or excessive jargon can alienate readers.

- **Example**:
  - UNCLEAR: "The thing AI does in healthcare is pretty useful."
  - CLEAR: "Artificial intelligence improves healthcare by enabling precise diagnostic tools and predictive analytics."

4. REFLECTING ACADEMIC STANDARDS

- **Why It's Important**: Academic writing adheres to specific conventions of grammar, vocabulary, and structure. A formal style reflects a commitment to these standards and enhances the work's credibility.

- **Example**: Proper use of passive voice, third-person perspective, and discipline-specific terminology aligns your work with academic expectations.

5. ENGAGING THE AUDIENCE

- **Why It's Important**: While academic writing is formal, it must also be engaging enough to sustain the reader's interest. A balanced tone that avoids monotony can make the work more compelling.

- **Example**: Using varied sentence structures and well-chosen examples helps maintain the reader's attention without compromising professionalism.

6. BUILDING CREDIBILITY

- **Why It's Important**: A consistent and scholarly tone reflects the writer's expertise and understanding of the subject. It reassures readers that the work is reliable and well-researched.

- **Example**: Avoiding exaggeration or informal expressions ensures the tone aligns with the expectations of academic readers.

SUMMARY

This chapter emphasized the critical role academic writing plays in the doctoral journey, positioning it as both a skill and a scholarly responsibility. Academic writing at the graduate level is characterized by a formal tone, evidence-based reasoning, and a rigorous structure designed to communicate research clearly and credibly. Doctoral students are expected to engage deeply with existing literature, especially within the last five years, to produce well-supported arguments that contribute new insights to their fields of study. This process of scholarly inquiry—also referred to as the development of "scholarship"—culminates in the dissertation, a formal body of work that demonstrates expertise and the ability to advance knowledge.

The chapter outlined the standard components of an academic paper: title page, introduction, body, conclusion, and references, each serving a distinct rhetorical purpose. It offered examples to guide students in constructing compelling arguments, beginning with a focused introduction and building through well-supported claims grounded in evidence and analysis. Importantly, it discouraged personal opinion or anecdotal experience in favor of objective, research-based conclusions.

Citing sources was presented not only as a requirement of academic integrity but also as a means of establishing credibility, situating arguments within scholarly discourse, and avoiding plagiarism. The discussion on tone and style further reinforced the importance of professionalism, clarity, and objectivity in academic communication. Finally, academic writing was framed as an evolving skill—refined through iterative assignments and feedback—that reflects a student's growth as a critical thinker and emerging thought leader.

CHAPTER 2 – THE FOUNDATION FOR THE DISSERTATION

In this chapter, the considerations that must be made by the doctoral student are covered at a high level. Understanding the rationale for conducting research is essential. **The primary reason for engaging in the dissertation process is to add a meaningful contribution to the existing body of literature!** Of course, there are personal reasons that all doctoral students have for embarking on the doctoral journey, and it is these reasons that serve to drive and motivate you throughout the process.

The research process consists of a series of systematic steps designed to explore research questions, test hypotheses, or investigate a problem. The purpose of this chapter is to provide the steps and general information for each step. In future chapters, each step will be explored further. Below are the steps, presented in order:

1. IDENTIFY THE RESEARCH PROBLEM

A research problem is not the *cause* of something—it is the *outcome*—because it emerges from a gap, conflict, or unresolved issue identified through prior observation, experience, or review of existing knowledge. Rather than initiating events or phenomena, the research problem reflects the *consequence* or *manifestation* of underlying conditions, trends, or deficiencies in current understanding (Creswell & Creswell, 2018).

> For example, high employee turnover is not the cause, but the outcome of deeper issues such as poor management, inadequate leadership, or lack of technology adoption. In this way, the research problem serves as the entry point for inquiry, signaling that something has already occurred or is currently happening that warrants investigation to understand its causes, effects, and solutions.

Checklist:

- ✓ **Verify that the research topic is directly related to your selected program and specialization!**
- ✓ Define the issue, question, or gap in knowledge that you aim to address.
- ✓ Ensure the problem is specific, measurable, and feasible for investigation.

2. CONDUCT A PRELIMINARY LITERATURE REVIEW

Machi and McEvoy (2021) outline a structured, step-by-step process for conducting a literature review. Their six steps are as follows:

1. **Select a Topic**
   Identify a general area of interest and narrow it to a manageable research topic. This includes clarifying the purpose of the review and developing initial questions.
2. **Search the Literature**
   Systematically gather relevant scholarly sources from databases, libraries, and other academic repositories. This step emphasizes using strategic keywords and refining search strategies.
3. **Develop the Argument**
   Analyze and synthesize the literature to identify patterns, themes, gaps, and contradictions. Begin forming a conceptual framework or narrative that will guide the review.
4. **Survey the Literature**
   Critically examine and evaluate the quality, credibility, and relevance of each source. This includes summarizing and comparing findings across the literature.
5. **Critique the Literature**
   Move beyond description to analysis by identifying methodological weaknesses, theoretical limitations, and areas of debate. This helps position the researcher's study within the scholarly conversation.
6. **Write the Review**
   Organize and compose the literature review in a coherent, scholarly format that reflects the argument developed in earlier steps. This includes proper citation and integration of sources.

Checklist:

- ✓ Review existing research and theories related to the problem.
- ✓ Identify gaps in knowledge, refine your understanding of the topic, and justify the need for your study by providing the literature as evidence of the problem's existence.
- ✓ Identify an appropriate theoretical framework, based on what was used in existing research studies or based on gaps in knowledge identified.

3. DEFINE THE RESEARCH OBJECTIVES

Alignment with the Problem Statement:
Research objectives must directly stem from the problem statement, offering measurable and achievable steps toward resolving or better understanding the issue (Saunders, et al., 2019). A well-crafted objective should address specific dimensions of the problem, such as its causes, impacts, or potential interventions.

Clarity and Focus:
Objectives must be clear, concise, and logically structured. According to Kumar (2019), objectives should follow the SMART **criteria—Specific, Measurable, Achievable, Realistic, and Time-bound**—to ensure they can be pursued systematically through research.

Hierarchical Structuring:
Typically, researchers define **general objectives** (broad aims) followed by **specific objectives** (narrower goals) that detail what will be explored, tested, or analyzed (Creswell & Creswell, 2018). This structure supports the formulation of appropriate research questions or hypotheses.

Function in the Research Process:
Research objectives provide a roadmap for methodology selection, data collection, and analysis. They are essential for evaluating the study's success in addressing the problem and for maintaining research coherence and validity (Leavy, 2020).

> **Example**
>
> If the **problem statement** is: "*There is a lack of strategic alignment between emerging technology adoption and organizational change management practices, which undermines the successful integration of digital transformation initiatives in mid-sized enterprises.*" then a **research objective** might be: "*to examine the relationship between organizational change readiness and the effective implementation of emerging technologies in mid-sized enterprises.*"

Checklist:

- ✓ Clearly state the purpose of the research.
- ✓ Develop specific objectives or goals, such as exploring a phenomenon, describing trends, or testing relationships.

4. DEVELOP RESEARCH QUESTIONS OR HYPOTHESES

A **research question** is a clear, focused, and concise inquiry that the study seeks to answer. It flows directly from the problem statement and objectives and defines the specific aspect of the problem the researcher intends to investigate (Leavy, 2020).

According to Saunders et al. (2019), a high-quality research question should be:

- **Clear and unambiguous**
- **Researchable** with available methods and data

- **Feasible** within time and resource constraints
- **Ethically sound**
- **Relevant** to academic or practical concerns

For **qualitative** studies, questions often begin with "How" or "Why", aiming to explore phenomena.

For **quantitative** studies, questions often begin with "What is the relationship between..." or "To what extent...", aiming to test measurable variables.

A **hypothesis** is a tentative, testable statement that predicts a relationship between two or more variables. It is typically used in **quantitative** research and is derived directly from the research question (Creswell & Creswell, 2018).

Types:

- **Null hypothesis (H_0)**: Suggests no relationship or difference exists.
- **Alternative hypothesis (H_1)**: Suggests there is a significant relationship or difference.

Characteristics of a Good Hypothesis (Kumar, 2019):

- Simple and specific
- Testable and falsifiable
- Logically derived from the research question
- Based on existing theory or empirical evidence

- Formulate initial research questions that guide the study.
    - **Exploratory research:** Open-ended questions (e.g., "What are the factors influencing X?")
    - **Quantitative research:** Testable hypotheses (e.g., "X is positively correlated with Y.")

- Ensure these align with the objectives.

Let's assume the **research problem** is:

"There is a lack of strategic alignment between emerging technology adoption and organizational change management practices, which undermines the successful integration of digital transformation initiatives in mid-sized enterprises."

- **Research Question**:
  To what extent does organizational change readiness influence the successful implementation of emerging technologies in mid-sized enterprises?

- **Hypotheses**:
  - H_0: *There is no statistically significant positive relationship between leadership commitment to change and the successful implementation of emerging technologies.*
  - H_1: *There is a statistically significant positive relationship between leadership commitment to change and the successful implementation of emerging technologies.*

5. CHOOSE A THEORETICAL FRAMEWORK

DEFINITION AND PURPOSE:

A **theoretical framework** is a structured set of concepts and propositions that guides the researcher's inquiry by providing a lens through which to view the research problem, interpret data, and explain findings (Creswell & Creswell, 2018).

It links the research **problem**, **objectives**, and **questions** to existing **theories**, offering a scholarly foundation and rationale for the study's design. Identify that relevant theories or conceptual models identified during the literature review can be used to adequately ground your research. The selection of the theoretical framework provides the lens you will use to frame your understanding of constructs and variables, interpret data once collected, and *connect your findings to existing knowledge in a meaningful, valuable manner.*

STEPS TO CHOOSING A THEORETICAL FRAMEWORK

a. Analyze the Research Problem

The framework must align with the nature of the problem. For example, a problem involving human behavior may call for **Behavioral Theory** (Watson, 1913; Skinner**,** 1953) while one involving system dynamics might align with **Systems Theory** (Kivunja, 2018).

b. Review Existing Literature

Conduct a thorough literature review to identify which theories have been used in past studies addressing similar problems. This helps ensure scholarly alignment and avoids reinventing the wheel (Leavy, 2020).

c. Match the Framework to the Research Purpose and Questions

The theoretical framework should help explain relationships among variables or themes, guiding data collection and analysis (Saunders, Lewis, & Thornhill, 2019). For **quantitative research**, frameworks often predict measurable relationships; for **qualitative research**, they help interpret meaning and context.

d. Assess Relevance and Fit

A chosen framework should:

- Apply to your discipline and topic
- Offer explanatory or predictive power
- Support the methodology (e.g., grounded theory, phenomenology, case study)

e. Justify the Choice

Researchers must articulate why the chosen theory is appropriate and how it shapes the study. This justification shows scholarly rigor and theoretical coherence (Ravitch & Carl, 2021). Doctoral students need to provide this rationale to their dissertation chair and need to be able to address their selection during the dissertation defense.

Example:

Research Problem: *"There is a lack of strategic alignment between emerging technology adoption and organizational change management practices, which undermines the successful integration of digital transformation initiatives in mid-sized enterprises."*

Theoretical *Framework*: *Technology-Organization-Environment (TOE) framework (Tornatsky & Fleischer, 1990)*

- Rationale: *The Technology-Organization-Environment (TOE) framework is a well-established model for examining the factors that influence organizational adoption of technological innovations.*

6. SELECT A RESEARCH DESIGN AND METHODOLOGY

- Decide on the design of the study (e.g., exploratory, descriptive, explanatory, constructive).
- Choose qualitative, quantitative, mixed, or constructive method approaches.
- Plan data collection techniques (e.g., surveys, interviews, experiments).

Selecting a research design and methodology is a critical step in the doctoral research process, as it provides the structural blueprint for how the study will be conducted and how data will be gathered and analyzed. Doctoral students must align their design choices—whether quantitative, qualitative, mixed, or constructive methods—with their research questions, the nature of the phenomenon under investigation, and the type of data needed to generate meaningful insights. A well-justified methodology demonstrates academic rigor and ensures the study's validity, reliability, or trustworthiness, depending on the paradigm. As part of this process, students should also consider ethical implications, sampling strategies, and data collection instruments. *Thoughtful selection and articulation of design and method not only enhance the study's credibility but also support a coherent, logically structured dissertation.*

7. DETERMINE THE STUDY POPULATION AND SAMPLING

- Define the target population.
- Choose a sampling method (e.g., random sampling, stratified sampling).
- Decide on the sample size by conducting a power analysis and ensure it is representative of the population.

When designing a doctoral research study, determining the **study population and sampling strategy** is a foundational step that directly impacts the validity, reliability, and generalizability of your findings. The study population refers to the entire group of individuals or entities that meet the criteria for inclusion in your research, while the sample is a subset of that population from which data will be collected. As a doctoral student, you must clearly define the characteristics of your target population and justify your sampling method—whether probability (e.g., random, stratified) or non-probability (e.g., purposive, convenience)—based on the goals and constraints of your study. Considerations such as sample size, accessibility, ethical implications, and potential for bias should guide your decisions. **For example, in the case of constructive research, the type of sampling depends on how and where the constructed solution is tested or demonstrated.** *Documenting a transparent rationale for your choices ensures methodological rigor and supports the credibility of your research outcomes.*

Probability Sampling Methods

Method	Description	Strengths	Limitations
Simple Random Sampling	Every individual has an equal chance of being selected.	High representativeness; easy to analyze statistically.	Can be difficult with large populations; needs a complete list.
Systematic Sampling	Selects every *k*th member from a list after a random start.	Easier than simple random; good for ordered lists.	Risk of periodicity bias if the pattern in the list coincides with *k*.
Stratified Sampling	Divides the population into strata (e.g., age, gender) and samples from each.	Ensures representation across key subgroups.	More complex; requires knowledge of all strata.
Cluster Sampling	Population is divided into clusters (e.g., schools), and some clusters are sampled fully.	Efficient for large or spread-out populations.	Less precise; high within-cluster similarity can reduce accuracy.
Multistage Sampling	Combines methods (e.g., cluster then random sampling within clusters).	Flexible and efficient for large studies.	Complexity increases the potential for sampling errors.

Non-Probability Sampling Methods

Method	Description	Strengths	Limitations
Convenience Sampling	Participants are chosen based on ease of access.	Fast and inexpensive.	Low generalizability; high bias risk.
Purposive Sampling	Selected based on the researcher's judgment about who best fits the criteria.	Useful for targeted or expert samples.	Subjective; can introduce researcher bias.
Snowball Sampling	Existing subjects recruit future subjects.	Helpful for hard-to-reach or hidden populations.	Not random; may skew toward certain networks or traits.
Quota Sampling	Ensures certain groups are included in specific proportions.	Allows control over subgroup representation.	Still non-random; potential for selection bias.

8. ACQUIRE OR DEVELOP DATA COLLECTION INSTRUMENTS

Create or select tools to gather data (e.g., surveys, interview guides, observation protocols). Typically researchers who develop their own instruments pilot test the instruments to ensure validity and reliability.

Doctoral students do not have the time and resources to develop instruments that have adequate validity and reliability. Therefore, they are highly encouraged to utilize standardized instruments that have demonstrated construct validity and reliability.

By leveraging standardized instruments with construct validity, doctoral students can enhance the rigor and impact of their research, ultimately contributing to the advancement of knowledge in their field.

As a doctoral student, acquiring appropriate data collection instruments is a critical step in ensuring the validity and reliability of your research findings. This process involves identifying or developing tools—such as surveys, interviews, observation protocols, or standardized tests—that are aligned with your research questions, theoretical framework, and methodology. **When possible, select instruments that have been previously validated in peer-reviewed studies to enhance credibility and support comparability across studies. Be sure to evaluate each instrument's psychometric properties, including reliability (e.g., internal consistency, test-retest) and validity (e.g., construct, content, criterion-related).** If you are creating a new instrument, pilot testing is essential to refine questions and ensure clarity. Additionally, consider ethical implications and obtain necessary permissions or licenses for proprietary tools. *Proper selection and documentation of data collection instruments not only strengthen the integrity of your study but also ensure compliance with institutional review board (IRB) requirements.*

9. COLLECT THE DATA

Once you have completed the required training per the institutional policy requirements and the IRB has approved your study:

- Execute the data collection plan while adhering to ethical guidelines.
- Ensure consistency in how data is gathered to maintain accuracy and reliability.

For doctoral students, the **data collection phase** is a critical step that must align precisely with the research design, methodology, and ethical considerations approved by the Institutional Review Board (IRB). Whether utilizing surveys, interviews, observations, or secondary datasets, the collection process should follow a clearly defined protocol to ensure consistency, reliability, and validity. During this

stage, it is essential to document every aspect of the data-gathering process, including instruments used, participant recruitment, consent procedures, and any challenges encountered. *Accurate and systematic data collection not only enhances the credibility of your findings but also provides a robust foundation for subsequent analysis and interpretation, which are integral to contributing meaningful insights to your field of study.*

10. ANALYZE THE DATA

- Organize and process the collected data.
- Use appropriate analysis methods:

  Quantitative data: Statistical techniques, and software tools (e.g., SPSS, R).

  Qualitative data: Thematic analysis, coding, narrative interpretation.

- Test hypotheses (if applicable) or identify patterns and insights.

Analyzing the data is a critical phase in the doctoral research process, where raw information is transformed into meaningful insights that address the research questions or hypotheses. This step involves selecting appropriate analytical techniques based on the research design, data type (qualitative or quantitative), and theoretical framework. For quantitative studies, this may include statistical tests such as t-tests, regression analysis, analysis of variance (ANOVA), or structural equation modeling (SEM) to determine relationships or differences between variables. In qualitative research, thematic analysis, coding, or content analysis may be used to identify patterns and themes. Doctoral students must also ensure the validity and reliability (or trustworthiness) of their findings, interpret results in the context of existing literature, and consider any limitations. Proper documentation of the analytic process enhances transparency and supports the scholarly rigor expected at the doctoral level.

11. INTERPRET THE RESULTS

- Relate findings to the research questions, objectives, and theoretical framework.
- Discuss implications, potential applications, and how the findings contribute to existing knowledge.

  When interpreting research results at the doctoral level, it is essential to go beyond simply reporting statistical outputs. Interpretation involves critically analyzing what the findings mean in the context of the research questions,

theoretical framework, and existing literature. Doctoral students should assess whether the results support or refute the hypotheses, consider the strength and direction of relationships or effects, and evaluate practical as well as statistical significance. Additionally, interpretation should include a discussion of any unexpected findings and their possible implications, while acknowledging limitations and potential sources of bias. *This reflective analysis is critical for demonstrating scholarly rigor and contributing meaningful insights to the academic field.*

12. DRAW CONCLUSIONS AND MAKE RECOMMENDATIONS

- Summarize key findings.
- Provide practical or theoretical recommendations based on the results.
- Identify limitations and suggest areas for future research.

In the final stages of a doctoral study, drawing conclusions and making recommendations is a critical process that synthesizes the research findings and aligns them with the original problem statement, research questions, and theoretical framework. Conclusions should be based on a clear and logical interpretation of the analyzed data, highlighting how the results address the research objectives and contribute to the existing body of knowledge. **Doctoral students must ensure that conclusions are evidence-based, avoiding speculation beyond what the data supports.** Recommendations should follow naturally from these conclusions and may include practical applications, policy implications, or suggestions for future research. These recommendations should be realistic, actionable, and grounded in the study's context and limitations, demonstrating the scholar's ability to apply research in meaningful and impactful ways.

13. REPORT AND SHARE FINDINGS

- Write a detailed research report, article, thesis, or dissertation, depending on the intended audience or assignment requirements.
- Present the findings through academic journals, conferences, or other platforms.

For doctoral students, the oral defense is a critical milestone where research findings are formally reported and rigorously evaluated by a committee of faculty experts. This presentation provides an opportunity to articulate the significance of your study, demonstrate mastery of your research design and methods, and defend

the validity of your findings and interpretations. The defense is not merely a summary but a scholarly dialogue—an occasion to clarify, justify, and contextualize your work within the broader academic discipline. Preparation should include anticipating questions, rehearsing clear and concise explanations, and aligning your responses with theoretical frameworks and existing literature. *Approaching the oral defense with confidence and scholarly integrity reinforces your credibility as an emerging expert in your field.*

14. REVIEW AND REFLECT

- Evaluate the research process for strengths and areas of improvement.
- Consider how the study aligns with its original objectives and contributes to the field.

As a doctoral student, the practice of reviewing and reflecting is essential to deepening your scholarly development and advancing your research expertise. Regularly reviewing academic literature allows you to stay current with emerging theories, methodologies, and debates in your field, while critical reflection helps you assess how this knowledge aligns with or challenges your research assumptions and goals. By intentionally revisiting your progress, decisions, and challenges, you not only enhance your analytical skills but also cultivate the intellectual agility needed to refine your research design and respond to complex problems. *Reflection fosters a mindset of continuous learning, which is vital for contributing original and meaningful insights to your discipline.*

Key Considerations Throughout the Process

Ethical Compliance: Ensure ethical guidelines are followed, such as obtaining informed consent, protecting privacy, and minimizing harm.

Iterative Adjustments: Be prepared to revisit earlier steps as new insights arise during the process.

This structured approach ensures the research is systematic and rigorous, and produces reliable and meaningful results.

SUMMARY

This chapter presented the doctoral research process as a structured, systematic approach used to make scholarly contributions. Emphasized in the chapter was that the primary goal of the dissertation was to address a gap in existing knowledge through rigorous academic inquiry.

The process of identifying **a** research problem was defined as an outcome of observed gaps or deficiencies in the literature. A preliminary literature review process followed, guided by Machi and McEvoy's six-step model: topic selection, literature searching, argument development, surveying, and critiquing sources, and writing the review.

The process of defining research objectives aligned with the problem statement, using SMART criteria—specific, measurable, achievable, realistic, and time-bound was explained. These objectives informed the development of research questions or hypotheses, depending on whether the study followed a qualitative or quantitative design.

A suitable theoretical framework was described as necessary to guide analysis and interpretation, ensuring the study was grounded in existing scholarship. The research design and methodology were cited to be chosen based on the study's purpose, and decisions about population, sampling, and data collection instruments were made accordingly.

Following IRB approval, the process of collecting, analyzing, and interpreting data**,** and relating findings to the framework and research questions was detailed. The section concluded by explaining the final step of making conclusions, recommendation**s**, and dissemination through academic writing and presentations.

Throughout the process, ethical compliance and academic integrity remained central. This chapter offered a high-level overview of each step, setting the foundation for deeper exploration in subsequent chapters.

CHAPTER 3 - SELECTING A RESEARCH TOPIC

First and foremost: **your research topic must fall under your declared program and specialization.** Conduct a review of existing literature concentrating on peer-reviewed journal articles from the last five years. Focus on research articles in which studies were conducted on the topic and **a call for future research is made** (typically at the end of the article). Deconstruct each journal article to determine the problem statement, the design, and type of study, research questions, hypotheses, and theoretical framework with the primary author and related constructs meaningful for theoretical application.

Based on the nature of the research problem and gaps in the literature, choose the method most conducive to studying the problem. The choice between quantitative and qualitative methods, mixed, or constructive research is driven by the overarching **research problem** (gap in the literature must be identified), questions, objectives, and practical constraints**.** These are typically finalized during the **research design phase**, ensuring alignment with the study's goals.

Selecting a dissertation research topic is a foundational step for doctoral students and involves a systematic, reflective process that aligns personal interests with academic and practical relevance.

Here are the key steps (as shown in Figure 1):

1. IDENTIFY BROAD AREAS OF INTEREST

Identifying a broad area of interest is a foundational step for doctoral students beginning the dissertation process. Best practice starts with reflective inquiry, and students should consider their professional experiences, personal curiosities, and long-term career goals to surface topics they are genuinely passionate about. Reviewing course materials, research articles, and industry trends can help stimulate ideas and reveal knowledge gaps. Keep a research journal to track recurring themes, questions, or problems that arise during coursework or professional practice. Engaging in regular discussions with faculty, peers, or practitioners can also refine thinking and expose you to emerging issues within your field of study.

Another key practice is to explore broad topics with a flexible mindset. At this early stage, you should avoid narrowing too quickly and instead focus on identifying several general areas that are conceptually interesting and practically relevant. You should evaluate these topics by considering the availability of data, alignment with academic and institutional resources, and feasibility in terms of time and scope. Conducting preliminary literature scans using library databases such as ProQuest, EBSCO, Google Scholar, or discipline-specific journals can help determine whether a topic has sufficient depth for a doctoral study and highlight theoretical frameworks or methodologies that have been used previously. **The goal at this point is not to define a specific research question yet but to establish a thematic foundation that can later be refined into a clear, researchable problem.**

2. CONDUCT A PRELIMINARY LITERATURE REVIEW

Engage with current peer-reviewed literature to understand:

- Gaps in existing research (calls for future research)
- Emerging issues, trends, and novel ideas
- Common theoretical frameworks and methodologies
  This helps refine your ideas and ensures your potential topic contributes new knowledge or insight.

3. NARROW THE FOCUS

Transform a broad area into a specific research problem. This involves:

- Asking focused research questions
- Considering variables or phenomena that can be studied
- Identifying a population or context

4. EVALUATE FEASIBILITY

Assess practical constraints such as:

- Access to data or participants
- Ethical considerations
- Required skills and resources (e.g., statistical software, domain expertise)
- Timeframe and scope of work

5. ALIGN WITH THEORETICAL FRAMEWORK

Consider how existing theories may support or guide your topic. Remember that the theoretical framework is the lens by which you understand your topic at a deeper level of inquiry. Choose a framework that can:

- Structure and support your research questions
- Guide data interpretation and ability to explain or predict
- Provide empirical support and situate your study in scholarly discourse

6. SEEK FEEDBACK

Discuss ideas with your dissertation chair, committee members, or peers. Constructive feedback can help refine your topic, ensure academic rigor, and align your study with doctoral program expectations.

7. FORMULATE A WORKING TITLE AND RESEARCH QUESTIONS

Draft a clear, concise working title and preliminary research questions or hypotheses. These should reflect the purpose of the study, the variables or themes of interest, and the population or setting.

8. CONFIRM TOPIC APPROVAL

Submit a proposal to your faculty member for approval based on the required steps listed for an assignment or at the request of the faculty member. Revisions may be required to meet institutional guidelines or to clarify your contribution to the field.

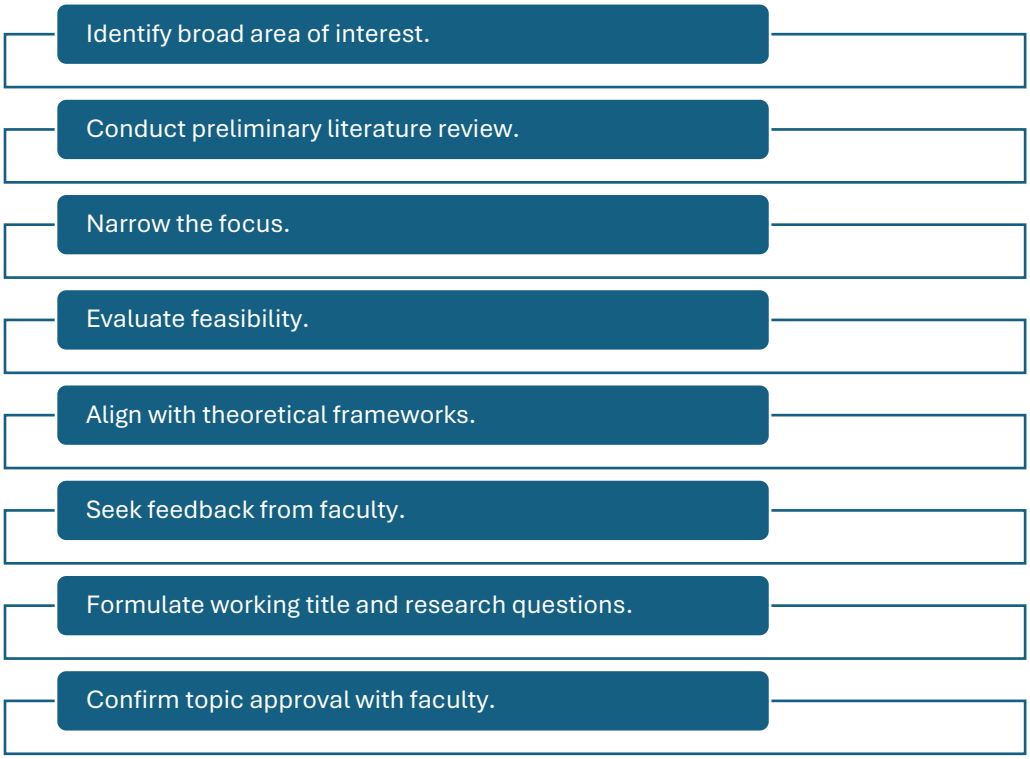

Figure 1- Steps to Selecting a Dissertation Research Topic

SUMMARY

This chapter outlined the systematic process for selecting a dissertation research topic, emphasizing alignment with your declared doctoral program and specialization. The process began with identifying broad areas of personal and academic interest—ideally, topics connected to professional experience or long-term goals—to maintain motivation throughout the dissertation journey, but also a topic that is relevant to the overarching goals.

A preliminary literature review was described as a critical early step, focusing on peer-reviewed journal articles from the past five years. Priority was given to empirical studies that included calls for future research. You were encouraged to deconstruct these studies to extract the problem statement, research design, methods, theoretical framework, and key constructs.

The chapter emphasized narrowing the focus to a specific research problem by posing clear questions and identifying a study population or context. Feasibility was also a major consideration, requiring reflection on ethical concerns, data access, skill requirements, and available resources.

You were advised to align your research with a theoretical framework that could support question formulation, data interpretation, and scholarly contribution. The choice of methodology—qualitative, quantitative, mixed, or constructive—depended on the identified gap, research questions, and practical constraints.

Feedback from faculty and peers was positioned as essential for refining the topic and ensuring academic rigor. Once refined, you were encouraged to formulate a working title and research questions or hypotheses that clearly articulate the purpose and scope of the study.

The chapter concluded by highlighting the importance of faculty approval to finalize the topic selection and ensure institutional alignment before progressing to the dissertation proposal phase.

CHAPTER 4 – DEVELOPING THE PROBLEM AND PURPOSE STATEMENTS

DECONSTRUCTING THE PROBLEM STATEMENT

The **problem statement section** should be no more than 300 words and it should be developed using the steps shown in Figure 2:

Paragraph 1. Adequately but succinctly **capture** the problem and be supported with evidence of its existence (be sure to align with in-text citations from the Introduction section of the paper once that is written).

Paragraph 2. Identify who is impacted by the problem (individuals, groups, industries, organizations, society)

Paragraph 3. Explain what knowledge gaps exist, and address the ramifications of not studying the problem.

The problem statement should be stated in a specific way. The problem statement should start with “The problem to be addressed in this study is…”

It is important to remember *the problem is not the result or symptom*. The **problem** is the underlying cause or issue that leads to the observable outcome or result. Focusing on the outcome or result because it “feels like the problem" is not the goal of doctoral research; identifying the cause driving the results is. **This understanding is what catalyzes the development of solutions as targeted interventions that solve the problem at the root.** This advancement in knowledge, as obtained from conducting research grounded in the cause, *contributes to a deeper understanding and theoretical development.* This practice ultimately adds to the extant research and has broader practical applications in the field. The **cause** is also focused on to ensure a more rigorous and meaningful research contribution is possible. *Focusing on symptoms alone*

is likely to lead to oversimplified studies that fail to address the complexities of the issue.

An example of the **problem statement section**:

> The problem to be addressed in this study is workplace bullying is increasing in prevalence in the United States and other countries and targets of workplace bullying are known to have short- and long-term health problems, including psychological and psychosomatic stress symptoms so severe that in some cases, the target suffers permanently or commits homicide or suicide (Mikkelsen & Einarsen, 2001; Lutgen-Sandvik et al., 2007; Martin, 2008; Namie, 2007; Workplace Bullying Institute, 2008). According to Neuman and Baron (2003), targets often experience feelings of dread, isolation, demoralization, and the inability to escape or prevent being bullied.
>
> Extant research on workplace bullying is limited to certain work environments and the findings cannot be generalized to other work environments (Lutgen-Sandvik et al., 2007; Namie, 2007; Salin, 2008). The specific problem this study will address is the need to quantify, analyze, and explain the extent of the prevalence and relationship between workplace bullying and psychological empowerment in the IT work environment and the degree of association between workplace bullying and psychological empowerment. This quantitative correlational study will use data collected from IT professionals to examine the extent to which workplace bullying and psychological empowerment exist, and whether a relationship exists between workplace bullying and psychological empowerment.

HOW TO DEVELOP THE PROBLEM STATEMENT

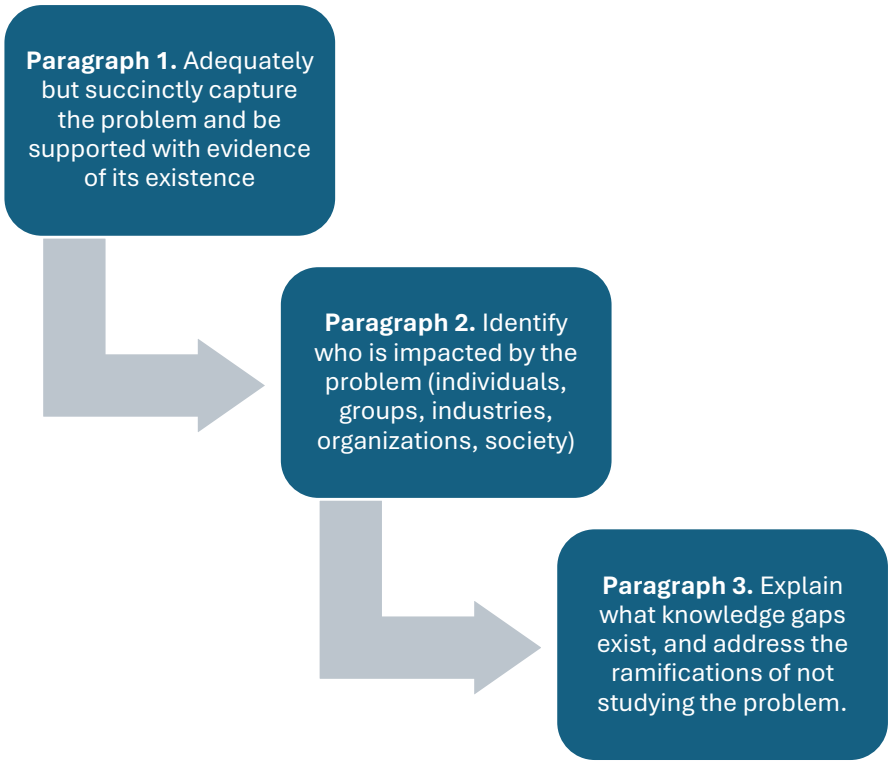

Figure 2. How to develop a problem statement

DECONSTRUCTING THE PURPOSE STATEMENT

The **purpose statement section** is written as one paragraph or page and needs to identify the method, design, and high-level goal of the research. The purpose statement should be written as follows, substituting the content inside and including the brackets, "The purpose of this **[identify research methodology] [identify research design]** study is to **[identify the goal of the dissertation that directly reflects and encompasses the research questions to follow]**."

An example of the purpose statement section:

The purpose of this quantitative correlational study is to conduct an empirical investigation to determine the extent to which a relationship exists between workplace bullying and psychological empowerment in the IT work environment. This research will also look at how often workplace bullying occurs, in what forms, and the extent to which IT professionals perceive themselves on four dimensions of psychological empowerment. Independent variables will be workplace bullying, gender, job type, and work sector (public or private); the dependent variables will be psychological empowerment and workplace bullying. In the analysis where a distinction will be made between participants who were bullied versus not bullied, workplace bullying will be the independent variable. An analysis will be conducted to determine if there are any particular groups at risk for workplace bullying that are based on gender, job type, and work sector (public or private). The ideal research methodology is quantitative, using a descriptive explanatory correlational survey design to collect and analyze “data at one point in time” (Creswell, 2005, p. 355). The rationale for performing this method of collection and analysis is that numerical values will be used for comparisons and determining whether relationships exist between variables. Time constraints and the inability to allocate the necessary financial resources prohibit a longitudinal study from being conducted at this time. A correlation is a statistical test that can detect a consistency in variation, or covariance, between two or more variables (Creswell, 2005). The current study will investigate the extent to which a relationship exists between workplace bullying and psychological empowerment in the IT work environment. Data will be analyzed using descriptive statistics, comparisons, and correlational analyses.

The specific population group that will be studied is 1,500 IT professional members of the Association of Information Technology Professionals (AITP) working in the United States and the sample will be determined based on who volunteers to participate in the study. One of the objectives of this study is that the findings from this investigation will further the existing knowledge related to workplace bullying and psychological empowerment.

SUMMARY

This chapter detailed the structure and significance of crafting effective problem and purpose statements for doctoral research. The first paragraph identifies the core issue and provides evidence of its existence using current literature. The second paragraph clarifies who is affected by the problem—individuals, organizations, industries, or society. The third paragraph outlines what is missing in the existing literature and explains the consequences of not addressing the issue through scholarly inquiry.

A key emphasis was placed on distinguishing between underlying causes and observable outcomes. Doctoral-level research must investigate the root cause of an issue—not merely its symptoms—to generate meaningful, theory-based solutions. Addressing causes allows for deeper insights, improved theoretical development, and stronger contributions to both scholarship and practice. In contrast, focusing on symptoms often leads to oversimplified studies lacking substantive impact.

The chapter also introduced the purpose statement, which identifies the research method, design, and overarching goal of the study. The purpose statement defines the variables to be studied, the target population, and the rationale for using the selected approach. It ensures alignment with the problem statement and research questions, offering a roadmap for data collection and analysis.

Together, these sections serve as the foundation for a well-structured dissertation. When developed thoughtfully, they demonstrate scholarly intent, methodological rigor, and relevance to both academic and real-world contexts.

CHAPTER 5 – DEVELOPING RESEARCH QUESTIONS AND HYPOTHESES

Developing research questions and hypotheses is a foundational step in the dissertation process, as it guides the direction, scope, and purpose of the study. **Research questions articulate what the researcher seeks to understand, explore, or explain and must align closely with the study's problem statement and objectives.** Good research questions are **clear, focused, and researchable**—they specify the population or context, identify variables or concepts, and suggest the type of data required. In qualitative research, questions often begin with "how" or "what" and aim to uncover meanings, experiences, or processes. In contrast, quantitative research questions focus on relationships, differences, or effects among measurable variables (Creswell, 2018).

Hypotheses are typically associated with quantitative research and are formulated as **testable predictions** based on theory and prior empirical evidence. A well-constructed hypothesis provides a tentative answer to a research question and establishes the basis for statistical testing. Hypotheses come in two forms: the **null hypothesis (H_0)**, which suggests no relationship or effect, and the **alternative hypothesis (H_1)**, which posits the presence of a significant relationship or difference. Developing clear, directional hypotheses ensures that the study is logically structured and measurable, allowing the researcher to draw valid conclusions based on data analysis. Both research questions and hypotheses must be logically derived from the theoretical framework and literature review, ensuring academic coherence and relevance (Creswell, 2018).

Research questions and hypotheses must be **directly aligned with the theoretical framework** because the framework provides the foundation and lens through which the study is conceptualized and structured. A **theoretical framework** has an integral role and serves as the foundation for:

- Defining the concepts and variables of interest.
- Explaining constructs or nature of relationships among variables.
- Guiding the selection of research questions and hypotheses.

It ensures that the study is grounded in existing knowledge and helps connect the research to broader theories in the field. This is an important objective of all academic research. It is also important to remember that research questions and hypotheses must be aligned with the theoretical framework.

1. ALIGNMENT OF RESEARCH QUESTIONS WITH THE THEORETICAL FRAMEWORK

Research questions are shaped by the concepts and relationships outlined in the theoretical framework. This is why you, the doctoral student, must know the theoretical framework "inside and out" before developing research questions. Below is a list of reasons that explain the importance of the theoretical framework:

Guidance for Inquiry:

a. The framework **highlights key concepts or variables to investigate.**

It helps *refine the scope of the questions to ensure they are specific and relevant.*

Example: If using Maslow's Hierarchy of Needs as a framework, research questions might explore how unmet physiological needs impact employee productivity.

Conceptual Definitions:

b. The framework defines how terms are understood and operationalized.

Example: In a study on self-efficacy (based on Bandura's Social Cognitive Theory), a research question could be: "How does self-efficacy influence managers of information systems?"

Exploratory vs. Explanatory Research Questions:

Theoretical frameworks often dictate whether research questions are exploratory (open-ended) or explanatory (focused on relationships or causation).

Assuming *Uses and Gratifications Theory*, which posits that individuals actively seek media to fulfill particular psychological needs, such as companionship, information, or entertainment:

Example: "What factors contribute to social media addiction?"
(Exploratory, informed by the Uses and Gratifications Theory)

Example: "To what extent does the need for social interaction predict social media addiction among young adults?"
(Explanatory, informed by the Uses and Gratifications Theory)

2. ALIGNMENT OF HYPOTHESES WITH THE THEORETICAL FRAMEWORK

Hypotheses are testable statements **derived from the theoretical framework's propositions or assumptions.**

Prediction of Relationships:

The theoretical framework identifies expected relationships between variables.

Example: Based on Self-Determination Theory, a hypothesis might state: "There is a statistically significant positive relationship between higher levels of intrinsic motivation and job satisfaction."

Logical Derivation:

Hypotheses logically follow from the framework's principles.

Example: Using Attachment Theory, a hypothesis might be: "There is a statistically significant difference in relationship satisfaction between securely and insecurely attached individuals."

Operationalization of Variables:

The framework guides how variables are measured or observed.

Example: A hypothesis based on the Theory of Planned Behavior could focus on attitudes, subjective norms, and perceived behavioral control as predictors of behavioral intention.

3. PRACTICAL EXAMPLE OF ALIGNMENT

Theoretical Framework: Bandura's Social Cognitive Theory (focuses on self-efficacy and observational learning).

Research Question: "What is the relationship between self-efficacy and job performance in the IT work environment?"

Hypothesis: "There is a statistically significant relationship between higher levels of IT worker self-efficacy after on-the-job training and higher job performance scores.

Alignment Checklist:

- ✓ The framework explains how self-efficacy influences behavior and outcomes.
- ✓ The research question investigates this core concept.
- ✓ The hypothesis tests a specific prediction derived from the framework.

4. WHY ALIGNMENT IS CRITICAL

Coherence: Ensures that all components of the study (questions, hypotheses, methods) are logically connected.

Theoretical Contribution: Links the research to existing knowledge and supports meaningful interpretation of findings.

Rigor: Reduces ambiguity and strengthens the study's validity and reliability.

By anchoring research questions and hypotheses in the theoretical framework, researchers create a robust and well-structured study that contributes to both theory and practice.

Aligning research questions and hypotheses with the theoretical framework (see Figure 3) is essential for ensuring coherence and rigor in a dissertation. **The theoretical framework provides a structured lens through which the research problem is examined, guiding the formulation of research questions and hypotheses.** This alignment ensures that the study's design, methodology, and analysis are grounded in established theories, facilitating meaningful interpretations and contributions to existing knowledge. As highlighted by Hoover (2021), the research design serves as the blueprint for a study, aligning research questions with data collection strategies and analytical techniques. Moreover, Khanday and Khanam (2019) emphasize that the nature of research questions—whether exploratory, descriptive, explanatory, or evaluative—determines the suitability of qualitative, quantitative, mixed-methods, or constructive approaches. Ensuring that research questions and hypotheses are in harmony with the theoretical framework not only enhances the study's validity but also its relevance and impact within the academic community.

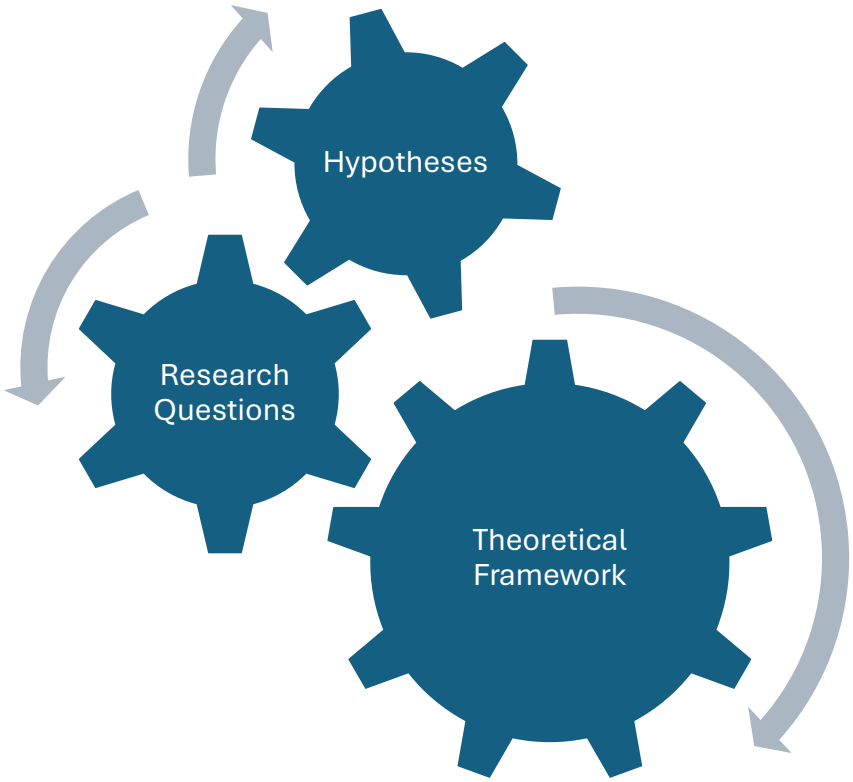

Figure 3. Alignment between theoretical framework, research questions, and hypotheses

SUMMARY

This chapter outlined the process for developing research questions and hypotheses. Alignment of research questions and hypotheses to the theoretical framework was emphasized and a practical example of alignment was provided. Lastly, the criticality of alignment between research questions, hypotheses, and theoretical framework was discussed.

CHAPTER 6 - SELECTING A RESEARCH DESIGN AND METHOD

Selecting a **research design and method** for a dissertation is a critical step that shapes how the research problem is investigated and how findings are interpreted. The research design serves as the blueprint for the entire study, outlining the logical structure that connects the research questions, theoretical framework, and data collection strategy. **Doctoral students must first consider the nature of their research questions**—whether they are exploratory, descriptive, explanatory, or evaluative—as this influences the choice between qualitative, quantitative, mixed-methods, or constructive approaches. For instance, a **quantitative design** is suitable when the aim is to test hypotheses or measure variables, while a **qualitative design** is ideal for exploring complex phenomena through rich, contextual data. **Mixed-methods research**, which combines elements of both, is often selected when a comprehensive understanding of a problem is required. **Constructive research** is an artifact-oriented approach commonly used in applied disciplines like computer science, information systems, and engineering. Its primary goal is to create and evaluate new artifacts (e.g., models, frameworks, algorithms, or systems) to solve real-world problems.

Difference Between a Research Design and Research Method

The **difference between a research design and a research method** lies in their scope and purpose within the research process:

RESEARCH DESIGN

- **Definition**: A research design is the **overall blueprint or strategic plan** for conducting a study. It outlines **WHAT** the researcher intends to do, including how data will be collected, measured, and analyzed.
- **Purpose**: It ensures that the research question is answered effectively by guiding the structure and logical flow of the study.
- **Examples**: Experimental, constructive, quasi-experimental, correlational, descriptive, case study, ethnographic, and longitudinal designs.

RESEARCH METHOD

- **Definition**: A research method refers to the **specific systematic steps, techniques, or procedures** used to gather and analyze data within the chosen design.
- **Purpose**: It provides the tools for artifact design (constructive research), data collection, and analysis.
- **Examples**: Artifact design (constructive research), surveys, interviews, observations, focus groups, content analysis, and statistical tests.

Think of the **research design** as the "what" or the **strategy** or **roadmap**, and the **research method** as the "how" or the **tactics** or **steps** used to execute that strategy.

RESEARCH DESIGNS

DESCRIPTIVE

The purpose of **descriptive research** is to describe characteristics, behaviors, or phenomena systematically. **An example is a study analyzing demographic data to describe the average age, gender, and income level of customers who use a particular e-commerce platform.** This research does not attempt to explain why certain demographics use the platform; it simply reports the observed patterns.

EXPLORATORY

The purpose of **exploratory research** is to explore a relatively unknown topic or problem, generate ideas, or identify patterns. **An example is a study exploring user attitudes toward a new, experimental social media platform to identify common themes and potential concerns.** The study might use focus groups and open-ended surveys to generate hypotheses about user preferences and challenges without drawing definitive conclusions.

EXPLANATORY

The purpose of **explanatory or causal research** is to examine cause-and-effect relationships between variables. **An example is a study investigating whether increased screen time causes reduced attention span in children aged 6–10.** The research might use experimental designs, such as comparing attention spans of children exposed to different amounts of screen time, to determine causation.

EVALUATIVE

The purpose of **evaluative research** is to assess the effectiveness or impact of a program, policy, or intervention. **An example is a study assessing the impact of a new employee training program on workplace productivity in a large corporation.** Researchers might compare productivity metrics before and after the program's implementation to evaluate its success.

CONSTRUCTIVE

The purpose of **constructive research** is to construct a novel solution. A constructive research study may, **for example, develop a machine learning–based early warning system to detect cybersecurity threats in small healthcare networks.** Researchers might compare productivity metrics before and after the program's implementation to evaluate its success.

RESEARCH METHODS

QUANTITATIVE RESEARCH

Definition: Quantitative research involves collecting and analyzing numerical data to identify patterns, relationships, or trends. This type of research uses statistical methods and techniques to measure, test, or validate hypotheses using numerical data.

Key Features: Structured methods like surveys, experiments, and numerical analysis.

Example:
A study measuring the impact of daily exercise on blood pressure levels in adults over six months.

Details: Researchers collect numerical data (e.g., systolic and diastolic blood pressure readings) and use statistical analysis to determine if exercise reduces blood pressure significantly.

EXAMPLE QUANTITATIVE RESEARCH DESIGN – MAPPED TO SELF-DETERMINATION THEORY (SDT)

Research objective: testing whether a mobile health app increases physical activity by influencing attitudes, social norms, and perceived control.

Research Question

- Does the use of a mobile health app significantly increase physical activity levels through changes in behavioral intention and perceived behavioral control?

Theoretical framework: Theory of Planned Behavior (TPB) (Ajzen, 2020)

TPB posits that behavior is directly influenced by:

1. **Behavioral Intention** – the intent to perform the behavior
2. **Attitude** – personal evaluation of the behavior
3. **Subjective Norms** – perceived social pressure
4. **Perceived Behavioral Control** – belief in one's ability to act

Hypotheses

- **H_0:** The use of the mobile app does not lead to statistically significant increases in both behavioral intention and physical activity levels by influencing users' attitudes, perceived social norms, and sense of control.

- **H_1:** The use of the mobile app leads to statistically significant increases in both behavioral intention and physical activity levels by influencing users' attitudes, perceived social norms, and sense of control.

Key Constructs and Variables

TPB Construct	Variable Name	Instrument
Attitude Toward Behavior	Attitude Score	TPB Attitude Scale
Subjective Norms	Social Norm Score	TPB Subjective Norms Scale
Perceived Behavioral Control	Control Belief Score	TPB PBC Scale
Behavioral Intention	Intention to Exercise	Intention-to-Act Questionnaire
Behavior	Physical Activity (min/week)	IPAQ Short Form; app-generated activity logs

DATA COLLECTION & ANALYSIS

- **Sample:** 100 app users in a randomized 8-week intervention.
- **Analysis:** Multiple regression to predict behavior from TPB constructs; paired t-tests for pre-post activity comparison.

QUALITATIVE RESEARCH

Definition: Qualitative research focuses on understanding behaviors, experiences, and perceptions through non-numerical data, such as interviews, observations, or textual analysis.

Key Features: Open-ended questions, thematic analysis, and rich, detailed descriptions.

Example:
A study exploring the experiences of college students coping with academic stress.

Details: Researchers conduct in-depth interviews, analyze the transcripts for recurring themes, and provide insights into coping strategies used by students.

EXAMPLE QUALITATIVE RESEARCH DESIGN – MAPPED TO SELF-DETERMINATION THEORY (SDT)

Research objective: To explore how intrinsic and extrinsic motivation influence engagement with a mobile health application for increasing physical activity.

Research Question:

How do users describe their motivational experiences while using a mobile health app to increase physical activity?

Theoretical Framework: Self-Determination Theory (SDT) (Deci & Ryan, 1985)

Data Collection & Analysis:

- **Method:**
  Semi-structured interviews with participants after 8 weeks of app use.
- **Analysis:**
  Thematic analysis using an SDT-informed codebook (Braun & Clarke, 2021).
  Codes are derived both inductively and deductively.

SDT explains motivation along a continuum from amotivation (lack of motivation) to intrinsic motivation and emphasizes the role of three basic psychological needs:

1. **Autonomy** – feeling in control of one's behavior
2. **Competence** – feeling effective and capable
3. **Relatedness** – feeling connected to others

MAPPING TO A THEORETICAL FRAMEWORK

SDT Construct	Operational Focus	Data Source
Autonomy	Users' sense of control over health decisions	Interview narratives
Competence	Perceived self-efficacy in completing app challenges	User reflections and progress stories
Relatedness	Social support, community features	Discussions of app community/peer support
Motivation Type	Intrinsic vs. extrinsic drivers	Thematic coding of motivational talk

Best Practices in Mapping to a Theoretical Framework

Mapping to a theoretical framework is a foundational practice in doctoral research**,** guiding the study's design, data interpretation, and alignment with existing knowledge. One best practice is to begin by **clearly defining the core concepts and variables within your research problem and questions.** Once identified, **examine existing theories that explain relationships among these constructs, ideally selecting a framework that has been validated in similar contexts**. This ensures that your study builds upon established knowledge and contributes meaningfully to ongoing scholarly conversations. Use peer-reviewed literature to justify your choice, demonstrating how the framework supports your assumptions, informs your hypotheses (in quantitative studies), or shapes your inquiry and coding structure (in qualitative studies).

Another best practice is to **ensure consistency between the theoretical framework and all elements of the research process—from research questions to data analysis.** For example, if using Social Cognitive Theory, your data collection tools should reflect constructs like self-efficacy or observational learning. Similarly, your discussion should tie back to the theory, explaining how findings support, extend, or challenge it. This mapping should be visible and traceable throughout your dissertation, often presented visually through a conceptual framework diagram. By doing so, you ensure theoretical alignment, foster analytical clarity, and lay a strong foundation for defending your research during committee reviews or publication efforts.

MIXED RESEARCH

Definition: Mixed research combines both **quantitative and qualitative methods** to provide a more comprehensive understanding of a research problem.

Key Features: Integration of numerical and narrative data; triangulation for enhanced validity.

Example:
A study evaluating the effectiveness of an online learning platform.

Details:

Quantitative Component: Analyze test scores of students before and after using the platform.

Qualitative Component: Conduct focus groups to gather students' feedback on their experiences with the platform.

The combination provides a holistic view of the platform's impact and usability.

EXAMPLE RESEARCH QUESTIONS AND HYPOTHESES FOR MIXED METHOD RESEARCH

Research Title: Exploring the Effects of a Mobile Health App on Lifestyle Habits and User Experiences

Research Questions:

1. Quantitative:
   Does The Use Of A Mobile Health Application Lead To Significant Improvements In Physical Activity Levels After 8 Weeks?

2. Qualitative:
   How Do Users Describe Their Motivation And Adherence To Physical Activity Goals While Using The App?

Hypothesis Couplet:

- H_0: The use of the mobile health application does not result in a statistically significant increase in physical activity levels over time.

- H_1: The use of the mobile health application results in a statistically significant increase in physical activity levels over time.

Constructs and Variables

Element	Description
Construct 1	Health Behavior Change
Variable 1 (Independent Variable)	App usage frequency (sessions/week), feature utilization rate
Construct 2	App Engagement
Variable 2 (Dependent Variable)	Average number of minutes of moderate-to-vigorous physical activity (MVPA) per week
Construct 3	User Motivation and Barriers
Variable 3 (Qualitative)	Thematic codes from participant interviews (e.g., goal setting, accountability)
Control Variables	Age, gender, BMI, baseline fitness level

Standardized Instruments

- **Quantitative:**
  - **International Physical Activity Questionnaire (IPAQ – Short Form):** A validated instrument for self-reported physical activity levels.
  - **App Usage Logs:** Automated tracking of daily activity minutes, app sessions, and goals completed.

- **Qualitative:**
  - **Semi-Structured Interview Protocol:** Questions focused on goal-setting, perceived usefulness, adherence, and motivational changes.
  - **Behavior Change Interview Coding Scheme:** Uses constructs from Self-Determination Theory or the Transtheoretical Model for qualitative analysis.

MAPPING TO A THEORETICAL FRAMEWORK

Theoretical Framework: Transtheoretical Model (TTM)

Overview:
TTM posits that individuals move through five stages of behavioral change:

1. **Precontemplation**
2. **Contemplation**

3. **Preparation**
4. **Action**
5. **Maintenance**

It also incorporates constructs like **processes of change**, **self-efficacy**, and **decisional balance**.

MIXED METHODS THEORETICAL FRAMEWORK INTEGRATION

- **Explanatory Sequential Design:**
  - Quantitative Phase: Measure participants' stage transitions and PA levels at baseline, midpoint, and post-intervention.
  - Qualitative Phase: Interview participants across different TTM stages to explore what processes or app features influenced their movement (or lack thereof).

- **Framework Matrix:** Combine quantitative stage shifts with qualitative themes for each participant.

CONSTRUCTS, VARIABLES, AND ALIGNMENT WITH TTM

TTM Construct	Operational Definition	Measured Variable/Source
Stages of Change	Readiness to adopt physical activity	Stage-of-change algorithm (Prochaska & Velicer, 1997)
Self-Efficacy	Confidence in the ability to perform physical activity	Exercise Self-Efficacy Scale (ESES)
Decisional Balance	Weighing pros/cons of activity	Decisional Balance Inventory
Processes of Change	Strategies used to progress (e.g., goal setting, reinforcement)	Thematic codes from interviews
Physical Activity	Time spent in MVPA per week	IPAQ-SF ad app usage logs

Example Interpretation Using TTM

- Participant A moved from **contemplation** to **action** and reported that goal reminders and social sharing features enhanced accountability—a classic **helping relationship** and **reinforcement management** mechanism in TTM.

- Participant B remained in **preparation** and cited a lack of time and motivation, aligning with low **self-efficacy** and unresolved **decisional balance**.

CONSTRUCTIVE RESEARCH

Definition: Constructive research involves solving a practical problem by designing, testing, and evaluating a new solution, method, or model. This type of research aims to create and evaluate an artifact that solves a practical problem. This approach follows a problem-solving cycle: identifying a relevant issue, constructing a solution, demonstrating and evaluating it, and then theorizing based on the results. It often includes **iterative development**, design validation, and theoretical contribution through practical application. The process is **both theoretical and practical**, aiming to extend existing knowledge through the creation of innovative solutions.

In constructive research, research questions are typically posed in a way that focuses on solving a real-world problem through the creation and evaluation of an innovative artifact, such as a model, framework, algorithm, or system. Rather than merely exploring or describing phenomena, the research question often takes a design-oriented and goal-driven form, such as: **"How can [artifact] be developed to address [specific problem] in [context]?"** This reflects the dual focus of constructive research on both practical relevance and theoretical contribution. The questions are formulated to guide the systematic construction of the artifact, its iterative refinement, and the validation of its effectiveness in practice. According to Kasanen et al., (1993), such research questions must be tightly aligned with both the identified problem domain and the intended contribution to academic knowledge, ensuring that the artifact not only works in practice but also advances understanding in the field.

Constructive research focuses on creating and testing artifacts as **constructions** or **solutions** to real-world problems and draws upon theoretical frameworks to guide the design, implementation, and evaluation of practical solutions. *A problem is solved by the artifact or construction, using a process of connecting and contributing to theory, while being practically functional and relevant.* The product of constructive research is the artifact developed (algorithm, construction, method, technique, system, etc.) to address the problem from a practically relevant perspective. **For you, the doctoral student to conduct constructive research, a theoretical connection and contribution to extant research is required.** Validation of the artifact should be done in an actual practical application setting (industry) to justify the practical relevance in the real world. Before engaging in constructive research, the **feasibility of quantitative validation** should be ascertained by the doctoral student before commencing. Theoretical and practical relevance are key evaluative criteria, but novelty and a rigorous research process are also required to ensure that the contribution to existing literature meets the highest standards.

Key Features: Focus on innovation and practical application.

According to Kasanen et al., (1993), constructive research requires the blending of **practical relevance and function** with a **connection and contribution to theory** using **problem-solving through construction.**

Example:

- Constructing a machine learning-driven anomaly detection framework to identify and mitigate zero-day attacks in enterprise network traffic.

Details: The research involves designing the algorithm, training it on existing data, and evaluating its accuracy in identifying and mitigating zero-day attacks in enterprise network traffic.

Artifact Validation Methods

1. Theoretical Validation

    - Compare the artifact against established theories, models, or frameworks in the field.
    - Justify design decisions based on relevant literature and best practices.

2. Expert Evaluation

    - Conduct structured interviews or surveys with domain experts to assess the artifact's relevance, feasibility, and correctness.
    - Use methods like the **Delphi technique** for iterative expert feedback.

3. Case Studies

    - Apply the artifact in real-world or simulated environments to examine its impact and effectiveness.
    - Document the outcomes and compare them against expected results.

4. Empirical Testing

    - Implement and test the artifact in controlled experiments to assess performance, usability, and reliability.
    - Collect quantitative data on key performance indicators.

5. Benchmarking

    - Compare the artifact with existing solutions using objective metrics.
    - Demonstrate improvements over prior approaches in terms of efficiency, accuracy, or usability.

6. Prototyping and Iterative Development

    - Develop prototypes and refine them based on user feedback.
    - Use agile methodologies to improve the artifact iteratively.

7. Simulation and Modeling

- Use computational models or simulations to test the artifact under various conditions.
- Validate the outputs against expected behaviors.

8. User Studies and Surveys

- Gather feedback from intended users through usability testing and structured surveys.
- Use qualitative and quantitative data to assess user satisfaction.

9. Proof-of-Concept Implementation

- Demonstrate the feasibility of the artifact through an initial working prototype.
- Showcase its practical application in solving the intended problem.

10. Action Research

- Embed the artifact within an organizational or societal setting and observe its impact over time.
- Collect iterative feedback from stakeholders for validation.

By combining multiple validation methods, you can provide a robust justification for the effectiveness and reliability of their constructed artifact.

EXAMPLE RESEARCH QUESTIONS AND HYPOTHESES FOR CONSTRUCTIVE RESEARCH

ARTIFACT: CYBERSECURITY – AUTHENTICATION ALGORITHM

Research Question:
How can a multi-factor authentication algorithm be constructed to improve login security for mobile banking applications without increasing user burden?

Hypothesis Couplet:

- H_0: The proposed multi-factor authentication algorithm does not result in a statistically significant reduction in unauthorized login attempts compared to existing methods.

- H_1: The proposed multi-factor authentication algorithm results in a statistically significant reduction in unauthorized login attempts compared to existing methods.

ARTIFACT: DATA SCIENCE – EMPLOYEE ATTRITION PREDICTION

- **Research Question:**
  What type of machine learning model can be constructed to accurately predict employee attrition in a large technology company?

- **Hypothesis Couplet:**
  - H_0: The constructed machine learning model does not achieve statistically significantly higher predictive accuracy than baseline models. (e.g., logistic regression).
  - H_1: The constructed machine learning model achieves statistically significantly higher predictive accuracy than baseline models.

ARTIFACT: PUBLIC HEALTH – DISEASE SURVEILLANCE DASHBOARD

- **Research Question:**
  How can an interactive data visualization dashboard be constructed to improve the efficiency of disease surveillance in rural health departments?

- **Hypotheses:**
  - H_0: The dashboard does not statistically significantly reduce the time needed for health officials to identify disease outbreaks compared to traditional reporting methods.
  - H_1: The dashboard statistically significantly reduces the time needed for health officials to identify disease outbreaks compared to traditional reporting methods.

KEY CHARACTERISTICS OF CONSTRUCTIVE RESEARCH QUESTIONS AND HYPOTHESES:

- Focus on **artifact creation** and practical problem-solving using theory as a lens to guide understanding.
- Research questions are often framed as **"How can x be designed or implemented to achieve y?"**
- Hypotheses are typically **used to evaluate the artifact's effectiveness using measurable outcomes.**

CONSTRUCTIVE RESEARCH EXAMPLE (CYBERSECURITY)

Domain: Cybersecurity – Mobile Banking
Artifact: Multi-Factor Authentication (MFA) Algorithm for Mobile Banking Applications

Research Question:
How can a multi-factor authentication (MFA) algorithm be constructed to improve login security for mobile banking applications without increasing user burden?

Hypothesis Couplet:

- **H_0:** The proposed MFA algorithm does not statistically significantly reduce unauthorized login attempts compared to existing authentication methods.

- **H_1:** The proposed MFA algorithm statistically significantly reduces unauthorized login attempts compared to existing authentication methods.

Constructs and Variables

Element	Description
Construct 1	Authentication Strength
Variable 1 (Independent Variable)	Type of authentication system (New MFA algorithm vs. standard 2FA)
Construct 2	System Security Effectiveness
Variable 2 (Dependent Variable)	Number of successful unauthorized login attempts in a controlled test
Construct 3	Usability/User Burden
Variable 3 (Dependent Variable)	User satisfaction score; average login completion time
Control Variables	Device type, user age, previous MFA experience

Standardized Instruments

- **System Usability Scale (SUS):**
  A 10-item Likert-scale questionnaire measuring user satisfaction and system usability across five dimensions (Brooke, 1996).

- **Drebin Dataset (ASBD):**
  A controlled dataset used to assess the effectiveness of security mechanisms against malicious applications in mobile environments (Arp et al., 2014).

Artifact Validation Methods (Examples)

- **Empirical Testing:** Conduct simulated attacks against both systems and measure breach rates.

- **Expert Evaluation:** Interview cybersecurity experts to assess feasibility, threat modeling, and best-practice adherence.

- **Usability Survey:** Use SUS to capture user experience metrics before and after implementing the new MFA algorithm.

- **Benchmarking:** Compare system performance metrics (e.g., attack success rate, login latency) to industry standards.

The Importance of Validating Artifacts

Artifact validation is a critical component of constructive research, serving to ensure that the designed artifact, whether a model, framework, or system, effectively addresses the identified problem and meets its intended purpose. In constructive research, the rigor of the study heavily relies on how well the artifact is developed and empirically evaluated within its real-world context (Kasenen et al., 1993). Validation not only confirms the artifact's utility but also supports its generalizability and theoretical contribution, linking practical problem-solving with academic relevance (Hevner et al., 2004). According to Peffers et al. (2007), validation should involve multiple strategies, such as experimentation, case studies, or expert reviews, to demonstrate that the artifact performs as expected under various conditions. Without systematic validation, the risk increases that the research outcome may lack credibility or fail to contribute meaningfully to theory and practice.

APPLICABLE THEORETICAL FRAMEWORKS FOR CONSTRUCTIVE RESEARCH

1. DESIGN SCIENCE RESEARCH (DSR) FRAMEWORK

Overview: A methodology specifically for creating and evaluating artifacts in information systems and other applied fields.

Key Components:

- Problem Identification and Motivation
- Definition of Objectives for a Solution
- Design and Development
- Demonstration
- Evaluation
- Communication

Applicability: Provides a structured approach for designing artifacts, such as algorithms, software systems, or methodologies.

Constructs:

Problem Identification: Understanding the context, significance, and root causes of the problem.

Objectives for Solution: Goals and criteria for the artifact's design and performance.

Artifact: The solution itself (e.g., model, system, algorithm, framework).

Design Processes: Methods and approaches for creating the artifact.

Evaluation Metrics: Criteria for assessing the artifact's effectiveness (e.g., utility, performance).

Communication: Strategies for presenting results and findings.

Key Contributions:

Hevner et al. (2004) published a seminal paper, Design Science in Information Systems Research, in **MIS Quarterly**. This paper outlined the framework for conducting and evaluating DSR in IS, emphasizing the creation and evaluation of artifacts to solve organizational problems.

Hevner's framework identifies **three main cycles** in DSR:

Relevance Cycle: Connecting research to the environment to ensure relevance to real-world problems.

Design Cycle: The iterative process of building and evaluating artifacts.

Rigor Cycle: Drawing from and contributing to the existing knowledge base to ensure theoretical soundness.

The framework is heavily influenced by earlier philosophical and methodological work, such as:

Herbert A. Simon's The Sciences of the Artificial (1969), emphasized the design of artifacts as a scientific activity.

Research traditions in engineering, systems thinking, and organizational problem-solving.

Broader Context:

While Hevner's 2004 framework is a cornerstone of DSR in IS, related methodologies and interpretations exist, such as Peffers et al.'s (2007) "Design Science Research Methodology" (DSRM), which offers a step-by-step guide for conducting DSR.

2. ACTIVITY THEORY

Overview: A sociocultural framework for understanding human practices through the analysis of tools, actors, and the context in which they operate.

Key Components:

- Subject (actor)
- Object (goal)
- Mediating artifacts (tools, processes)
- Rules, community, division of labor

Applicability: Useful for exploring how the constructed artifact interacts with users and systems in practice.

Constructs:

Subject: The individual or group performing the activity.

Object: The goal or purpose of the activity.

Outcome: The result of the activity.

Mediating Artifacts: Tools, symbols, or processes that facilitate the activity.

Rules: Norms or constraints governing the activity.

Community: The social context or group involved in the activity.

Division of Labor: Roles and responsibilities within the activity system.

Key Contributions:

The theorist most commonly associated with Activity Theory is Alexei Leontiev, a Soviet psychologist who expanded on the foundational work of his mentor, Lev Vygotsky. While Vygotsky introduced the idea of mediated action and cultural tools in human development, Leontiev extended this framework by emphasizing the collective and social nature of activity (Leontiev, 1978).

Leontiev's contributions formalized the concept of activity as a system involving three components:

Subject (the individual or group engaging in the activity).

Object (the goal or motive driving the activity).

Mediating Tools or Artifacts (including physical tools and symbolic systems like language).

This theory was further developed by other scholars like Yrjö Engeström, who created the third generation of Activity Theory, which is widely used today in fields like education, organizational studies, and human-computer interaction. Engeström's model introduced the idea of analyzing multiple interacting activity systems (Engeström, 2015).

3. GROUNDED THEORY

Overview: A qualitative methodology that is used to develop a theory grounded in data that is systematically collected and analyzed.

Key Components:

- Iterative data collection and analysis
- Open, axial, and selective coding

Applicability: This can be used to generate theories on how artifacts impact practice or behavior.

Constructs:

Codes: Labels assigned to data segments during analysis.

Categories: Groupings of related codes that represent key themes.

Properties: Attributes or characteristics of categories.

Core Category: The central concept that explains the phenomenon.

Data Saturation: The point at which no new information emerges.

Key Contributions:

The theorists behind **Grounded Theory** are **Barney G. Glaser** and **Anselm L. Strauss**. They developed this qualitative research methodology in the 1960s and introduced it in their seminal book, *The Discovery of Grounded Theory: Strategies for Qualitative Research* (1967).

Grounded Theory is a systematic approach to analyzing qualitative data, where theories are inductively developed from the data itself, rather than testing existing theories. This methodology has been widely used in various fields, including sociology, education, healthcare, and organizational studies.

4. INNOVATION DIFFUSION THEORY

Overview: Explains how, why, and at what rate new ideas and technologies spread within a culture or organization.

Key Components:

- Innovation characteristics (e.g., relative advantage, compatibility, complexity, trialability, observability)
- Communication channels
- Social systems

Applicability: Helps assess how effectively a constructed artifact might be adopted and used in real-world settings.

Constructs:

Innovation Characteristics:

- Relative Advantage: Perceived benefits over existing solutions.
- Compatibility: Fit with existing values, practices, and systems.
- Complexity: Ease of understanding and use.
- Trialability: The extent to which the innovation can be tested.
- Observability: Visibility of the innovation's results.

Communication Channels: Means of sharing information about the innovation.

Social System: The network of individuals and groups influencing adoption.

Adoption Rate: Speed at which the innovation is adopted.

Key Contributions:

The theorist behind Innovation Diffusion Theory is Everett M. Rogers.

Rogers introduced the theory in his seminal 1962 book, Diffusion of Innovations. The theory explains how, why, and at what rate new ideas and technologies spread through cultures, social systems, or populations. It identifies key elements in the diffusion process, including:

- **Innovation** – The new idea, product, or practice being adopted.
- **Communication Channels** – The means through which information about the innovation is shared.
- **Time** – The rate of adoption among individuals or groups.
- **Social Systems** – The networks and contexts in which the diffusion occurs.

Rogers also categorized adopters into groups based on their innovativeness:

- Innovators
- Early Adopters
- Early Majority
- Late Majority
- Laggards

This framework is widely applied in various fields, including education, marketing, healthcare, and technology (Rogers, 1962).

5. SYSTEMS THEORY

Overview: Examines how components of a system interact to form a complex whole.

Key Components:

- Inputs, processes, outputs, feedback loops
- Interdependencies and emergent properties

Applicability: Offers insights into how artifacts interact within larger systems, emphasizing interconnections and dependencies.

Constructs:

Inputs: Resources, data, or stimuli entering the system.

Processes: Activities or transformations within the system.

Outputs: Results or products generated by the system.

Feedback: Information used to adjust system operations.

Boundaries: Limits defining the system's scope.

Subsystems: Smaller components within the larger system.

Environment: External factors interacting with the system.

Key Contributions:

The primary theorist behind Systems Theory is Ludwig von Bertalanffy, an Austrian biologist. He developed General Systems Theory (GST) in the mid-20th century, aiming to understand the principles that govern systems across different fields, such as biology, sociology, psychology, and engineering (von Bertalanffy, 1968).

Bertalanffy's work emphasized the idea that systems are composed of interrelated and interdependent parts and that understanding the whole system requires looking at how these parts interact rather than focusing solely on individual components. His theory became foundational in various disciplines, including organizational studies, management, and cybernetics.

Other notable contributors to Systems Theory include:

Norbert Wiener – Pioneer of cybernetics, focusing on communication and control in systems.

Jay Forrester – Known for applying systems thinking to management and urban dynamics.

Gregory Bateson – Worked on systems theory in the context of anthropology and communication.

Niklas Luhmann – Applied systems theory to sociology, developing a theory of social systems.

These theorists expanded and applied systems concepts to various domains, making Systems Theory a cross-disciplinary framework.

6. SOCIOTECHNICAL SYSTEMS THEORY

Overview: Focuses on the interaction between people, technology, and the work environment.

Key Components:

- Technical system (technology, tools)
- Social system (people, organization, culture)
- Joint optimization

Applicability: Ensures the constructed artifact aligns with human, organizational, and technical needs.

Constructs:

Technical Subsystem: Tools, technology, and processes.

Social Subsystem: People, roles, and organizational culture.

Joint Optimization: Alignment between technical and social elements.

Task Design: How work is structured and assigned.

Environmental Fit: Alignment with the external environment.

Key Contributions:

The theorist most commonly associated with **Sociotechnical Systems Theory** is **Eric Trist**, along with his colleagues at the Tavistock Institute of Human Relations in London during the 1950s and 1960s. Trist and his collaborators, including **Fred Emery**, developed the theory to address the interplay between social and technical systems within organizations. The foundational work stemmed from their studies of British coal mines, where they observed that the introduction of new technology was most effective when paired with consideration of workers' social structures and behaviors (Trist & Bamforth, 1951).

- The key idea of Sociotechnical Systems Theory is that organizations function best when their **technical systems (tools, processes, and technology)** and **social systems (human relationships, roles, and norms)** are designed to complement each other. This approach emphasizes the importance of jointly optimizing these two dimensions to improve performance, productivity, and employee satisfaction.

7. COGNITIVE LOAD THEORY

Overview: Explains the impact of instructional design on working memory and learning efficiency.

Key Components:

- Intrinsic, extraneous, and germane cognitive loads

Applicability: Guides the design of artifacts intended for learning or decision support.

Constructs:

- **Intrinsic Load:** Cognitive effort required by the complexity of the task.
- **Extraneous Load:** Cognitive effort caused by poor design or irrelevant information.
- **Germane Load:** Cognitive effort dedicated to learning and schema building.
- **Schemas:** Mental structures for organizing knowledge.
- **Working Memory:** Capacity for temporary information processing.

Key Contributions:

Cognitive Load Theory (CLT) was developed by **John Sweller**, an educational psychologist. He introduced the theory in the late 1980s as a framework for understanding how the cognitive load imposed on a learner's working memory affects their ability to process and learn new information. Sweller's work emphasizes the importance of designing instructional materials and strategies to align with the limitations of human cognitive architecture, particularly the constraints of working memory and the role of long-term memory in learning (Sweller, 1988).

8. CRITICAL THEORY

Overview: Examines power structures and challenges dominant paradigms, emphasizing emancipation and societal improvement.

Key Components:

- Critical reflection on societal and organizational impacts
- Advocacy for change

Applicability: Useful for questioning the ethical and societal implications of constructed artifacts.

Constructs:

- **Power Structures:** Relationships and dynamics of control and influence.

- **Ideology:** Beliefs and values shaping societal norms.
- **Emancipation:** Efforts to reduce oppression or inequality.
- **Critique:** Examination of assumptions and dominant paradigms.
- **Social Transformation:** Actions aimed at creating equitable systems.

Key Contributions:

The primary theorists behind **Critical Theory** are associated with the **Frankfurt School**, a group of interdisciplinary scholars formed in the early 20th century. Key figures include:

Max Horkheimer - Considered one of the founders of Critical Theory. He emphasized the integration of social sciences and philosophy to critique societal power structures.

Theodor W. Adorno - Known for his contributions to aesthetics and cultural criticism, Adorno critiqued the culture industry and the commodification of art.

Herbert Marcuse - Explored the intersection of technology, society, and human freedom, and is famous for his work *One-Dimensional Man*.

Walter Benjamin - Although not formally part of the Frankfurt School, his work, particularly on aesthetics and the effects of mechanical reproduction on culture, is foundational to Critical Theory.

Jürgen Habermas - A second-generation Frankfurt School theorist, Habermas developed the theory of communicative action, focusing on rational communication as a means to achieve democratic ideals.

Critical Theory is rooted in the ideas of **Karl Marx** but expands beyond economic critique to examine culture, ideology, and the power dynamics embedded in society.

9. USER-CENTERED DESIGN (UCD)

Overview: Focuses on designing artifacts around user needs, preferences, and limitations.

Key Components:

- User research
- Iterative design and testing
- Usability evaluation

Applicability: Ensures the artifact is practical, intuitive, and user-friendly.

Constructs:

- **User Needs:** Functional and emotional requirements of end users.
- **Personas:** Fictional representations of user archetypes.
- **Scenarios:** Contextual narratives describing user interactions.
- **Usability:** Ease of use and satisfaction with the artifact.
- **Accessibility:** Inclusiveness for diverse users, including those with disabilities.
- **Feedback Loops:** Iterative design and user testing processes.

Key Contributions:

The theorist most commonly associated with **User-Centered Design (UCD)** is **Donald**

Norman, a cognitive scientist and usability engineer.

Norman's work, particularly his book *The Design of Everyday Things* (originally published as *The Psychology of Everyday Things*), is foundational to UCD principles. He emphasized designing systems, interfaces, and products with a deep understanding of the users' needs, capabilities, and behaviors. His concept of **Human-Centered Design**, which overlaps with UCD, focuses on iterative design processes involving users at every stage.

While **User-Centered Design** is not itself a theory, it is deeply informed by theoretical foundations from multiple disciplines**. Its strength lies in its practicality and adaptability, but it is not inherently a research-driven framework for generating new theoretical insights. To bridge this gap, UCD can integrate more formal research methods and theoretical models to strengthen its foundation.**

While Norman is a key figure, UCD also draws from broader disciplines like human-computer interaction (HCI) and ergonomics, with contributions from other researchers and practitioners over time.

10. AGILE AND LEAN FRAMEWORKS

Overview: Emphasize iterative development, user feedback, and continuous improvement.

Key Components:

- Short development cycles (sprints)
- Incremental delivery
- Collaboration and adaptability

Applicability: Guides the iterative and incremental design of artifacts.

Constructs:

- **Sprints:** Short, iterative development cycles.
- **Product Backlog:** List of features or tasks to be completed.
- **Minimum Viable Product (MVP):** Simplest version of the artifact with core functionality.
- **Customer Feedback:** Input from users or stakeholders.
- **Iterative Improvements:** Incremental enhancements to the artifact.
- **Collaboration:** Team dynamics and shared responsibility.

Key Contributions:

The Agile Manifesto Authors (2001): The Agile Manifesto was created by 17 software development practitioners, including:

- Kent Beck
- Martin Fowler
- Robert C. Martin (Uncle Bob)
- Ward Cunningham
- Ron Jeffries
- Jeff Sutherland
- Alistair Cockburn
- Jim Highsmith

These individuals were instrumental in formalizing Agile principles.

Related Theories:

Iterative and Incremental Development: Influenced by early pioneers like Barry Boehm (Spiral Model) and Tom Gilb.

Extreme Programming (XP): Developed by Kent Beck, with strong influence on Agile practices.

Scrum Framework: Created by Jeff Sutherland and Ken Schwaber, foundational to Agile methodologies.

Lean influenced Agile significantly, especially through its emphasis on:

- Delivering value to the customer.
- Minimizing waste.
- Continuous feedback and improvement.

Criticism:

Agile practices are often based on practitioner experience and anecdotal evidence rather than empirical studies.

The theoretical foundation for why Agile works in some contexts and fails in others remains underdeveloped.

Many Agile concepts, such as "self-organizing teams" and "velocity," lack rigorous theoretical grounding, leading to inconsistent interpretations and implementations.

Impact: Without a solid theoretical foundation, Agile frameworks can be misapplied or overhyped, especially in non-software contexts. **Doctoral students should avoid using any theoretical framework that focuses on practitioner experience, uses anecdotal evidence, and lacks the solid empirical research foundation necessary for their dissertation.**

Selecting the Right Framework:

The choice of a framework depends on:

Nature of the Artifact: Is it a physical tool, a digital system, or a conceptual model?

Research Goals: Is the focus on user interaction, societal impact, or technological innovation?

Field of Study: Different disciplines (e.g., education, healthcare, information systems) may favor specific frameworks.

Ethical Considerations: Ensure the framework supports ethical and inclusive research practices.

The selected framework must be thoroughly studied to determine its ability to properly frame your research context and objectives. **An industry framework that does not have a solid theoretical basis cannot be used for the dissertation!** The information provided by the authors (theorists) of the selected framework, the confirmatory factor analyses conducted to demonstrate the validity and reliability of the framework, and studies that relied on the framework should all be part of the extensive knowledge acquired by the doctoral candidate seeking to utilize the framework for their dissertation.

Summary of Applications

Quantitative Research: Best for numerical analysis and testing hypotheses.

Qualitative Research: Ideal for exploring human behaviors and experiences in-depth.

Mixed Research: Combines strengths of both quantitative and qualitative approaches for comprehensive insights.

Constructive Research: Focuses on creating and validating innovative solutions to real-world problems.

Each method is suited for different types of questions and objectives, depending on the scope and purpose of the study.

SUMMARY

This chapter provided details on different types of research methods, and extensive information on various theoretical frameworks. Examples of different research designs and how mapping occurs to ensure alignment between research questions, hypotheses, variables, to the constructs provided in theoretical frameworks were explored. Lastly, the process used to select a theoretical framework based on research objectives, design, and method was explained.

CHAPTER 7 – POWER ANALYSIS

WHAT IS POWER ANALYSIS AND WHY IT IS NECESSARY?

Power analysis is a statistical technique used to determine the minimum sample size required for a study to detect an effect of a given size with a certain degree of confidence. Specifically, it calculates the probability that a test will correctly reject a false null hypothesis (i.e., avoid a Type II error). This probability is known as the **statistical power** of the study and is typically set at 0.80 or 80%, meaning there is an 80% chance of detecting a true effect if it exists (Cohen, 1988). The analysis takes into account the **effect size, sample size, significance level (alpha), and statistical power**, ensuring the study is designed to yield *meaningful and interpretable results*.

Power analysis is **necessary** because underpowered studies may fail to detect real effects, leading to false conclusions and wasted resources. Conversely, overpowered studies may detect trivial effects that are not practically significant. In dissertation research, conducting power analysis during the planning phase enhances the **validity and reliability** of the findings and supports ethical research design by avoiding unnecessary data collection (Faul et al., 2009).

Example #1

Imagine a doctoral student conducting a **quantitative study** to examine whether a new teaching method improves test scores compared to traditional instruction. The researcher plans to use a **two-tailed independent t-test** to compare two groups. Using G*Power software, they input an expected **medium effect size (d = 0.50)**, set **α = 0.05**, and aim for **80% power**. The software calculates that a **sample size of 64 participants per group** (128 total) is needed to reliably detect an effect. This ensures the study is appropriately scaled to draw valid conclusions. The key components of power analysis are shown in Figure 4. The diagram illustrates how the four core elements—**effect size**, **sample size**, **statistical power**, and **significance level**—interact in a power analysis. Together, they help ensure your study is appropriately designed to detect meaningful results.

Example #2

Another doctoral student is investigating the **relationship between daily screen time and sleep quality** among working adults. The research question is whether **increased screen time is associated with decreased sleep quality**, using **Pearson's correlation** to assess the strength and direction of the relationship. The researcher plans to use a **two-tailed t-test** and a bivariate normal model. Using G*Power software, they input an expected **moderate effect size (d = 0.30)**, set **α = 0.05**, and aim for **80% power**. The software calculates that a **sample size of 84 participants** is needed.

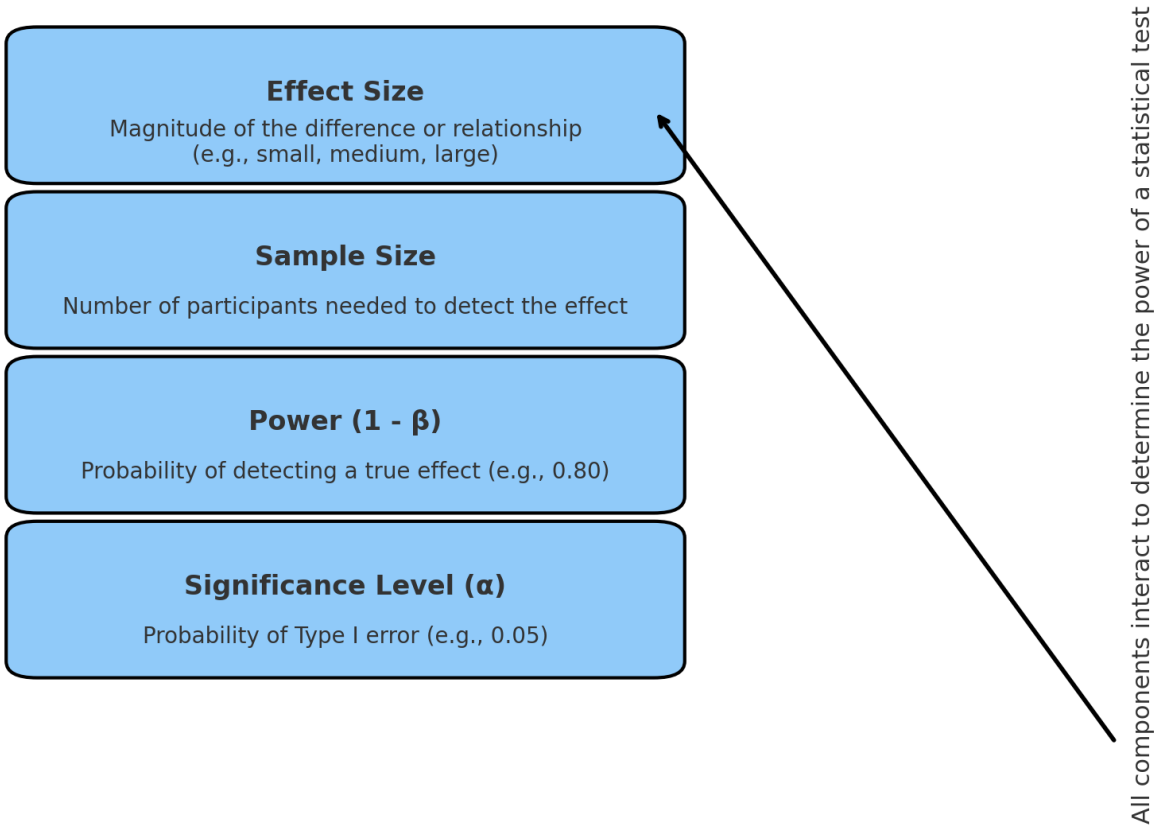

Figure 4. Key components of power analysis

FOUR KEY COMPONENTS OF POWER ANALYSIS

1. **Effect Size**
   - Indicates the magnitude of the relationship or difference you expect to find (e.g., Cohen's D, Pearson's R, odds ratio).
   - Can be small, medium, or large, based on prior research or theoretical expectations.
2. **Significance Level (α)**
   - The probability of a **Type I error** (false positive), is usually set at 0.05.
   - Lower alpha reduces the chance of false positives but requires a larger sample size.
3. **Power (1 - β)**
   - The probability of correctly rejecting a false null hypothesis (commonly set at 0.80).
   - Higher power reduces the risk of **Type II error (false negative)** but requires more participants.
4. **Sample Size (N)**
   - The number of observations or participants needed.
   - Determined based on the other three factors (effect size, significance level, and power) and the statistical test used.

TYPES OF POWER ANALYSIS

- **A priori (Prospective)**: **Conducted before data collection** to determine the required sample size.
- **Post hoc (Retrospective)**: **Done after a study** to calculate achieved power.
- **Sensitivity Analysis**: Determines the smallest effect size that can be detected given a sample size and alpha.
- **Criterion Analysis**: Calculates the required alpha or power given other parameters.

Comparison of Type I and Type II Error

Error Type	What Happens	Reality	Decision Made
Type I - Alpha (α)	Reject a true null hypothesis	Null is true	False positive
Type II – Beta (β)	Fail to reject a false null hypothesis	Null is false	False-negative

Type I Error (α)

Impact on Power:

- Setting a **lower alpha level** (e.g., 0.01 instead of 0.05) makes it **harder to reject the null hypothesis**, which in turn **reduces power** unless the sample size is increased.
- A **higher alpha** increases power but also increases the risk of a false positive.

Type II Error (β)

Impact on Power:

- Power is defined as 1−β.
- A **lower Type II error** (smaller β) means **higher power** (you're more likely to detect a real effect).
- High Type II error (low power) increases the risk that a real relationship or effect goes undetected.

Power and Implications of Each Component

Component	Relationship with Power
α (Type I error)	Decreasing α leads to ↓ Power (unless n ↑)
β (Type II error)	Decreasing β leads to ↑ Power
Sample Size (n)	Increasing n leads to ↑ Power
Effect Size	A larger effect leads to ↑ Power

WHY POWER ANALYSIS MATTERS

- **Scientific Validity**: Ensures your findings are robust and replicable.
- **Ethical Responsibility**: Prevents exposing participants to unnecessary research if the study is underpowered.
- **Resource Management**: Helps avoid wasting time and funding on inadequately designed studies.

SUMMARY

This chapter provided information on what power analysis is and why it is important to research. The four key components of power analysis were explained and different types of power analysis were detailed. Power analysis was explored using a conceptual foundation, mathematical underpinnings, and practical applications of power analysis as a means of ensuring methodological rigor and ethical research practices. This chapter underscored that power analysis is not merely a statistical exercise but a critical decision-making process that strengthens the credibility, reproducibility, and ethical standards of scholarly research.

CHAPTER 8 – ESSENTIAL SOFTWARE TOOLS

Using software tools like **G*Power** offers significant benefits in dissertation research, particularly when designing and evaluating the statistical power of a study. G*Power helps researchers determine the appropriate sample size needed to detect an effect of a given size with a desired level of confidence, which is crucial for maintaining methodological rigor. It allows for a variety of statistical tests—t-tests, ANOVA, regression analyses, and more—enabling researchers to plan robust quantitative studies and avoid issues like underpowered analyses, which can compromise the validity of findings. By accurately estimating sample sizes and effect sizes, G*Power enhances the efficiency and reliability of the research design process (Faul et al., 2009).

G*POWER

The G*Power interface is designed to be intuitive and user-friendly, facilitating statistical power analyses for a variety of tests. Here's an overview of its main components:

1. **Test Family and Statistical Test Selection**: At the top of the main window, dropdown menus allow users to select the appropriate test family (e.g., t-tests, F-tests, χ^2-tests, z-tests, or exact tests) and the specific statistical test within that family.

2. **Type of Power Analysis**: Adjacent to the test selection, another dropdown menu lets users choose the type of power analysis, such as:
   - A PRIORI (compute required sample size)
   - POST HOC (compute achieved power)
   - EFFECT SIZE (determine effect size)
   - SENSITIVITY (compute the effect size that can be detected)
   - CRITERION (compute alpha or beta given other parameters)

3. **Input Parameters Panel**: This section updates based on the selected test and analysis type. Users input values such as:
   - Effect size (with an embedded calculator accessible via the "Determine" button)
   - α error probability (commonly set at 0.05)
   - Power (1-β, often set at 0.80 or 0.95)
   - Sample size or other relevant parameters

4. **Output Parameters Panel**: After inputting the necessary data and clicking "Calculate," this area displays results including:
   - Noncentrality parameter
   - Critical value
   - Degrees of freedom
   - Actual power achieved

5. **Graphical Display**: The upper portion of the interface provides a visual representation of the statistical distributions under the null (H_0) and alternative (H_1) hypotheses, highlighting areas corresponding to Type I (α) and Type II (β) errors. This visualization aids in understanding the implications of the input parameters.

6. **Protocol of Power Analyses**: G*Power maintains a log of all analyses conducted during a session. This protocol can be viewed, saved, or printed, ensuring transparency and reproducibility in research planning.

Overall, G*Power is compact yet flexible, offering both novice and advanced researchers a powerful tool for designing statistically sound studies.

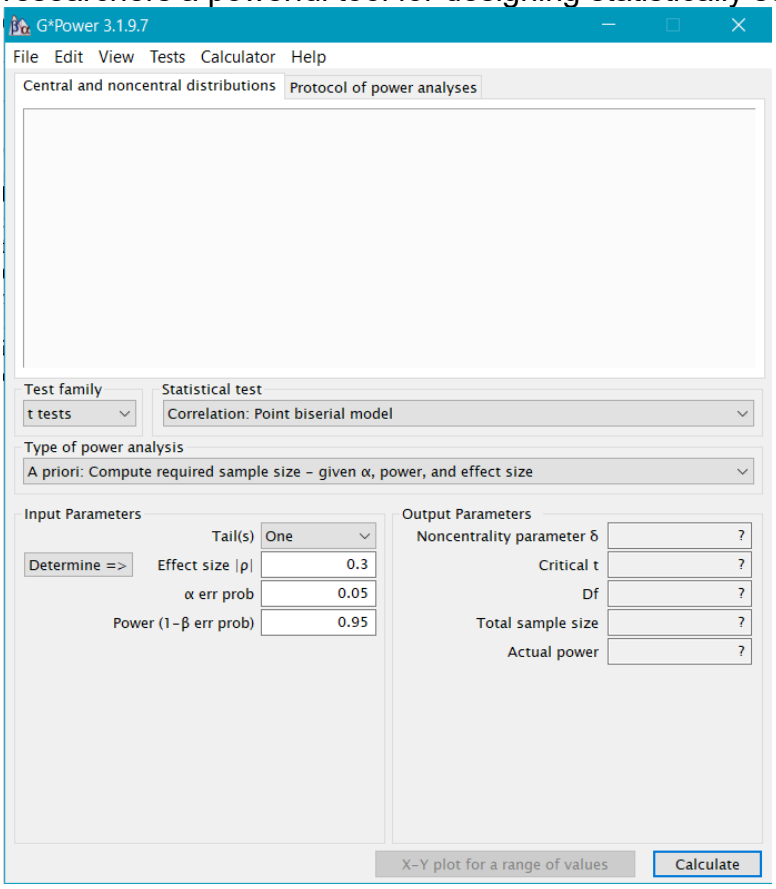

Figure 5 G*Power interface

HYPOTHETICAL SCENARIO:

A doctoral student wants to examine whether a **mindfulness-based intervention** improves **academic performance** compared to a control group receiving no intervention. The outcome is measured using **final exam scores**.

- **Design**: Independent samples t-test (two groups: treatment vs. control)

- **Effect Size**: Medium (Cohen's D = 0.5)
- **Significance Level (α)**: 0.05
- **Power (1 - β)**: 0.80

STEPS IN G*POWER

STEP 1: OPEN G*POWER

Download and install G*Power if you haven't already:
https://www.psychologie.hhu.de/arbeitsgruppen/allgemeine-psychologie-und-arbeitspsychologie/gpower

STEP 2: SET THE TEST PARAMETERS (BASED ON YOUR RESEARCH OBJECTIVES)

1. **Test family**: T TESTS
2. **Statistical test**: MEANS – DIFFERENCE BETWEEN TWO INDEPENDENT MEANS (TWO GROUPS)
3. **Type of power analysis**: A PRIORI: COMPUTE REQUIRED SAMPLE SIZE – GIVEN A, POWER, AND EFFECT SIZE

STEP 3: INPUT THE VALUES

- **Tail(s):** 2
- **Effect size d**: 0.5 (MEDIUM EFFECT PER COHEN, 1988)
- **α err prob**: 0.05 (STANDARD THRESHOLD FOR SIGNIFICANCE)
- **Power (1 – β err prob)**: 0.80 (STANDARD THRESHOLD FOR ADEQUATE POWER)
- **Allocation ratio N2/N1**: 1 (EQUAL GROUP SIZES)

STEP 4: CLICK "CALCULATE"

- G*Power will output:
  - **Total sample size needed**: 128 PARTICIPANTS
  - **Sample per group**: 64 PARTICIPANTS IN THE TREATMENT GROUP, 64 IN THE CONTROL GROUP

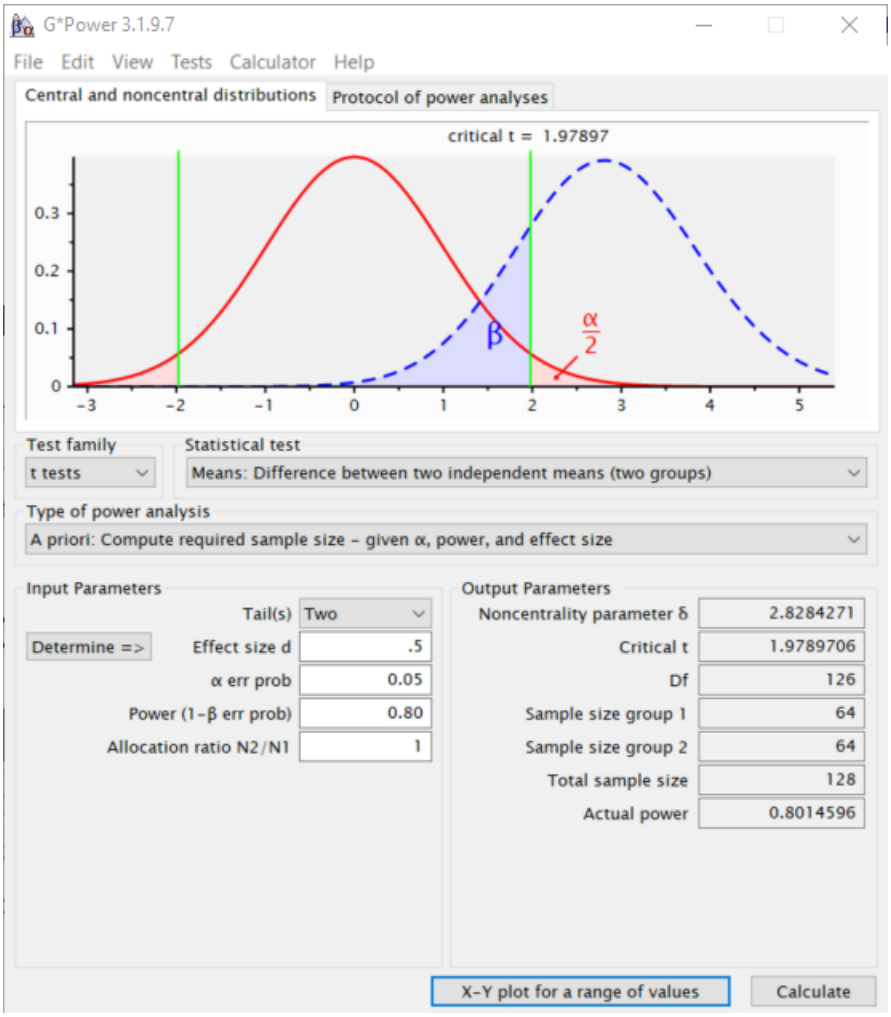

Figure 6: Sample size calculation

STEP 5: REVIEW GRAPH OR EXPORT

You can view:

- A **power curve**
- Change the **effect size** or **power** to explore different scenarios
- Export the results for inclusion in your dissertation proposal

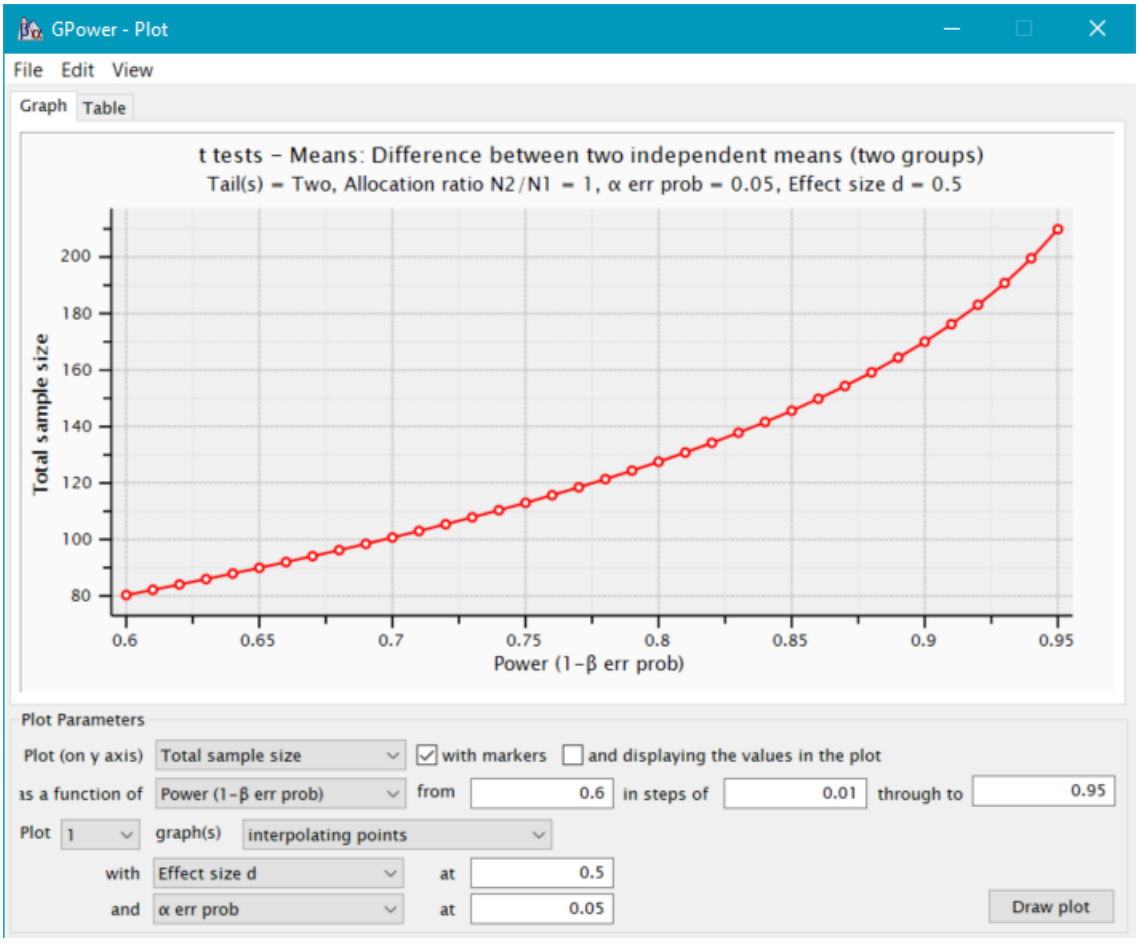

Figure 7: Plot total sample size

INTERPRETATION

This analysis tells the researcher they need a **minimum of 128 participants** (64 per group) to detect a **medium-sized difference** in exam scores between groups with **80% power** and a **5% risk of Type I error**.

NVIVO

NVivo, is an invaluable tool for qualitative research, providing a structured platform for organizing, coding, and analyzing large volumes of unstructured or semi-structured data (textual, audio, or video). It enables researchers to identify patterns, themes, and relationships within complex qualitative datasets, which might otherwise be difficult to manage manually. NVivo supports rigorous qualitative analysis by offering features such as word frequency queries, coding comparisons, and data visualization tools, which strengthen the credibility and transparency of the research process. The software's advanced features, including thematic analysis, data visualization, and AI-assisted coding, facilitate the identification of patterns and themes that might be overlooked through manual analysis.

Widely used in the social sciences, education, health, and other fields that rely on qualitative methodologies, NVivo enables researchers to work with interview transcripts, open-ended survey responses, audio files, videos, social media data, and more. Its primary function is to assist in thematic coding—identifying patterns, categories, and themes within qualitative data—and to facilitate data interpretation through visualization tools like word clouds, concept maps, and cluster analysis.

One of NVivo's core strengths lies in its ability to improve analytical rigor and transparency. By allowing for detailed documentation of coding processes and supporting audit trails, NVivo helps researchers enhance the credibility of their qualitative findings. The software also supports mixed methods research, integrating

qualitative and quantitative data for deeper insights. Additionally, its advanced search functions, query tools, and classification capabilities enable researchers to explore relationships across data sources and develop grounded theories or data-driven conclusions efficiently. NVivo's collaborative features also support team-based research by managing coding consistency and enabling shared projects in secure environments.

The **NVivo** interface is thoughtfully designed to support qualitative and mixed-methods research, offering a structured and intuitive environment for data analysis. Its layout comprises several key components that facilitate efficient navigation and in-depth exploration of data.

1. **Ribbon**: Located at the top of the interface, the Ribbon contains tabs such as *Home*, *Import*, *Create*, *Analyze*, and *Explore*. Each tab provides access to a set of tools and commands relevant to specific tasks, streamlining the workflow by grouping functionalities contextually.
2. **Navigation View**: Situated on the left side, this panel organizes all project items into categories like *Data*, *Codes*, *Cases*, *Notes*, *Queries*, and *Visualizations*. It serves as the primary means of accessing different components of the project, allowing users to manage and organize their data systematically.
3. **List View**: When an item is selected in the Navigation View, its contents are displayed in the List View. This middle pane presents a list of files, codes, or other items, enabling users to select specific elements for detailed examination or editing.
4. **Detail View**: Occupying the main workspace area, the Detail View displays the content of the selected item from the List View. Here, users can read documents, code data, write memos, and view query results. The Detail View supports multiple tabs, allowing for simultaneous work on various items.
5. **Quick Coding Bar**: Positioned below the Detail View, this feature provides a streamlined method for coding data. Users can quickly assign codes to selected text or media segments, enhancing the efficiency of the coding process.
6. **Find Bar**: Located above the List View, the Find Bar allows users to search for specific items within the project. It supports filtering by current folder, subfolders, or the entire project, facilitating quick access to desired data.
7. **Status Bar**: At the bottom of the interface, the Status Bar displays information about the current project status, including the number of items selected, coding references, and the position within the data. It also provides feedback on ongoing processes, such as query execution or data import.

This structured interface supports a comprehensive approach to qualitative data analysis, enabling researchers to manage complex datasets effectively.

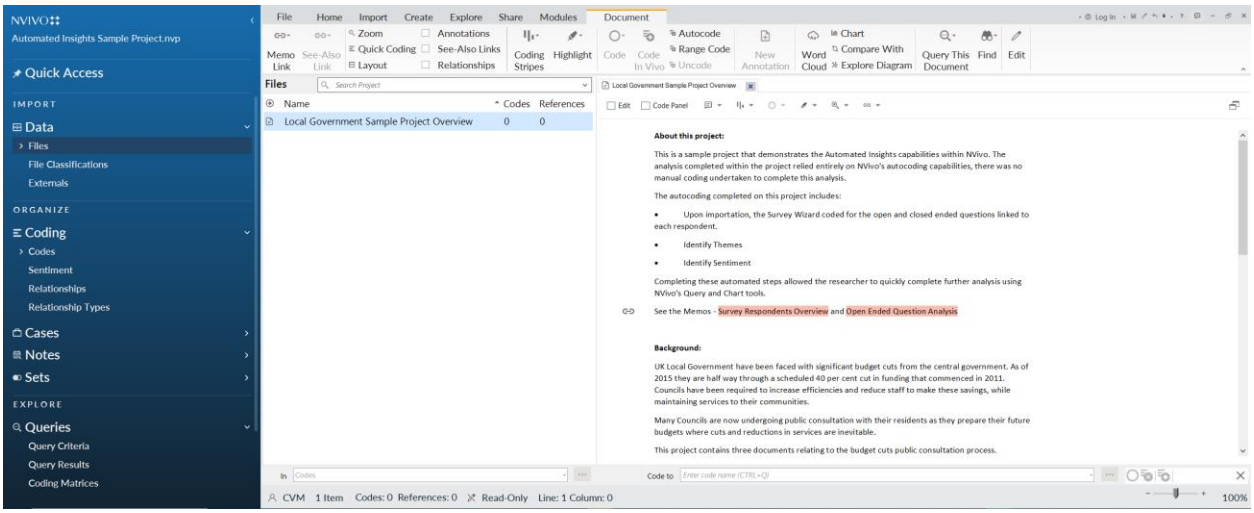

Figure 8. NVivo interface

PSPP

PSPP, a free and open-source alternative to SPSS, offers significant benefits for dissertation research involving quantitative data analysis. It allows researchers to perform a wide array of statistical procedures such as t-tests, ANOVA, regression, chi-square tests, and descriptive statistics—essential for testing hypotheses and examining relationships between variables. PSPP's interface closely mirrors that of SPSS, making it easy to learn for those with experience in that environment, while providing a no-cost solution ideal for students working on limited budgets. Its ability to read SPSS-formatted (.sav) data files also ensures compatibility and flexibility in collaborating with other researchers or institutions using proprietary software (gnu.org, n.d.).

In addition to its cost-effectiveness and compatibility, PSPP enhances reproducibility and transparency in academic research. Because it is open source, users can review and verify the underlying code and algorithms, which is especially valuable in academic

settings that emphasize methodological integrity. PSPP also supports scripting and syntax-based operations, allowing researchers to automate complex analyses and document their analytical decisions more rigorously. This helps reduce human error and ensures consistency across multiple datasets or iterative tests. For students conducting dissertation research, PSPP is a powerful tool that facilitates thorough, ethical, and reliable data analysis without incurring financial barriers.

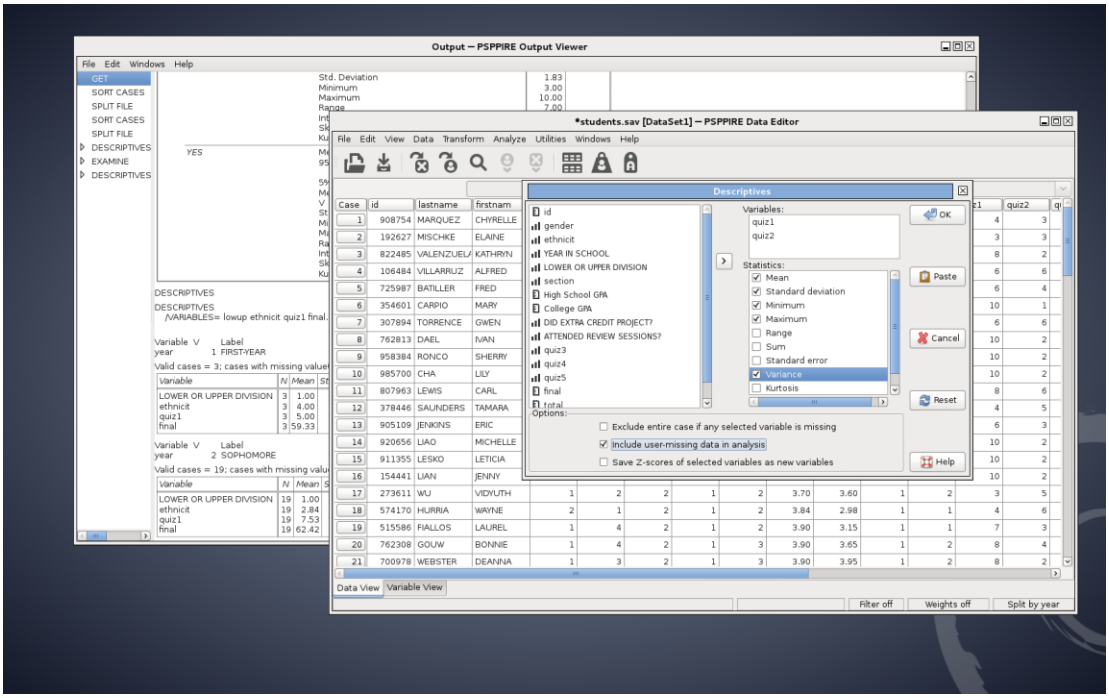

Figure 9. PSPP interface

The graphical user interface (GUI) of **PSPP**, known as **psppire**, offers a user-friendly environment for conducting statistical analyses without requiring command-line interactions. Designed to resemble the interface of SPSS, psppire features a spreadsheet-like **Data Editor** where users can input and view data. This editor is divided into two views:

- **Data View**: Displays the actual data values, allowing for direct data entry and editing.

- **Variable View**: Allows users to define metadata for each variable, such as names, types, labels, and measurement levels.

At the top of the interface, a menu bar provides access to various functions:

- **File**: Options to open, save, and manage data files.
- **Edit**: Standard editing functions like undo, redo, cut, copy, and paste.
- **Data**: Functions for manipulating data, including sorting and transposing.
- **Transform**: Tools for computing new variables or recoding existing ones.
- **Analyze**: Access to statistical tests and procedures, such as descriptive statistics, t-tests, ANOVA, and regression analyses.
- **Graphs**: Options to create visual representations like histograms and boxplots.
- **Utilities** and **Help**: Additional tools and documentation support.

Each function within these menus typically opens a dialog box where users can specify parameters for their analyses. These dialog boxes often include an option to display the corresponding syntax, which can be useful for learning or automating analyses. The output from analyses is presented in a separate **Output Viewer** window, which organizes results in a tree-like structure for easy navigation.

Overall, psppire provides an accessible platform for users to perform a wide range of statistical analyses through an intuitive GUI, making it a valuable tool for researchers and students alike.

SUMMARY

This chapter provided information on various software tools that are used in the dissertation process. A hypothetical scenario was provided and the steps used in G*Power to run a power analysis were described. Lastly, a high-level view of the purpose of each software application was explored.

AFTERWORD

As you reach the final pages of this manual, we hope it has served not only as a guide but also as a companion through the often complex and demanding process of doctoral research. The journey toward earning a doctorate is one of intellectual growth, perseverance, and the continual refinement of ideas—and research design and methodology lie at the heart of that journey. This Open Educational Resource (OER) was created with a deep respect for the diversity of research approaches, learner needs, and academic disciplines. Supported by a grant from National University, the development of this manual reflects a shared vision: to make high-quality, practical research guidance accessible to all doctoral students, regardless of background or institutional resources.

The tools, frameworks, and strategies outlined in this manual are meant to be revisited often. Research is not a linear path but an iterative process—one that evolves as your understanding deepens and your questions sharpen. Let this resource remain a touchstone as you move from proposal to dissertation, and from student to scholar. We encourage you to share, adapt, and build upon this work. As an OER, this manual is part of a growing movement that values openness, collaboration, and the collective advancement of knowledge. Your insights, additions, and reflections are welcome contributions to future editions. In closing, remember that your research has the power to contribute meaningfully to research, your field, and society. Stay curious, stay committed, and continue asking important questions. The world needs your voice.

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