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# Research process model for Bachelor's thesis

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## *Abstract*

This is an exploration of challenges faced by bachelor's students during the thesis-writing process and the development of a model to simplify and visualise this research journey. Drawing from literature and insights gained through supervision observations and interviews, the model addresses common challenges such as topic selection, methodological clarity, and adherence to academic standards. It offers an outlined approach, first focusing on research proposal development and then progressing to the full project, covering key elements such as the literature review, problem definition, research questions, methodology, and ethical considerations. By providing a clear, step-by-step guide, the model enhances student understanding and fosters academic independence, offering practical support for both students and supervisors.

**Keywords:** thesis writing; undergraduate; guidance; research; methodology.

## *Introduction*

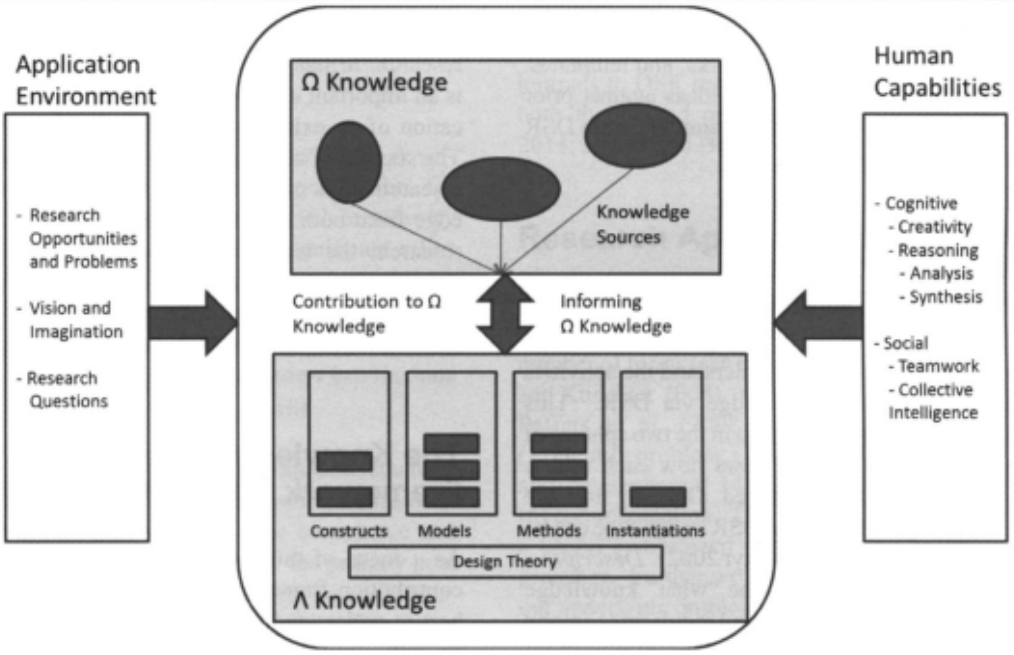
Bachelor's students writing their thesis often face various challenges and misunderstandings throughout the research process (Benavente et al., 2022; Mayyas and Alzoubi, 2022). These challenges can range from difficulties in selecting a suitable research topic (Jalongo, 2023), to understanding complex methodological concepts (Hammersley, 2023), and adhering to academic standards (Reimann et al., 2025). Students may also struggle with time management (Fleming and Kowalsky, 2021a), finding relevant literature (Heck et al., 2023), and maintaining motivation over an extended period (Houston, 2024). These hurdles can result in frustration, delays, and sometimes even failure to complete the thesis on time (Fleming and Kowalsky, 2021b). Not

surprisingly, effectively guiding students through the research process has become a critical focus in academic development (Stephen, 2024). Academical faculty members often try to address these misunderstandings by providing guidance, creating workshops (Jusslin and Widlund, 2024), and making resources available to support the students through their thesis-writing process (Paltridge and Starfield, 2020; Jusslin and Hilli, 2024). Faculty members might offer one-on-one supervision, feedback sessions, and seminars on research methods and academic writing (de Grave et al., 2014; Jusslin and Widlund, 2024). Additionally, some institutions provide access to online resources, libraries, and writing centres to further assist students (Jusslin and Hilli, 2024). Despite these efforts, the support systems are not always sufficient to meet the diverse needs of all students (Benavente et al., 2022). Still there is a shortage of simplified road maps which could help students visualise the research process in a comprehensible way (Baglione, 2021; Jagadeesh et al., 2023).

Many students find the existing guidance overwhelming or difficult to apply to their specific projects (Baglione, 2021; Benavente et al., 2022). Simplified, step-by-step guides or models can significantly aid in demystifying the process, helping students to see the bigger picture and understand how each part of their research fits into their thesis project (Davidavičienė, 2018; Magaldi and Berler, 2020; Douglas, 2022). These road maps can provide clarity, structure, and direction, making the thesis writing process less daunting and more manageable (Vinayavekhin and Phaal, 2023). By visualising the stages of research, from the initial idea to the final write-up, students can better plan their time, set realistic goals, and stay motivated throughout their thesis journey (Jagadeesh et al., 2023).

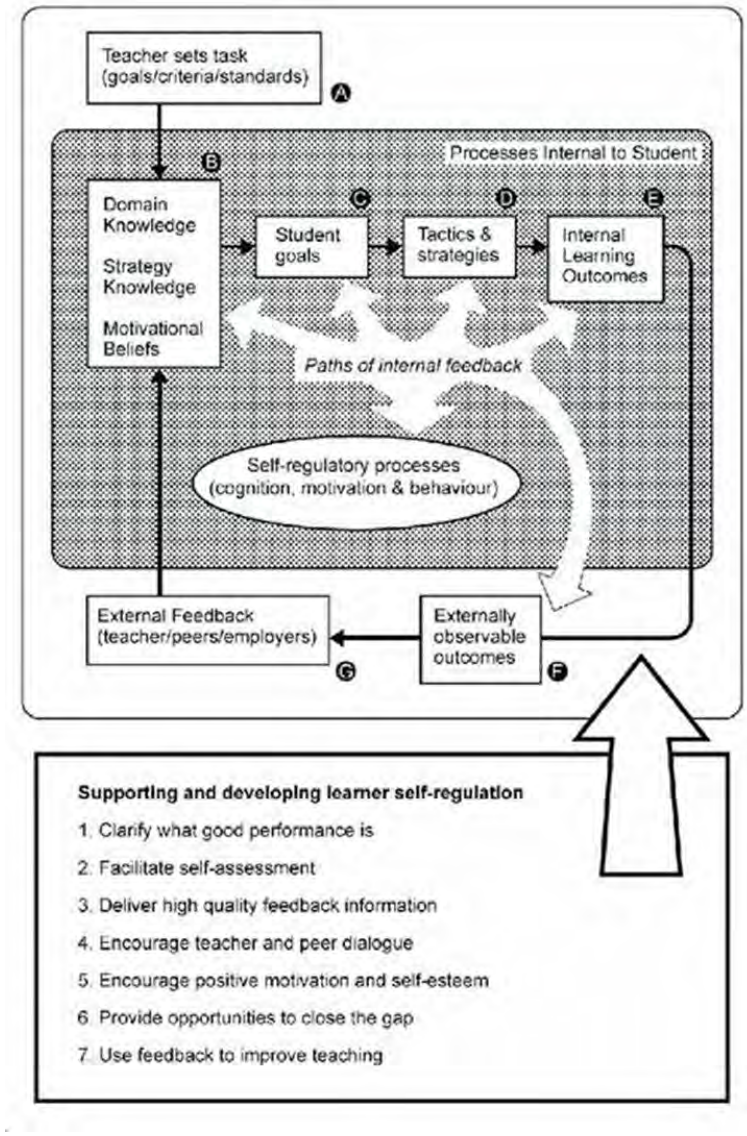
As a new teacher, I was thrown in the deep end of higher education when presented with my first students to supervise and in my initial search for structure I stumbled upon a book called 'The Craft of Research' by Booth et al. (2024). This book quickly became my manual, it is really a great read, both for supervisors as well as students, and I encourage my students to consult it. It is however only a foundation, the holistic view that I am trying to establish is not provided through this; student individualism and supervisor pedagogical leadership are absent topics. Analysing previous research, it is quickly concluded that frameworks designed to simplify and structure this journey are particularly valuable for undergraduate students navigating the complexities of thesis writing (Wisker, 2018; Hart and Annear, 2020; Taub et al., 2023). These frameworks address challenges such as topic selection, methodological clarity, and adherence to academic standards (Brooke, 2017).

**Figure 1. The roles of knowledge in design science research (Hevner and Gregor, 2013).**




Among the most notable contributions is the Design Science Research (DSR) framework (Hevner and Gregor, 2013; see Figure 1). This framework is highly relevant in disciplines such as computer science and engineering, where practical application of theoretical knowledge is pivotal. By emphasising iterative cycles of artefact creation and empirical validation, the DSR framework offers robust guidance for structuring research projects. Its focus on evidence-based evaluation aligns well with the needs of students engaged in applied research (Hevner and Chatterjee, 2010). Zobel's (2014) work on academic writing also contributes to this domain by equipping students with tools to articulate their research findings effectively, this work emphasises the importance of an iterative approach to literature reviews, advocating for critical analysis to synthesise existing knowledge into a cohesive narrative, which aligns with broader goals of enhancing research clarity and impact. Nicol and Macfarlane-Dick (2006) offer a significant contribution by integrating formative assessment with self-regulated learning through a conceptual framework and a visual model for how feedback should be distributed through the different stages, challenging the traditional view of feedback as a one-way process by positioning students as active participants who generate and utilise feedback (Figure 2).

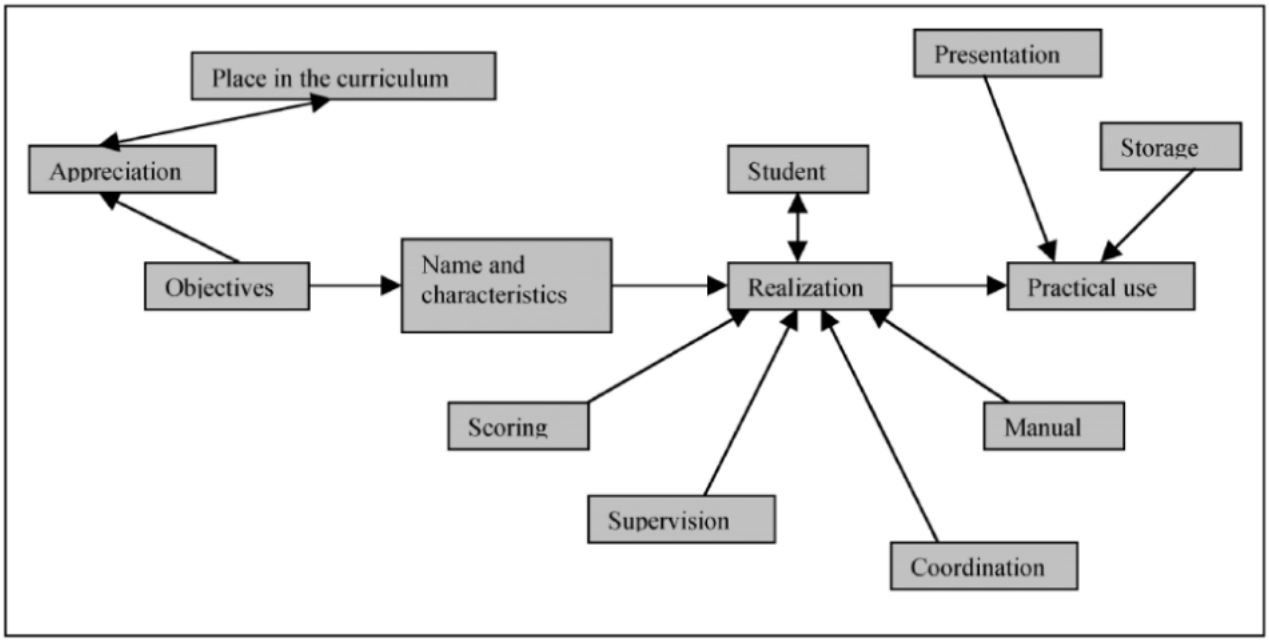
**Figure 2. A model of self-regulated learning and the feedback principles that support and develop self-regulation in students (Nicol and Macfarlane-Dick, 2006).**




Meeus et al. (2004) explore the potential of adopting a practice-oriented approach to final theses at the bachelor's level, particularly in teacher education, as an alternative to the traditional theory-oriented model and outlines a diagrammatic model to visually capture the relationships between thesis components and approaches (see Figure 3). Råde (2014) systematically reviews different final thesis models, examining their orientation toward academic and teaching professional goals, and ultimately identifies portfolio, thesis, and action research as the three primary models. The book 'Successful Research Supervision' by Lee (2019) provides a comprehensive, research-based framework for improving supervision effectiveness. It identifies five conceptual approaches to research supervision – functional approach, enculturation, critical thinking, emancipation, and relationship development – and provides practical tools and strategies for navigating challenges in supervising postgraduate research. Agricola et al. (2021) explore the interactive dynamics

between supervisors and students during undergraduate thesis supervision and examines supervisors' in-the-moment decisions, their connection to supervising actions, and students' perceptions of these actions. Gordon (2022) explores how Kolb's experiential learning cycle – comprising concrete experience, reflective observation, abstract conceptualisation, and active experimentation – can be integrated with four educational supervision models. The study provides guidelines for practical application and scaffolding strategies, emphasising the role of supervisors in facilitating experiential learning and promoting instructional improvement.

**Figure 3. Diagrammatic network of the bachelor's thesis in teacher education (Meeus et al., 2004).**




These studies emphasise the theoretical versus practical orientation of the thesis process but lack specific, actionable guidance for students on navigating the research process. While valuable in their respective contexts, they do not offer a holistic or simplified visual road map to guide students through the intricacies of thesis writing. In this paper, I aim to present a structured visual model specifically designed to address this. The model is mainly based on my experiences as a supervisor and seeks to address common challenges students face during the research process. This model not only provides a clear, step-by-step guide for students but also emphasises the importance of independence, critical thinking, and academic integrity. By systematically outlining each stage of the thesis journey, from the initial research idea to the final write-up this model serves as a comprehensive road map for students, and supervisors, helping them navigate the academic expectations and ultimately produce high-quality research.

## *Methodology*

The development of the research process model was grounded in both practical experience and a systematic exploration of the challenges faced by bachelor's students during thesis writing. This methodology chapter outlines the approach taken to understand these challenges and the steps involved in creating the model.

### Research design

The study employed a qualitative research design, focusing on observations and interviews to gather insights. The primary aim was to develop a process model that could simplify and visualise the research journey for students. The research design was iterative, this approach allowing for continuous refinement of the model over time, since its evolution was based on feedback and additional insights gathered from both students and colleagues throughout the process.

### Data collection

Data was collected through two main methods:

#### *Observation of supervision sessions*

I have attended many supervision sessions, both as an active participant, student, supervisor and as an observer. I believe this has given me firsthand insight into the common issues and misunderstandings students encounter during their thesis writing process. As a student, I found myself many times lost in the scientific process, not naturally understanding the research step-by-step flow. Later on, as a supervisor myself I quickly understood that sometimes supervisors also found it difficult to keep up with the research process, especially when it was a case of mixed science, such as integrating both qualitative and quantitative research methods to provide a more comprehensive understanding of a scientific problem. When reaching out to colleagues, I often received contradicting suggestions, often based on what this colleague felt was personally of most importance to them. When I had the opportunity to sit in and observe other supervisors, I again recognised these difficulties for students to visualise themselves within the research process.

### *Interviews with experienced supervisors*

I conducted interviews with experienced thesis supervisors to understand their approach and strategies for guiding students, these interviews were usually based on conversational interviewing and therefore were often informal and would usually happen by chance as we discussed supervision in general amongst colleagues within my faculty. I did conduct one planned and more formal interview which was semi-structured, allowing for flexibility in exploring various aspects of the supervision process through informal discussions (Adams, 2015). The insights from all these different interviews have helped me greatly in developing the model, particularly in terms of how to structure the research process.

## Ethical considerations

The development of this research process model adheres to established ethical guidelines to ensure integrity, transparency, and accountability throughout the research journey. In alignment with the European Code of Conduct for Research Integrity (ALLEA, 2023), the research follows key principles of reliability, honesty, respect, and accountability, ensuring methodological rigour, transparency in reporting, and the protection of participants' rights and privacy. Furthermore, insights from the ethical framework outlined in Praestegaard Larsen (2024) emphasises the importance of transparency and objectivity in data interpretation, management of potential conflicts of interest, and adherence to data protection regulations such as the General Data Protection Regulation (Council regulation [EU] 2016/679). This commitment to ethical considerations enhances the credibility and trustworthiness of the research process, ensuring that the development of the thesis model is conducted with the highest standards of academic integrity. Everyone who contributed insights through formal and informal conversations provided verbal consent for their input to be included in this research. While these discussions were handled anonymously and not formally recorded or transcribed, every effort was made to represent their perspectives accurately. The interpretations presented in this paper are my own, and participants were not asked to verify specific excerpts before publication.

## *Data collection*

In my second year as a supervisor, I was invited to observe a supervision session with bachelor's students alongside a supervisor with more than ten years' experience, a person who I also had the opportunity to sit down and have an interview with prior to this supervision session. I began the interview with a prepared opening question but intentionally kept the structure flexible. This allowed me the freedom to adapt my questions based on the responses and explanations provided. The interview had a dual purpose, professional development and potential data collection for academic analysis. Initially, it was framed as an opportunity to gain insights from a more experienced supervisor, aiming to improve my supervisory techniques. However, specific parameters were informally set, as I aimed to uncover key practices and strategies that contributed to effective supervision. These included exploring how supervisors provide structure, motivate students, and manage challenges within the research process. While these elements were not rigidly predetermined as part of a formal study, the conversation naturally aligned with the data needed for this paper, as it addressed recurring challenges in guiding students through their thesis journey. This synergy between professional development and research objectives enriched the depth and relevance of the findings.

**Interview summary**

My initial question was to identify if the supervisor provided students with some kind of overview document they could use as a guide through the different stages of the research process. I found out that indeed this was the case, this was presented together with the supervisor describing in detail what the different parts would usually contain and what the students should take into consideration. Then students would be asked during the first meeting to create their own weekly timeline, something that in the past had proven to be a little difficult at first. However, the supervisor assured me this activity gave students control over their own schedule and it helped prevent the possibility of weeks and months passing without students having structured their activities, leading to last minute scenarios and possible failure. Students would also be given a shared document within which they could request supervisory time slots, and they were also told to be specific in their questions and to prepare themselves thoroughly prior to having these meetings with the supervisor. This was mainly due to the fact that a supervisor has a limited amount of time for each student, and experience had taught that especially in the beginning of thesis writing the need for supervisors to read through everything was less important. The supervisor would also read

the whole thesis more briefly prior to each planned meeting and then offer to do a full read of the manuscript before final submission. When it comes to providing material for students the supervisor explained that the shared document which was used for students to sign up for supervision slots also provided numerous lists that contained good references for different methods. The supervisor assured me that keeping this type of material centralised in such manner, not only simplifies administration, but also makes it easier for students to find material. The supervisor also emphasised the importance of using the provided formal thesis template.

In addition to this planned interview, multiple unstructured conversations took place over time with other experienced supervisors, including teachers within higher education who held formal university courses teaching bachelor's thesis supervision to colleagues. These informal discussions often emerged organically, either before or after meetings, when asking for advice in particular issues or during casual exchanges in the office or online forums. These conversations provided rich insights into the nuances of supervision. Topics ranged from strategies for maintaining student motivation, handling conflicts, and balancing academic rigour with empathetic guidance, to practical advice on organising supervision schedules and addressing common student misunderstandings. To preserve these unstructured conversations, I made notes immediately afterward, recording key takeaways and recurring themes. Although these interactions lacked a rigid framework, they offered a broad and diverse perspective, contributing significantly to my understanding of best practices in supervision. By synthesising the insights from both the formal interview and the unstructured discussions, I gained a holistic view of effective supervisory techniques, which informed my own supervisory approach, and the development of the research process model presented in this paper.

**Supervision observations**

The supervision session which I attend as an observer was conducted online using Zoom and it involved several students; it should here be pointed out for clarity that in Sweden it is not uncommon that students write their bachelor's thesis as a group project, which was the case here. The supervisor wasted no time and started with a calm enquiry of the students' current project standing only to realise that the students had not done what they were supposed to. At this point the supervisor explained the importance of recognising higher education studies as a full-time commitment. Pointing this out set the tone for the following

discussion, emphasising that success within academia extends beyond the confines of the classroom. As the supervisor delved into the specifics of why the students had failed to achieve what had been agreed, it was clear to me that their intention was on understanding the nature of the students' problems and guiding them to a solution, more than giving them any sort of reprimand. The discussion seamlessly transitioned to the significance of discipline and adherence to the bachelor's project schedule previously agreed upon, drawing parallels between the scheduled milestones and the overall success of the thesis project. This connection was crucial for the supervisor to be able to underscore that all of this was key components in higher education and vital for professional development. This insight was presented not as a critique but as a valuable lesson for the students.

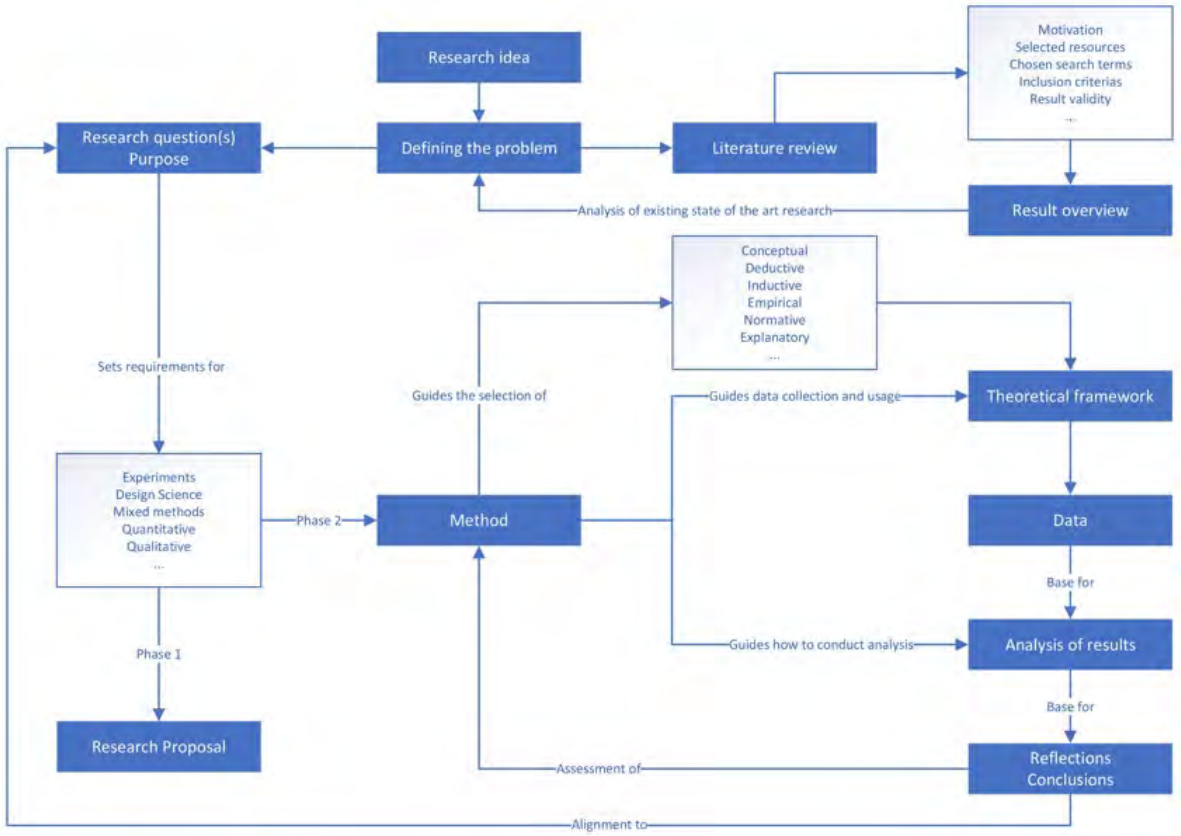
The session's pivotal moment came when the supervisor prompted the students to make decisions about their next steps. This was not a passive inquiry but a call to action, encouraging the students to take control of their project. The supervisor set a clear expectation of receiving a thesis draft before the next scheduled meeting, giving the feeling that it was a practical measure to ensure the students were actively engaged in the process and moving forward with purpose. In conclusion, the supervision session was a lesson in effectively communicating the expectations of higher education, emphasising commitment, discipline, and accountability. The supervisor in many ways navigated the delicate balance between encouragement and firmness very professionally. The session served as a moment of challenging the students to rise to the occasion and take charge of their work. Unfortunately, I was unable to attend the follow-up session to the supervision meeting. As a result, I do not have access to any progress data that would allow me to evaluate the extent to which this observed session effectively communicated expectations and guided the students toward success.

**Model development**

The insights gathered from the observations and interviews were systematically analysed using qualitative research methods. The qualitative approach was primarily used to explore and understand individuals' thoughts, emotions, and interpretations of processes (Freeman, 2008). Thematic analysis was used to identify patterns and determine best practices (Kiger and Varpio, 2020), enabling the researcher to uncover key challenges faced by both students and supervisors and providing a rich, contextual understanding of

the thesis-writing process. Additionally, inductive reasoning was applied to synthesise these findings, moving from specific observations to broader generalisations that informed the development of a comprehensive framework (Thomas, 2006). These realisations were subsequently incorporated into the creation of the Research Process Model, designed as a practical tool to address the diverse needs of students and supervisors (Figure 4). This model integrates a structured timeline, providing clarity and deadlines for each stage of the research process, along with detailed guidelines to help students navigate tasks such as defining a research problem, conducting a literature review, and developing a methodology. Furthermore, the model offers evidence-based recommendations, informed by the interviews and observations, for maintaining student motivation and managing time effectively, ensuring that the framework is both adaptable and aligned with best practices in academic research supervision.

**Figure 4. Initial version of the RPM created in 2023.**

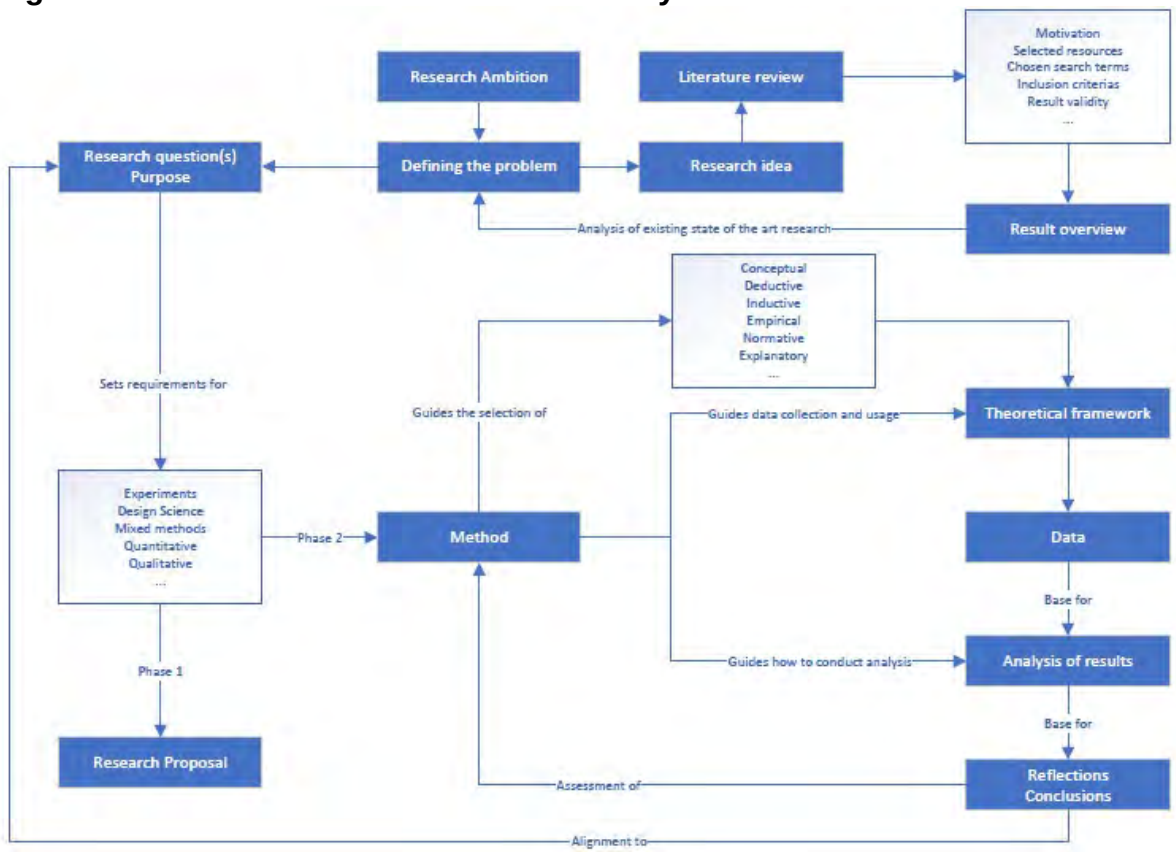



## Validation

The model was validated through feedback from students who I supervised and encouraged to work according to the model and from experienced supervisors to whom I presented it. The feedback from both was crucial in refining the model further to ensure it was both practical and effective in addressing the challenges students face. This led to

significant improvements in the Research Process Model to better support the thesis journey (Figure 5). Clearer guidelines and visual aids were introduced to make the stages of the process easier to understand. A flexible timeline was integrated, allowing students to adjust milestones to their individual needs while maintaining structure. Adjustments were continuously made to enhance clarity, usability, and relevance to the students' research journeys.

**Figure 5. Version of the RPM created in early 2024**




## *Timeline structure*

Based my observations during the supervision session, and the advice I received during the interview, I wanted to incorporate many of the things learned through this within my own construction of an appropriate timeline structure and a research process model. Jaldemark and Lindberg (2013) proved the importance of structured timelines with clear deadlines. I therefore started by presenting students with a scheduled seminar list.

- Seminar 1 - Thesis proposal (2 pages)

For the seminars, two to four students should provide their peer reviewer with the manuscript a minimum of seven days before the seminar. These reviewers are then

expected to write a two-page review with constructive comments and send this to the author 24 hours prior to the seminar. The objective of this is to find faults and other shortcomings within the text, also the reviewer must be prepared to discuss this verbally during the seminar in a constructive and professional manner.

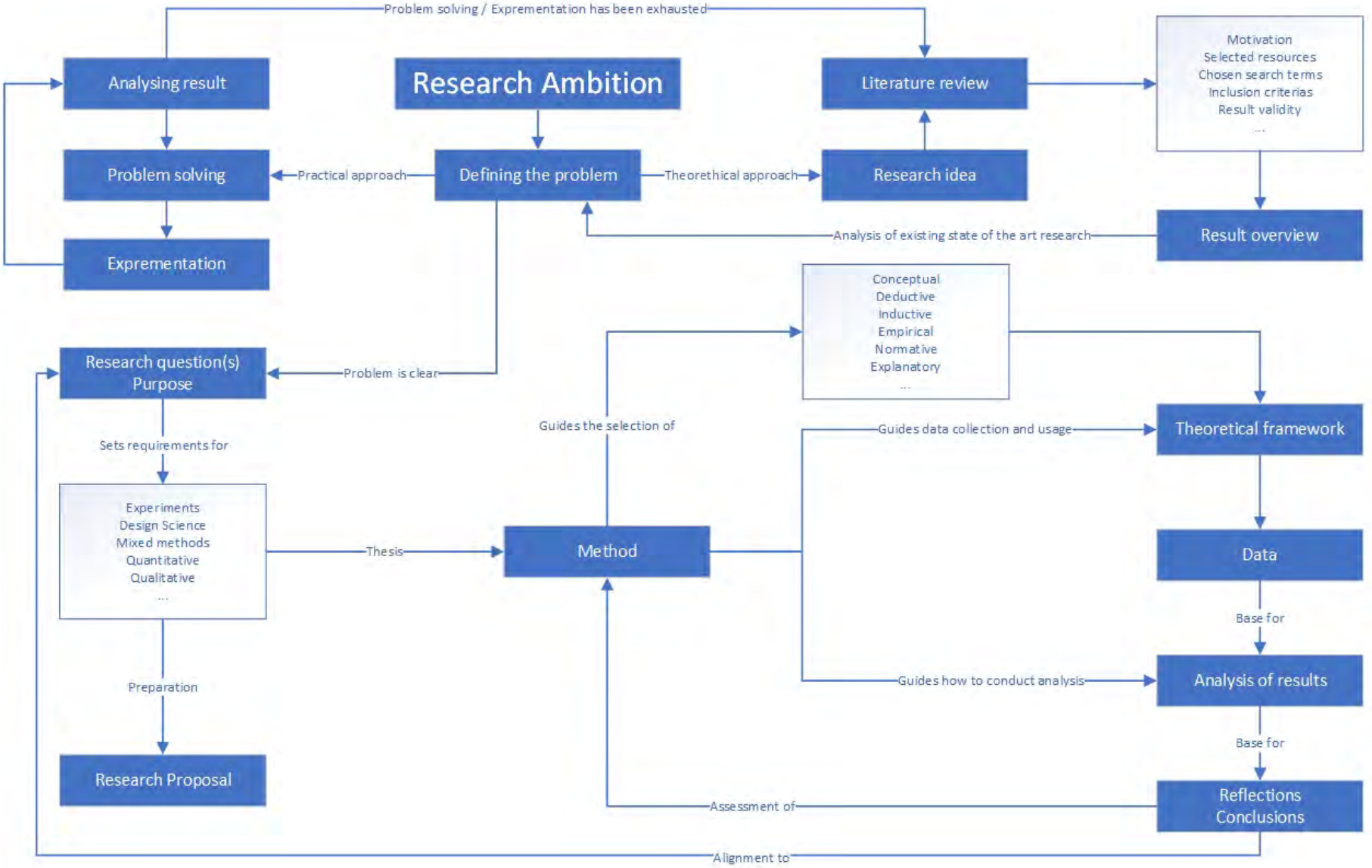
- Seminar 2 - Introduction, literature review (could be ongoing), outline methodology, disposition, and time planning (5 pages)
- Seminar 3 - Revised introduction and literature review and a comprehensive method section including data analysis (15-20 pages)
- Seminar 4 - Completed draft including analysis, discussion, conclusion and any appendices.

These seminars were supposed to be mandatory, and between each seminar there should also exist the possibility for students to request individual supervision. The outline for this was greatly influenced by the Escorting Students into Responsibility and Autonomy (ESRA) model for supervision which referred to these meetings as the '0%, 40%, 70%, and 90% meetings', this being an indication for the amount of project completion which is to be expected before each meeting (Jordal et al., 2021). But I quickly realised that, as much as I appreciated this structure, it was not flexible enough for my approach (at least not at this moment in time) and I instead removed the seminars and implemented my own structured but flexible time scheduling standard. I started with setting up ten optional pre-scheduled supervision sessions, but in the end students would actually use between five to nine depending on their needs.

This proved itself very successful, first of all the students could immediately schedule in their calendar and each meeting would automatically become a deadline for them. At the first meeting we would agree on what they should present at the next one and from there it just snowballed. It makes all the difference when you as a supervisor ensure regular check-ins to discuss progress, address challenges, and provide feedback. I encourage students to accept calendar invitations, share their work in advance, and highlight areas where they need specific guidance. I maintain great flexibility in scheduling, allowing for adjustments as needed to accommodate students' varying timelines and needs. But most importantly, I maintain a 'can do' attitude with the students and communicate this regularly. Indeed, executed in a proper manner the students are not only more likely to achieve a higher final grade but also build confidence in these transferable skills.

## *The model*

**Figure 6. Research process model for bachelor's thesis.**



The model was produced as a tool for helping bachelor's students about to initiate their thesis work to visualise the research process in a simplified manner, making the final thesis assignment more accessible and providing a clear road map (Figure 6). The latter is very important since guiding the student is a crucial parameter for success (Roberts and Seaman, 2018; Strebel et al., 2021). It has also been noticed in past student projects that students seem to have a difficulty keeping the different research process entities differentiated, thus leading to student confusion and misunderstandings. One solution might be to use a version of blended supervision, using expertise within different areas of the process to assure a thorough understanding (Karunaratne, 2018). This model has two distinctive paths, the first path is the process to be used for establishing the research proposal, at this point the literature review might not be as extensive as needed for the full project. Once the proposal has been accepted the student is supposed to revisit the literature review process to explore this further before the thesis project moves on to the method path.

I introduce this model at an initial startup meeting which I hold with every student I supervise. Using a visual presentation, I walk the students through the process. As a thesis supervisor, my primary role is to guide students through the intricate journey of developing and writing their bachelor's thesis. This includes relating their work to existing sources, contexts, and taking responsibility for their research decisions.

The next phase involves meticulous research and planning. I guide students on how to build their research on existing literature, manage their time effectively, and utilise academic databases. Collaboration is also key, so I introduce tools like OneDrive, Google Drive, and communication platforms like Zoom and Teams to facilitate this. I try to break down the thesis into manageable components: research idea, defining the problem, literature review, research question, methodology, theoretical framework, analysis, and conclusion. Each component is addressed methodically, ensuring that students understand the importance of a strong foundation through literature review, the relevance of a solid theoretical framework, and the need for consistent alignment throughout their research.

During this journey, ethical considerations are discussed to ensure that students adhere to good research practices and the European Code of Conduct (ALLEA, 2023). Proper referencing is also emphasised, using referencing guidelines, to uphold academic integrity.

Finally, I encourage students to engage actively during supervision sessions, ask questions, and take ownership of their learning process. By the end of this journey, students should not only have a well-crafted thesis but also a deeper understanding of research, enhanced analytical skills, and a sense of pride in their academic accomplishments.

To ensure a comprehensive understanding of how the research process model can be effectively utilised by both students and supervisors, it is advisable to consult the appendix. The appendix provides detailed guidance on the model's application, including strategies for defining research ideas, structuring the thesis process, and addressing key challenges such as literature reviews, methodology selection, and ethical considerations. By referring to this resource, supervisors can enhance their mentorship strategies, while students can gain clearer insights into navigating the complexities of thesis writing, ultimately fostering a more structured and successful research journey.

The research process model developed aims to simplify and visualise the thesis journey, addressing common misunderstandings and challenges that students face. By observing supervision sessions and conducting interviews with experienced supervisors, valuable insights were gained that have been integrated into this structured model. The model is designed not just as a reflection of the thesis process but also to provide important, relevant information that nurtures student growth, it emphasises the importance of structured guidance. Each component of the model has been shaped with the goal of making the final thesis assignment more accessible and manageable for students.

One of the key elements highlighted in this model is the significance of a structured timeline with clear deadlines. Research has shown that having a well-defined schedule can greatly enhance the success of the thesis process, this structured approach helps students stay on track and avoid last-minute rushes, which can lead to sub-optimal outcomes.

The research process model also emphasises the importance of defining a clear research idea and problem. This initial step sets the direction for the entire thesis and involves thorough discussions with peers, supervisors, and independent exploration. A well-defined research problem ensures that the study is focused, manageable, and aligned with the overall objectives of the thesis. This process is not just about producing a final document

but about cultivating academic independence, critical thinking, and research skills. I emphasise the importance of independence, and I really try to encourage my students to take the initiative, demonstrate originality, and approach their work with creativity and enthusiasm.

Furthermore, the model underscores the critical role of a comprehensive literature review. Understanding existing research and identifying gaps are essential for formulating unique and relevant research questions. The literature review also helps in building a solid theoretical framework, which guides the research design and analysis of results. A strong theoretical foundation ensures that the study is grounded in established knowledge while also contributing to the advancement of the field.

Data collection and analysis are also crucial components of the thesis process. The model provides guidelines for selecting appropriate methodologies and statistical techniques, ensuring that the data collected is reliable and valid. It also highlights the importance of acknowledging limitations and interpreting results within the context of the study. By following these guidelines, students can produce credible and impacting research findings.

Ethical considerations are another vital aspect covered in the model. Adhering to ethical principles ensures the integrity and accountability of the research (Booth et al., 2024). The model provides resources for students to consult, helping them establish sound ethical values and practices in their research

## *Conclusion*

The research process model for bachelor's theses offers a comprehensive roadmap for students, guiding them through each stage of the thesis process. By providing clear structure, continuous feedback, and valuable resources, the model aims to demystify the thesis journey and support students in producing high-quality, impactful research. This approach not only enhances the academic experience of students but also contributes to the broader scientific community by fostering rigorous and well-conducted research.

This exploration into the crafting of a bachelor's thesis is rooted in a sincere ambition to serve as a guide for students who are about to start their bachelor's thesis work.

Something that demands that the supervisor transform from a researcher into a research advisor (Ädel et al., 2023). Each part of this model's composition has been shaped with the goal of offering not just a reflection of the task at hand, but important, relevant information that nurtures student growth. Of course, this document is far from complete, and many additional aspects, such as intercultural supervision, must be taken into consideration (Zheng et al., 2019). There are of course a wide number of parameters which affect supervisors and students, culture is only one piece of the puzzle which stretches far into other areas, such as gender equality, social status, race, sexual preferences and more, it is an incredibly entangled topic (Ng and Stephenson, 2015; Ayo, 2018). Just as any other teacher it is therefore important that supervisors understand they also must adhere to anti-discrimination laws and policies, guaranteeing equal access and opportunities for all students regardless of their background (Hollis, 2017; Howard, 2018; Fields and Wotipka, 2022).

Remember that a bachelor's thesis is the first time a student is faced with writing a proper academic document, it can be a daunting and scary experience at first and it is your job as a supervisor to guide the student in such a manner that they become motivated, encouraged, inspired and stimulated to shoulder the challenge of such an accomplishment. It must be the ambition of you as a supervisor to guide students in a manner which will inspire them to want to evolve self-discipline, that makes them want to become the absolute best version of themselves. If we as teachers can obtain this, then in my opinion we have been successful.

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## *Licence*

## *Appendix*

Establishing a clear research idea is a fundamental step in the thesis-writing process, shaping the direction and scope of a student's academic work. This appendix provides an overview of key considerations when formulating a research topic, including the role of discussions with peers, consultations with supervisors, and independent exploration of literature. It highlights the importance of defining a precise research problem, conducting a thorough literature review, and crafting well-structured research questions. Additionally, the text delves into methodological choices, theoretical frameworks, data collection, analysis, and the ethical considerations that underpin rigorous research. By following these principles, students can develop a solid foundation for their thesis, ensuring both academic relevance and practical feasibility.

**Research idea**

Students must establish a starting point for their research, as this step sets the direction for their entire thesis (Ellis and Levy, 2008; Davidavičienė, 2018). This can be achieved through discussions within research groups or consultations with supervisors (Bazrafkan et al., 2019; Wisker, 2019). Engaging with peers and faculty helps explore various topics, gain diverse perspectives, and refine ideas (Booth et al., 2024; Stangebye, 2019). Research groups offer a collaborative environment for brainstorming and assessing research questions (Wisker, 2019), helping identify manageable and interesting topics for a bachelor's thesis (Stangebye, 2019).

Consulting supervisors is equally important (Bazrafkan et al., 2019). Supervisors offer insights based on their expertise, guiding students toward relevant, original topics (Mhunpiew, 2013). They help narrow broad ideas into specific, researchable questions and provide feedback on practicality (Bazrafkan et al., 2019). Supervisors also suggest resources useful in the initial stages of literature review and problem definition (Mhunpiew, 2013).

Independent exploration is another critical component (Booth et al., 2024; Kopzhassarova et al., 2016). This involves reviewing current literature, attending seminars, and staying updated on recent developments (Wisker, 2019). Online databases, academic journals, and books help identify gaps in existing research and formulate unique research questions

(Kopzhassarova et al., 2016). Self-directed research not only generates ideas but deepens understanding of the chosen field (Wisker, 2019). Personal interests and experiences also play a role in topic selection. Aligning research with a student's passion or career goals enhances motivation and commitment. Personal experiences or internships can provide insights into real-world problems worth academic exploration (Recker, 2021).

**Defining the problem**

Defining the research problem involves analysing previous research (Davidson and Sternberg, 2003). This process is closely tied to the literature review (Sergis and Sampson, 2017; Yadav, 2023), creating an iterative loop until the problem is clarified. A thorough literature review identifies gaps, inconsistencies, or areas needing further investigation (Rowley and Slack, 2004; Booth et al., 2021). Understanding the current state of knowledge allows students to pinpoint issues that have not been addressed, leading to a precise and relevant research problem (Salmento and Murtonen, 2019).

In addition to academic papers, students should consider industry reports and case studies for practical insights. These sources highlight real-world problems not fully covered in academic literature but still significant. After reviewing relevant literature, students articulate their research problem, defining its scope, context, and key variables (Rowley and Slack, 2004). A well-defined problem should be specific, measurable, and researchable within the thesis's timeline and resources.

Consulting with supervisors or peers helps refine the problem statement, ensuring it is significant and feasible. A rigorously defined research problem lays a solid foundation for the research process, addressing genuine gaps in knowledge and contributing meaningfully to the field. Resources like 'The Psychology of Problem Solving' edited by Davidson and Sternberg (2003) offer valuable insights.

**Literature review**

A thorough literature review involves using academic databases like Google Scholar, JSTOR, PubMed, and IEEE Xplore to access scholarly articles, conference papers, and other research publications (Rowley and Slack, 2004). The goal is to gather comprehensive information on the topic, focusing on recent studies, seminal works, and

highly cited papers. This helps students understand the evolution of thought in the field and identify key theories and researchers (Booth et al., 2024).

However, many students underestimate the importance of a comprehensive review (Imel, 2011). They might either provide a shallow overview or become overwhelmed by the volume of literature. The initial review should help understand existing research on the topic (Denney and Tewksbury, 2013).

During the review, it is crucial to evaluate the quality and relevance of sources (Booth et al., 2024). Look for methodological rigour, validity of findings, and relevance to your research. Annotating key points from each source helps synthesise information and identify themes for further exploration.

The question of why a review is being conducted should be well answered and explained, also detailing the resources used, search terms, and criteria for including literature (Denney and Tewksbury, 2013). Recommended readings include 'How to Read a Paper' by Keshav (2007) and 'Conducting a Literature Review' by Rowley and Slack (2004).

**Research question**

Crafting research questions that are either too broad or too vague is a common issue, leading to difficulties in research (Booth et al., 2024). This often stems from a lack of clarity about the research focus, making it challenging to maintain direction and gather relevant data (Mantzoukas, 2008). For example, a broad question like 'What are the effects of climate change?' is too vast, while a vague one like 'How does climate change affect us?' lacks specificity. Both scenarios complicate the research process.

Research questions must be well-defined and specific, they should be clear, focused, and researchable within available resources and time. A well-crafted question narrows the study's scope to a manageable size, providing clear direction. For instance, 'What are the impacts of climate change on agricultural productivity in the North American Midwest over the past decade?' is focused and offers a clear investigation pathway.

Crafting a research question involves conducting a preliminary literature review to identify gaps and formulate questions that are relevant and original. It is also helpful to discuss potential questions with supervisors or peers for feedback.

Feasibility is key to ensure access to necessary data and resources (Creswell and Creswell, 2022). The research question should align with the thesis's objectives, providing a framework for data collection, analysis, and interpretation.

**Methodology**

Choosing the correct research methodology is vital for the success of any thesis. Students often face challenges in selecting the appropriate method for their specific research questions, or they might fail to justify their choices effectively. Misunderstandings during the data collection and analysis phases can lead to unreliable results and hinder the research's overall coherence.

Selecting the right methodology involves careful consideration of the research question, the type of data needed, and the most suitable methods to answer the question effectively. Both qualitative and quantitative methods have their place, and understanding the differences and applications of each is crucial. Incorrect method selection can significantly affect research outcomes, leading to invalid conclusions (Lewis, 2015).

Resources such as 'Designing a Qualitative Study' by Maxwell (2009), 'Qualitative Inquiry and Research Design: Choosing Among Five Approaches' by Lewis (2015), 'Qualitative Research Design: An Interactive Approach' by Maxwell (2012), and 'Introduction to Design Science Research' by vom Brocke et al. (2020) are essential for gaining a thorough understanding of various methodologies. Additionally, seeking advice from experienced researchers and consulting methodological experts can greatly enhance the methodological rigour of the research.

Methodology is not merely a formality but the backbone of a credible thesis. Justifying methodological choices in relation to research questions and objectives ensures that the study is robust, reliable, and contributes meaningfully to the academic field.

**Theoretical framework**

The theoretical framework is often overlooked, leading to the use of irrelevant theories for research questions or methods. This can cause significant challenges, as students struggle to apply and integrate these theories effectively, resulting in a superficial or disconnected thesis.

A strong theoretical framework provides a clear lens through which the research is viewed, ensuring coherence and logical structure (Booth et al., 2024). It guides the research design, influencing the selection of appropriate methods and tools, which is crucial for producing valid and reliable results.

Moreover, the theoretical framework helps in analysing results, connecting data to broader concepts for a deeper understanding of the research problem. This connection strengthens the study's credibility and enhances its contribution to existing knowledge. A solid theoretical framework can also identify gaps in the literature and suggest areas for further research. It encourages students to engage critically with existing theories, producing original research with impact. In summary, a robust theoretical framework will support scholarly research, grounding the study in established knowledge while pushing boundaries. Students who develop strong theoretical foundations are more likely to produce high-quality theses that contribute significantly to academic knowledge.

**Data**

Data collection is a complex process, and students might inadvertently introduce bias, selecting data that fits preconceived notions. Ethical considerations, such as confidentiality and informed consent, might also be overlooked, potentially compromising the study's integrity.

Ensuring methodological rigor in data collection is crucial for the reliability and validity of research findings (Booth et al., 2024). Poorly designed instruments, inconsistent procedures, or inadequate control measures can severely undermine the research's credibility. To avoid these pitfalls, students must thoroughly understand the data collection techniques relevant to their study.

'Data Collection and Analysis' edited by Sapsford and Jupp (2006) is a recommended starting point for students, providing guidance on various data collection methods. Additionally, students should be aware of the ethical dimensions of their research, ensuring that all data is collected in compliance with ethical standards.

Effective data management is also critical. Students need to ensure that their data is accurately recorded, stored securely, and analysed correctly to maintain its integrity. Regularly reviewing data for accuracy and consistency can prevent errors that could compromise the study's conclusions.

**Analysis of results**

Data analysis can be challenging due to the multiple steps involved, each requiring precision and appropriate methods (Lewis, 2015). Misunderstandings, such as using parametric tests on non-parametric data, can lead to invalid conclusions. It is essential to select the correct statistical methods that align with the data and research questions.

Misinterpretation of results is another common issue. Researchers might overestimate findings or ignore confounding variables, leading to unsupported conclusions. Interpreting results within the study's context and understanding the assumptions behind statistical tests are crucial. Proper training and consultation with a statistician can help mitigate these risks.

Acknowledging the analysis's limitations is vital for research integrity. Every study has constraints, related to sample size, tools, or validity, which should be clearly stated. Recognising these boundaries prevents over generalisation and provides a balanced view of the research outcomes.

Multiple rounds of analysis and validation ensure robust results. Peer review and replication by others help verify accuracy. By addressing these aspects of data analysis, researchers minimise errors and enhance the credibility of their conclusions. For qualitative research, I suggest 'Qualitative Data Analysis: A Methods Sourcebook' by Miles et al. (2014), 'Thematic Analysis of Qualitative Data' by Kiger and Varpio (2020), 'The Coding Manual for Qualitative Researchers' by Saldaña (2021), and 'Thinking about the Coding Process in Qualitative Data Analysis' by Elliott (2018) as initial reads.

## Conclusion

Students often misunderstand the conclusion, viewing it as merely restating findings instead of presenting key insights, addressing research questions, identifying limitations, and discussing broader implications (Denney and Tewksbury, 2013). This misconception can lead to superficial conclusions lacking depth, failing to convey the research's significance.

A well-crafted conclusion summarises the main findings concisely but should go beyond restating results. Students should synthesise findings to highlight critical insights, interpreting them in the context of the research questions and theoretical framework. This demonstrates how their research contributes to existing knowledge and advances understanding.

The conclusion also comprehensively addresses research questions. Students should revisit the questions posed at the thesis's start and discuss how their findings answer them, reinforcing the research's purpose. Identifying limitations is another crucial aspect. By acknowledging these, students show awareness of the study's boundaries, enhancing credibility.

Furthermore, the conclusion should explore the research's broader implications, considering its impact on the field and beyond. This might include practical applications, policy recommendations, or suggestions for future research. Highlighting the significance of their contributions, students should articulate how their research fills gaps in the literature.

In summary, the conclusion should be a synthesis of key findings, directly addressing research questions, acknowledging limitations, and discussing broader implications. By viewing the conclusion as an integral part of the thesis, students effectively communicate the value of their research, leaving a lasting impression on their readers.

## Ethical considerations

Ethics guides researchers, influenced by individual moral beliefs, societal regulations, and cultural heritage (Hamburg and Grosch, 2017). These personal standards ensure researchers' actions align with societal values.

The research community provides ethical principles to guide researchers, ensuring integrity and accountability (Kretser et al., 2019). These principles, such as honesty, transparency, objectivity, independence, accountability, and fairness, are essential for maintaining public trust in scientific research and promoting transparency (ALLEA, 2023; Praestegaard Larsen, 2024). Adhering to these principles helps avoid conflicts of interest, maintain accuracy, and uphold field standards.

Research ethics have seen significant efforts to standardise principles (Kenneally and Dittrich, 2012; Loi and Christen, 2020; van de Poel, 2020, Weber and Kleine, 2020). These include codes and guidelines from international bodies. For example, the European Code of Conduct for Research Integrity (ALLEA, 2023) provides a framework for consistency and high standards in research across Europe.

These principles address emerging ethical challenges, such as data privacy, cybersecurity, and AI ethics. Researchers must stay informed and update their practices to align with the latest standards.

Ethics within research is a dynamic field requiring continuous attention and adherence. By following established principles, researchers ensure the integrity and credibility of their work, contributing positively to knowledge and society. Students are advised to consult 'The European Code of Conduct for Research Integrity' by ALLEA (2023) for guidance on establishing sound ethical practices.