Enarch - the doctoral program of engineering and architecture

Guidelines for writing a research proposal

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Introduction

This guideline contains advice on writing a research proposal when applying to ENARCH, the doctoral program of engineering and architecture. The basic principles of writing a research proposal are identical for all fields, but in both engineering and architecture, special emphasis is put on the applicability or at least relevance of the topic for solving practical problems. The relevance or suitability or practical applicability of the research may also be indirect. Not all research carried out by applied sciences is applied research or product development, it may also be basic research. Naturally, different disciplines have different requirements for both carrying out the research and reporting on it. This guideline focuses mostly on general principles. For more detailed instructions, please refer to your thesis supervisor or instructor, with whom you will have to go through your research proposal before you file your admission application, as the instructor will approve the proposal by signing it.

The purpose of the research proposal is very similar to that of any planning: a job well-planned is half done, or maybe one third done. In other words, the proposal helps the researcher to define the research problem, the methods and the schedule. Secondly, it helps the thesis instructor see the purpose of the study and any problems that need correcting. Thirdly, the research proposal is often the document used to apply for a doctoral program and for competing for doctoral school positions or funding. A carefully written research proposal allows the instructor or admissions coordinator to quickly scan whether the applicant has the skills for executing his or her research proposal. Also applicants who take part in a more complex research project or consortium should prepare a research proposal explaining his or her part in the project; they should not simply append the proposal for the entire project written by others.
Since research is, at its best, work which generates new knowledge, looks for new questions, maps reality in a new way or finds solutions to theoretical or real-world problems, you should avoid making your research proposal very detailed. It is very common for a good research proposal to never be fully executed: during the study, the researcher and his or her perspective on the research problem may change so radically that the proposal must allow continuous modification. This does not mean, however, that the plans made in the early stages of the research project would be useless: each step astray or backwards is a useful step on the journey towards not only research, but more importantly towards becoming a scientifically and culturally educated researcher.

The following outline presents the elements which any good research proposal should include in one form or another. While you do not need to follow the outline meticulously, it does work as a kind of checklist helping you to include all the necessary items.

1. **Background and topicality of study**

Since we have not grown up in isolation but are constantly surrounded by a rich and diverse cultural heritage, a researcher whose proposal discusses only his or her motives and ideas usually reveals nothing else but his or her immaturity. Science, like art, is one of those forms of culture which are very intimately connected to their own, millennia-old traditions, while being constantly faced with the demand for topicality. Since the research proposal should be concise (about 5 to 10 pages), you cannot include all of the above in it. However, as a researcher, you should be able to link your research with a topical scientific discussion and/or scientific tradition. Even at the planning stages of the research, you are, thus, required to demonstrate a certain degree of general education and proficiency in the research field.

The degree of Master of Science in Technology, Architecture or Landscape Architecture and possible work experience naturally provide a solid foundation of expertise which should not be overlooked in the researcher career, either. It gives the researcher insight into, first and foremost, the practical relevance of the topic, but it also provides him or her with what, according to the famous distinction made by Bertrand Russell, can be called **knowledge-how (i.e. competence-based knowledge)**, as opposed to **knowledge-that (fact-based knowledge)**. In an ideal situation, this expertise can be harnessed for research, but it should be noted that research is by nature different from practice-oriented work.
Today, the scientific community does not see research knowledge as being simply cumulative by nature. In other words, it no longer believes that new knowledge simply builds on the existing knowledge as if it were a building block added on top of the old ones. New research, even such that does not produce ‘violent revolutions’ in the sense intended by Thomas Kuhn, often aims at looking at things from a new perspective and to thematize or focus on new topics that were maybe examined scarcely if at all in previous research. Typically, new research is also critical of earlier research. This should by no means be understood as abandoning all previous research as ‘obsolete’. For instance, classic works and research themes tend to re-emerge from time to time in many disciplines, and it is precisely their reusability that has won them their status as classics.

The above is the essence of scientific discourse. Today, science is seen as never-ending critical discussion, to which each new researcher adds their own comments. While ‘the final truth’ is never discovered, a host of errors, delusions and half-truths are abandoned along the way. Open-minded discussion is thus a central tool for the scientific community, and 'staying alive' in the discussion is a sign of good research. This is also the idea behind the principle ‘publish or perish’: without publishing, you do not get ahead as a researcher.

As noted, the research in the fields of engineering, architecture and landscape architecture is practice-oriented similarly to that in fields like medicine, pedagogy or social policy. This practical nature brings with it the demand for demonstrating the practical relevance and topicality of the study. You should not, however, take this demand too literally. Practical relevance may take many forms. It may mean research which produces knowledge meeting practical needs. It may, for instance,

- produce new knowledge on the distribution of apartment buildings with no elevators in the urban structure or on the applicability of new structural systems for different types of apartments. Sometimes acquiring this type of knowledge may be very demanding, as in the case of assessing the environmental impacts of buildings or residential areas.
- aim at the development of new methods or technology, in order to better meet current or perennial challenges of the research field. The methods may relate to, for instance, the teaching and learning of a technique or planning, processing practical work, negotiation and communication skills, social organization and learning, the definition of assessment criteria or the modeling and illustration of starting points and possible solutions.
- aim at adding to understanding of technology, planning and design and the underlying social and cultural reality. This helps not only researchers but also those working at the practical level to see their work as part of a larger whole, also from a historical viewpoint.
- aim at interpreting technology and the built environment as products of culture, and in the case of architecture and landscape architecture, also as works of art. The starting point is the idea that cultural products are always significant for people, and that interpreting them - not simply explaining them - is essential for understanding them.

- aim at producing knowledge on the impacts of technology and the built environment on peoples' lives and experiences. These questions do not always emerge from practical needs but they are essential for making advances in technology and its development.

to critically analyze the development of technology, the prevailing planning and design practices and their current trends. Criticism may be targeted at the relationship between the environment and the user, the environmental impacts, the interconnectedness of architecture and technology, the power relations in the construction industry, interaction practices etc.

Naturally, critical research is inseparable from values, and the researcher should be aware of his/her explicit and implicit values and ethical standing as well as of those of the research object. Researchers should be careful not to break unintentionally so-called Hume's Law, according to which value judgments cannot be inferred from statements of fact.

The practical relevance of the study may be described in the background section or it may partly be left to later sections (see 4: Expected results and their transferability). In such cases, the background section may be used to refer to problems found in practice or to the discussion on the topic in different social arenas. It is in the interest of the researcher to demonstrate that his or her study is at least indirectly linked to topics that arouse the interest of the general public or are considered important or difficult topics at the moment.

2. Research topic and research questions

The research topic should be apparent from its name. This requirement applies particularly to theses and dissertations, where supervisors usually assess the students' skills in defining the scope of the study and expressing it in the title. If you want to give your thesis a concise, 'selling' title, include a more formal subheading. (E.g. Irene Roivainen ‘Sokeripala metsän keskellä. Lähiö sanomalehden konstruktiona’ – ‘A sugar cube in the woods: the construction of suburb in a newspaper’.)

You should, however, also specify the topic on the basis of the background of the study described above. You should demonstrate how the planned study will contribute to the scientific discussion on the topic.
In its simplest form, the study may gather together scattered research and research knowledge (which makes it a review-type study), but it may also pose new types of questions, adopt a critical view on earlier studies and provide supplementary or experimental empirical results. The most demanding goal is defining a brand new theory, but this is not recommended for researchers who have just begun their careers. Nonetheless, it is not impossible for a talented researcher to produce a valuable contribution to the theoretical discussion of the field as early as in his or her doctoral dissertation.

Since research problems are extensive and complex, and on the other hand the range of interesting topics is wide, it is typical for beginners to try to bite off more than they can chew. To use a metaphor related to construction, one could say that a small brick is often more useful than a big balloon. In practice, researchers are faced with the difficult necessity of defining a sensible scope for the study. In this too, general education helps: the more you know, the better you know how little you know or even can hope to know. If you are interested in, for instance, dwelling as research topic you will soon notice that dwelling has been studied for a long time in the fields of history, in the history of art and architecture, in construction technology, in social philosophy, economics, psychology, sociology, political science and cultural anthropology. Since it is impossible to include all earlier research even superficially, you should limit the scope, for instance on the basis of time and place (e.g. the development of dwellings in Finland after the Second World War) and/or on the basis of perspective (e.g. design of dwellings as part of the modernistic ideology of design, dwellings as part of the real estate business). In some cases, as the research progresses, even a quite strict scope turns out to be too inclusive. In such a case, the introduction of the study should clearly express the elements to be examined in the study and those that are excluded. A researcher who tries to go through the entire spectrum of research on the topic will soon find him/herself drifting aimlessly in a sea of materials.

When defining the scope, you should be aware of the dangers of developing tunnel vision, meaning you no longer see beyond your own field. Researchers should be able to link their topic and their views to wider contexts, and they should examine these contexts in their study. Otherwise, they will easily adopt a false perspective, in other words, their viewpoint will block out the rest of the world. You should work like a painter: take a few steps back every once in awhile to see the bigger picture before you continue working on the details.

An irreplaceable tool for defining the scope of the study and expressing its goals is breaking it into a few essential research questions. You should formulate them into very simple questions, such as 'What factors contributed to the rise of modernism as the key trend in Finland' or 'How does
urban density influence energy consumption?’ Of course, not all topics are this easy to break into questions. For instance, if you want to examine the artistic content of minimalism, any research question may seem too naive. In these cases, too, the research questions help you to organize your thoughts (e.g. ‘How should minimalism be understood in the context of cultural changes historically/nowadays?’, ‘Is the dichotomy intelligence/emotionality appropriate for interpreting minimalism’ etc.).

Research questions help you to determine the scope and, after their formulation, you may ask yourself: ‘Am I really able to answer these questions within the time I have available?’ If you cannot say yes, you have to keep narrowing the scope or alternatively postpone the original deadline by, for instance, making the current study a part of a larger whole. The time limit is important, because nowadays you should no longer look at your dissertation as a life-long project, as it was for some people in the past. Rather, it should be seen as a ‘driving license’ to research, allowing you to start practicing independently and finally working as a researcher. Completing the dissertation should take no more than four years for full-time students and eight years for part-time students.

Another benefit of the research questions is that they are a natural step on the journey towards choosing research methods; you should select research methods that give you a realistic chance for answering the set research questions. In other words, research questions are promises that your study should live up to.

3. Research methods

It is not possible to present all the different kinds of research methods and their practical applications here; for that purpose we already have a wide variety of literature on methodology, which you are recommended to study in greater depth than just one or two books. This is important also because the choice of method in not a meaningless event: often the methods used bring with them certain assumptions regarding the nature of the phenomenon studied (the ontology of your research), and thus obligate the researcher.

Methodology literature often makes a distinction between methods and methodology, the former referring to the set of methods used and the knowledge and skills needed to apply them (e.g. preparing questionnaires and statistical analysis of them), and the latter to a consideration of the kind of methods that fit each situation, and their inherent philosophical assumptions. Since the researcher has to justify the used methods (at the public examination if not sooner), s/he should consider these aspects in good time. The choice of methods should thus not only be seen as an
arbitrary or ideological process; science is not a department store where you can choose only the items you like. This is why you should keep in mind the connections between the different types of questions and their methodological requirements.

**Conversance with and use of related literature** is a central part of all research. In some cases (so-called literature review or theoretical study) and in some disciplines as a whole (philosophy, logic, mathematics), literature is the only material used, and the creative part of the study is interpreting the literature, processing it in the light of theories or analyzing it critically. But research literature also forms an integral part of empirical research, where it serves the purpose of communicating the results of earlier studies or building a theoretical framework for the study itself. You should refer to earlier studies on the topic and to the key sources used in the study as early as in the research proposal.

**Experimental methods** are used when one tries to find causal relations or to explain events. They usually require circumstances that can be controlled in order to reduce the number of factors influencing the results at the same time. Experimental methods have been used particularly in natural and technical sciences, and also to some extent in behavioral sciences. The problem often found in this type of research is that the object of the study (e.g. human, society) is too complex to lend itself to experimental examination. Cultural meanings are another example of phenomena which cannot be studied using experimental methods. In behavioral and social sciences, also ethical problems often prohibit the use of experiments: you cannot expose innocent people to experiments that may potentially harm them.

**Computational methods and modeling** have become an increasingly important element of scientific methods particularly owing to the development of information technology and systems theory. Aside natural and technical sciences, they are also applied in social sciences and design research. The aim of modeling is to describe the interdependencies within complex systems in order to accomplish better understanding and predictability and allow better management of the desired changes.

**Quantitative statistical and survey methods** are founded either on existing statistics discussed and analyzed in the study, or on surveys where the examiner produces his or her material and analyzes it. Quantitative methods aim at finding results which, although only indicative when applied to individuals, are generalizable to a larger population (e.g. to Finns or residents of a given area).
Archives are organized authentic products of culture which form the foundation of historical research. The significance of archives is based on the fact that they can be considered more reliable and more objective than for instance, accounts based on interviewing key persons. The research proposal should expressly state the archives available and their use in the study. Sometimes a study may be based mainly on a single archive left behind, for instance, by a renowned person if the researcher has managed to gain access rights to the archive.

Qualitative methods are based on limited empirical data (often no more than a few dozen cases), which is more detailed and extensive but which cannot be generalized to apply to the whole population. Such methods include semistructured theme interviews, where the interviewees are interviewed on themes selected beforehand and in-depth interviews where the interviewer aims to see behind the facade of the interviewee. Midway between quantitative and qualitative methods are structured interviews where the interviewer fills in a questionnaire with the interviewee. Qualitative methods may also be considered to include observation of the object, such as ‘shadowing’ (the researcher takes part in observing the daily operations of e.g. a company for so long that his/her presence no longer attracts attention). Qualitative textual material may be analyzed with a host of methods, for instance discourse analysis. Urban ethnography (usually long-term observation on chosen places) is an important method used in studying the social and cultural aspects of the built environment.

The case study is a special kind of qualitative method. It examines one or more examples in more detail, either because they are interesting in themselves or because they serve as an example of a case which is of research interest. (You may look into, for instance, the master plan process of Helsinki as an example of the interaction required in the Land Use and Building Act, or the realization of the Kamppi shopping center as an example of the relations between the domestic and international real estate business). In case study research, usually many kinds of methods are used in parallel (analysis of documents, key person interviews, analysis of media coverage, etc.) to achieve a good enough description of the case.

Action research aims to study knowledge which is communicated during a process to those involved in it, but which is usually not accessible to outsiders. The researcher must have an active role in the process, and thus his or her research may also influence it. The problem in action research is often subjectivity: since the researcher is also an actor, it makes it difficult for him or her to distance him/herself from the actions or from the interest groups.
4. Expected results and their transferability

Before the study is carried out, you naturally cannot foresee its results, but you can form rational expectations. The study may aim at, for instance verifying or testing a hypothesis or to produce knowledge needed for solving a practical problem. In the case of engineering sciences, architecture and landscape architecture, you should also separately discuss the practical relevance of the study in this section, unless you have done so to a sufficient extent in the background section (cf. part 1). Even in such cases, you should briefly return to it here. The transferability of the results should be presented in a realistic and practice-oriented manner giving enough details (it should not be formulated e.g. ‘to produce new knowledge in order to meet the needs of planning and industry’).

5. Connections of the study to other research and doctoral studies

The research proposal should expressly state if the study is part of a larger entity or if it is connected to the doctoral studies of either the author or someone else.

6. Schedule and financing

Organizing the research into shorter stages helps you to follow up on its progress. The schedule should not, however, be too tight, so that you have time for creative work. Essential stages in this process include familiarizing yourself with research literature, collecting material, analyzing the material, writing a report or thesis, and taking part in doctoral training, seminars and conferences. An article dissertation should be organized in accordance with the planned publications. Take particular care to set time aside for familiarizing yourself with related literature and writing the dissertation without running from one event to the next. For instance, if you are planning to complete the dissertation in four years, you should use the first year familiarizing yourself with research literature and taking the courses required for doctoral studies, the second and third year writing publications or the thesis, and the fourth revising the dissertation on the basis of the comments by the supervisor, instructors and examiners.

The schedule of the study is of course dependent on its funding. You should always include a financing plan, even if its realization was uncertain, because most sponsors require it. If the study is not funded by scholarships, you should remember to include overheads and other expenses (travel, literature, possible costs for printing) in addition to your pay.
7. Publication plan

This is needed for certain types of contract research and projects funded by the Academy of Finland. This is particularly necessary for article dissertations.

8. Bibliography

The research proposal should only refer to the most important sources. The bibliography should not be longer than one page.