Performing a Thesis at the Chair of Transportation Systems Engineering

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Abstract

This short paper includes a general introduction on what is expected and how you might utilize your Masters' thesis at the Chair of Transportation Systems Engineering.

1 Introduction

Congratulations on conducting your Masters' thesis within the Chair of Transportation Systems Engineering. Prof. Antoniou, and all the daily supervisors hope that you will enjoy it and learn throughout this process. Here you will find some basic concepts and ideas that might help you perform your thesis in an efficient way. Before we start, we note that in every single topic there is room for producing something innovative and new, which would help you advance your career. Also, you should understand that the goal of performing an M.Sc. thesis is not the same as all the courses that you already had, which is basically to learn. It is the one project that you are expected to contribute to the research community, something done primarily by making a research contribution that would be helpful for other researchers.

Towards this direction, you should first understand the types of contributions that exist. In general terms, there are three main categories of contribution in science (order is important):

- Theoretical
- Methodological
- Practical

Starting from theoretical, this is the holy grail of contributions. It means that you come up with a theory to explain something. For example, the "utility maximization" concept used to describe choice is a theory.

The second type of contribution includes the development of a way (method) that would provide a solution to a problem. Methodological contributions, are rather happily accepted by the scientific community as they can be used by other people to solve their problems.

Finally, practical contributions (3rd type), are the application of something that someone else invented. It is essentially, the exploration of some methods or data and the practical implications they have in a different city, or test case. Although practical contributions seem to be the less important ic comparison to the other to above, they allow for understanding of the actual implementation and the abilities of a method, which especially for a master thesis could be an excellent contribution.

The reason why it is important to understand what each contribution is and where your thesis falls is to first of all help you understand what you want to do and second to help you understand what is expected from you.

2 Thesis Framework

Starting a thesis with a topic, gives you a direction but in the same time it is supposed to give enough flexibility in order to allow you to come with up with an innovative solution to a problem; thus allow you to make your contribution to your field. In order for you to work in an efficient way, you have to plan ahead. This means, create a framework that would allow you to have a clear outline of what you think you want to do in your thesis and how you would achieve the objectives and goals set. An example of such a framework is presented in the Figure 1.
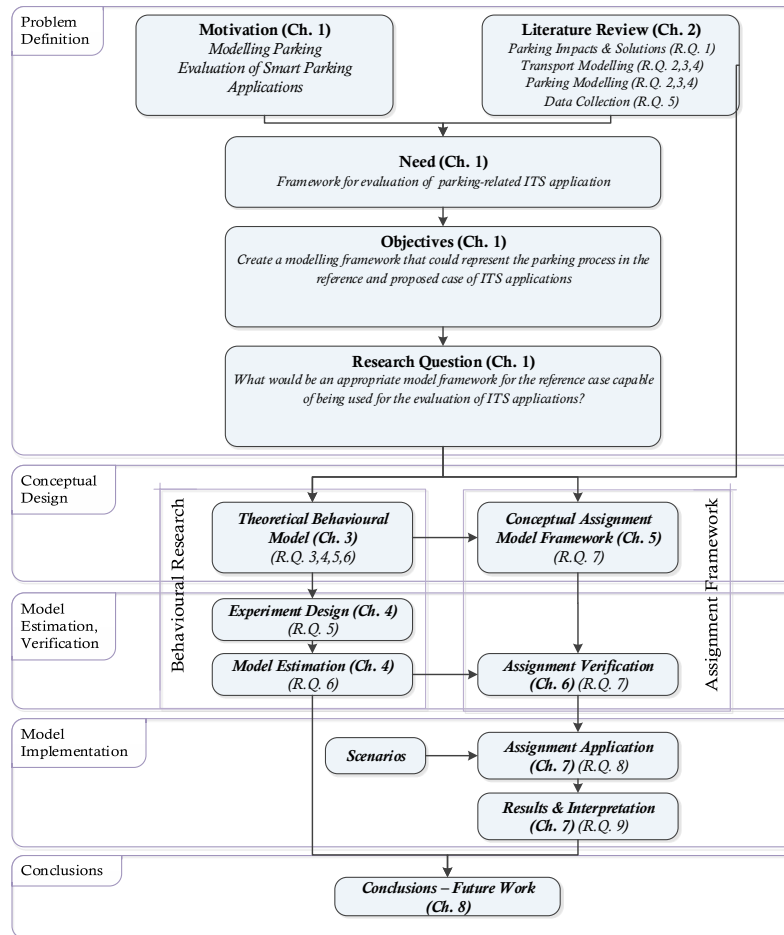

Figure 1: Example of a thesis framework for parking (Chaniotakis, 2014)

For all types of thesis, a **literature** review is the starting point. You would have to identify the various different contributions that people make, categorize them and figure out what is the gaps that exist and worth exploring, and decide that you want to focus on some of them. It is the starting point point that would further help you structure your thesis in a comprehensive way and make it fit as contribution to the community. The gaps identified (by you or proposed by us as a suggestions) define the **need** to focus on this subject and as a consequence your main **research question** and **problem definition**. Then again these shape your **goals** and **objectives**[1], which then shape the process you would have to follow to reach the contributions you would like to make.

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[1]Note that objectives and research question could be structured the other way around based on what they represent. For example the objective to design a better model is translated to the research question "which model better represents the situation at hand", and also a research question (which model is better) leads to research-question-based objectives such as "define the system at hand"

3 Evaluation Points

It is perfectly normal to feel lost from time to time when you are doing your thesis, however this can be reduced by following a structured approach on performing your thesis. Toward this direction, we try to guide you using structured meetings that serve also as evaluation points. This has been found to produce better results. These are essentially meetings that serve as milestones in your timeline and are specifically tied with a percentage of work that needs to be performed until these fixed dates:

Kick-off you have finished a literature review and you have a project description. It depends on you, but I suggest you spend around a month on this (at most). This includes a small report and a presentation.

Mid-Term you have worked on a 50%-60% of your expected work, you have a clear understanding of what you believe that is required to work on to finish with a perfect grade, and you just need to implement it. Keep in mind that it would be nice to have a report outline with around 30% - 50% of the text you would expect to have and again a presentation.

Green Light You send us a report with 85% to 95% of the report and sent a draft of the presentation you expect to have. This would be 30 to 10 days before you have to send the thesis report, and would allow us to give you some quick feedback that can improve your grade (if required).

Defence Final presentation open to everybody.

4 Timeline

As mentioned in the introduction, a successful completion of a thesis requires good planning, something that should also be reflected on a good time plan. This means that from the very beginning and with the foreseen work that has to be completed in the six months to follow, you would have to have an idea about when to stop exploring something and when to start working with the following task. This is critical for the successful realization of your thesis as many times we tend to dive into a particular problem, forgetting that a good thesis is one that does not try to answer all research issues that arise, but it also includes a report and a presentation that should be of high quality. For this reason, it is important to be able to put boundaries on which part of your work is within your thesis scope and what should be left for others to figure it out (or you in a future job or PhD project). A useful tool is a Gantt diagram that you would have to consult every now and then to have an overview of your progress and also help your supervisors to give you more accurate advices on how to proceed. An example is presented in the following figure.

4.1 Kick-Off meeting and Project Outline

In order to help you put your thoughts in order and tackle your thesis efficiently from the very first moment the kick-off document is suggested to include the following sections.

- Introduction
- Problem Definition
    - Related Work
    - Area of Implementation
    - Research Question & Objectives
    - Expected Contributions

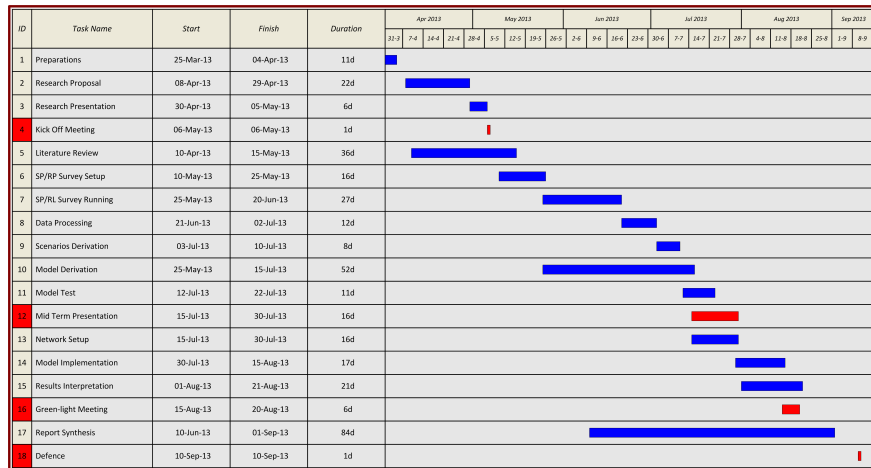| ID	Task Name	Start	Finish	Duration	Apr 2013				May 2013				Jun 2013				Jul 2013				Aug 2013				Sep 2013	
					31-3	7-4	14-4	21-4	28-4	5-5	12-5	19-5	26-5	2-6	9-6	16-6	23-6	30-6	7-7	14-7	21-7	28-7	4-8	11-8	18-8	25-8	1-9	8-9
1	Preparations	25-Mar-13	04-Apr-13	11d																								
2	Research Proposal	08-Apr-13	29-Apr-13	22d																								
3	Research Presentation	30-Apr-13	05-May-13	6d																								
4	Kick Off Meeting	06-May-13	06-May-13	1d																								
5	Literature Review	10-Apr-13	15-May-13	36d																								
6	SP/RP Survey Setup	10-May-13	25-May-13	16d																								
7	SP/RL Survey Running	25-May-13	20-Jun-13	27d																								
8	Data Processing	21-Jun-13	02-Jul-13	12d																								
9	Scenarios Derivation	03-Jul-13	10-Jul-13	8d																								
10	Model Derivation	25-May-13	15-Jul-13	52d																								
11	Model Test	12-Jul-13	22-Jul-13	11d																								
12	Mid Term Presentation	15-Jul-13	30-Jul-13	16d																								
13	Network Setup	15-Jul-13	30-Jul-13	16d																								
14	Model Implementation	30-Jul-13	15-Aug-13	17d																								
15	Results Interpretation	01-Aug-13	21-Aug-13	21d																								
16	Green-light Meeting	15-Aug-13	20-Aug-13	6d																								
17	Report Synthesis	10-Jun-13	01-Sep-13	84d																								
18	Defence	10-Sep-13	10-Sep-13	1d																								

Figure 2: Gantt Diagram example; (Chaniotakis, 2014)

- Project Framework (including explanation of the included components)

- Time Plan (Gantt)

- Conclusions

- References

5 Publishing and Thesis

We believe that an MSc thesis should be a work with a significant impact. For this reason we try our best to support students with publishing their work and results. It is not a prerequisite –as not all thesis can be publishable– but it is a plus. For this reason discussions take place during the evaluation points to explore the possible opportunities for a publication.

6 Deliverables

When delivering a thesis, there a few important deliverables:

1. A Powerpoint slide for disseminating your thesis, 10 days before your presentation. + Invitation to all members of the TSE and friends.

2. 3 hard-copies of your thesis

3. a final digital copy that will be published on the TSE chair website

4. 1 CD or USB with all the files that are related to your thesis (such as data, code scripts, report in pdf)

References

Chaniotakis, E. (2014). Parking behavioural and assignment modelling: Methodology and application for the evaluation of smart parking applications.

Disclaimer

The above suggestions are meant to help students be productive and perform research of high impact. They do not override the regulations and rules of TUM concerning students good conduct, plagiarism and cheating which are enforced with zero tolerance. In case the above suggestions are contradictory to what is regulated by the TUM regulations, the TUM regulation overrule.