EXAMPLE OF THE THESIS TITLE

Full name of PhD candidate

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DISSERTATION

to obtain
the degree of doctor at the University of Twente,
on the authority of the rector magnificus,
prof.dr.ir. A. Veldkamp,
on the account of the decision of the Doctorate Board,
to be publicly defended
on (day) the XXth of (Month) 20XX at ... hours

by

Full name of PhD candidate

born on the XXth of (Month), 20XX
in (Town of Birth), (Country of Birth)

This dissertation has been approved by:

Supervisor
prof.dr.ir. First Supervisor

Co-supervisor
dr.ir. Second Supervisor

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Graduation committee

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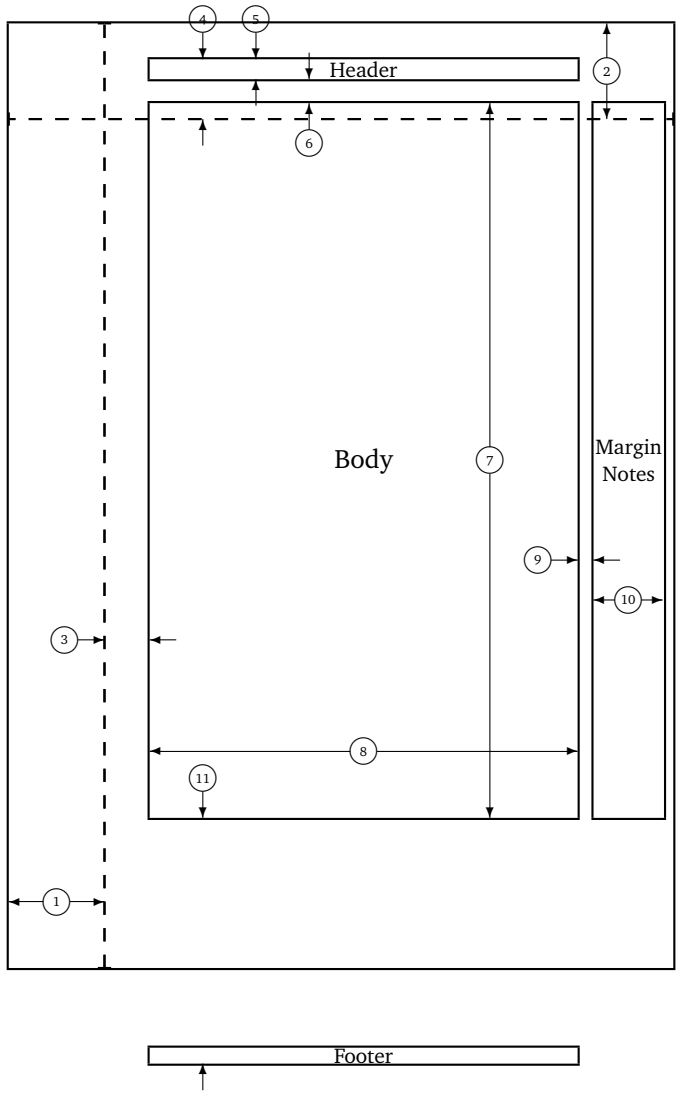
Contents

Preface

You can write a nice preface here, reflecting on your years of research, development, and personal process. Thank colleagues, friends, family, etc.

Name
Location, date



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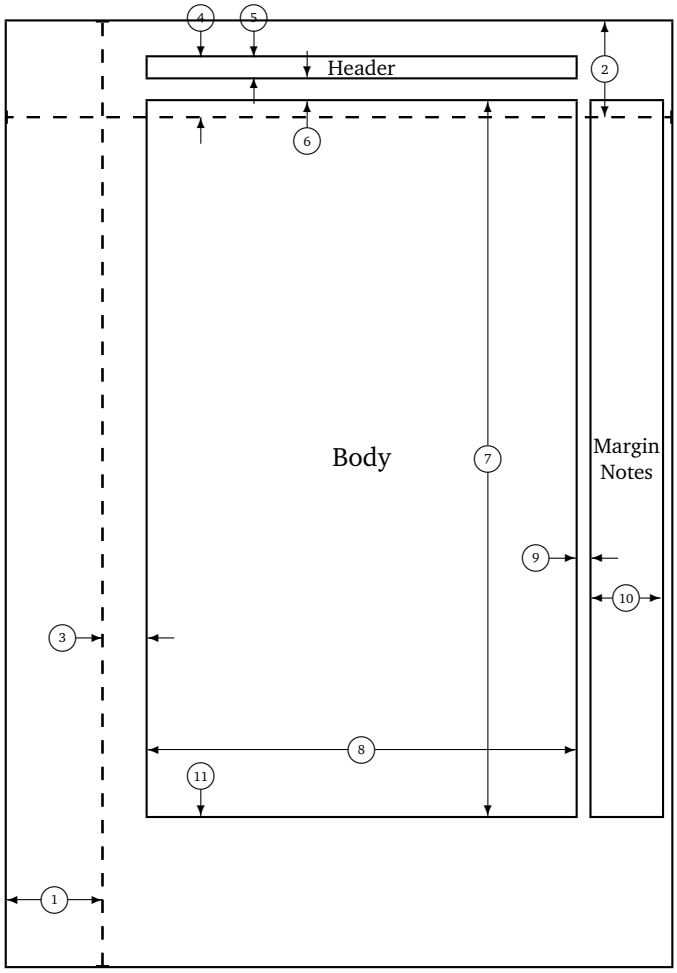

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Part I

Introduction

1 Introduction

Type inspirational quote here

— Name
(Profession)

The general introductory text of your thesis can be written here. The structure is this template chapter is purely a suggestion and not a strict requirement. It mainly serves its purpose to provide some examples of the layout, different (sub)sections, figures, research questions, etc.

1.1 Research motivation

An example of a figure is given in Figure 1.1.

Figure 1.1.: The four phases of disaster operations management.

1.2 Related literature

<TEXT>

1.2.1 Subsection 1

<TEXT>

1.2.2 Subsection 2

<TEXT>

Subsubsection

This is an example of a subsubsection.

Paragraph You can also use a paragraph.

1.3 Research design

You may want to add a section about your research design in the introduction. This can consist of the scope, objective (Section 1.3.1), research questions (Section 1.3.2), and methodology (Section 1.3.3).

1.3.1 Scope and objective

An example of a URL to the website of Wings For Aid (wingsforaid.org). You can also add a common general website like this as a footnote[1], or insert a regular footnote[2]. Specific sources, also online, are preferred to end up in the reference list at the end of the thesis.Specific sources, also online, are preferred to end up in the reference list at the end of the thesis.

Below is an example of the formatting of the research objective:

> *Here can the research objective be written. The research objective is slightly smaller here than in normal text width and in italics. Of course, formatting is of your own choosing.*

[1] `https://wingsforaid.org/`
[2] This is a footnote.

1.3.2 Research questions

Research questions are formulated below. This may be done in a different format than regular text.

RQ 1. *How can we formulate research questions such that the formatting is different than regular text?*

As a basis for this template, we have a set of standard formatting stuff. This aids in the formatting of the thesis.

RQ 2. *What should we do in order to formulate a second research question?*

Just write the details of the question here.

1.3.3 Research methodology

<TEXT>

1.4 Structure of the thesis

We can outline the structure of research questions, topics, and chapters here, preferably with a nice flowchart.

Part II

Title of the first part

2 Model

Type inspirational quote here

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Type introduction here

2.1 Introduction

<TEXT>

2.2 Related literature

<TEXT>

2.2.1 Subsection 1

You can refer to literature with Van Steenbergen et al. (2023a) or with (Van Steenbergen et al., 2023b). If you provide an example of some papers, you can also mention them in this way (e.g., Van Steenbergen et al., 2023b; Toth and Vigo, 2014).

2.3 Problem description

You can describe a formula in this way, for example, a formula for deprivation costs:

$$\gamma(\delta) = e^{0.065\delta} - 1. \tag{2.1}$$

Equation (2.1) represents the deprivation costs per individual per hour. Or provide the in-text formula in this way: $\gamma(\delta) = e^{0.065\delta} - 1$.

You can also provide a list of multiple formulas, where the equal sign is aligned:

$$I_{t+1}^{\mathsf{CW}} = I_t^{\mathsf{CW}} - \sum_{k \in \mathcal{K}} \sum_{n \in \mathcal{N}} x_{tnk} + \hat{s}_{t+1}^{\mathsf{CW}}, \tag{2.2}$$

$$I_{t+1,n} = \max \left\{ 0, \; I_{tn} + \sum_{k \in \mathcal{K}} x_{tnk} - \hat{d}_{t+1,n} \right\}, \qquad \forall n \in \mathcal{N}, \tag{2.3}$$

$$\delta_{t+1,n} = \begin{cases} \delta_{tn} + 1 & \text{if } I_{tn} + \sum_{k \in \mathcal{K}} x_{tnk} \leqslant \hat{d}_{t+1,n}, \\ 0 & \text{otherwise,} \end{cases} \qquad \forall n \in \mathcal{N}, \tag{2.4}$$

where the inventory position of the central warehouse is updated according to the allocation decisions and the arrival of new supplies in Equation (2.2). The inventory positions at the districts are increased by the allocation decisions and decreased by the realized demand in the period or set to zero if the demand exceeds the inventory position plus the allocation decisions in Equations (2.3). Lastly, the deprivation times are increased by one if the post-decision inventory is not sufficient to fulfill the demand and otherwise reset to 0 in Equations (2.4).

An example of an algorithm is detailed in Algorithm 1.

Algorithm 1 Nearest neighbor heuristic

initialize locations $\mathcal{N}$, demand list $d_n \in \mathcal{D}$, travel time matrix t, vehicle $v = 0$, current location $l_v = 0$, available time $\mathrm{T} =$ *operating time*, available capacity $Q =$ *vehicle capacity*
while $\sum n \in \mathcal{N} d_n > 0$ **do**
  $v \mathrel{+}= 1$, $r = 0$, $\tau_v = \mathrm{T}$
  while $\tau_v > 0$ **do**
    $r \mathrel{+}= 1$, $q_v = Q$
    initialize depot as the starting point of the route
    while $\tau_v > 0$ and $q_v > 0$ **do**
      nearest travel time $t^{\min} = \infty$
      for $n \in \mathcal{N}$ **do**
        if $t_{l,n} < \tau_v$ and $t_{l,n} < t^{\min}$ and $d_n > 0$ and $d_n \leqslant q_v$ **then**
          $t^{\min} = t_{l,n}$
          $n^{\min} = n$
        end if
      end for
      add location $n^{\min}$ to the end of route r of vehicle v
      update remaining time $\tau_v \mathrel{-}= t_{l,n^{\min}}$, remaining capacity $q_v \mathrel{-}= d_{n^{\min}}$, current location $l_v = n^{\min}$, demand $d_{n^{\min}} = 0$
    end while
    add depot as the last location of the route
  end while
end while

Appendix

Each chapter can have a sub-appendix with additional material regarding this chapter.

2.A Additional material

A simple table is in Table 2.A.1.

Table 2.A.1.: Caption of tables is on top.

District	Demand per period	UAV costs	Truck costs
1	100	50	300
2	200	100	600
3	300	150	900
4	400	200	1200
5	500	250	1500
6	600	300	1800

Part III

Title of the second part

Example

3

Type inspirational quote here

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(Profession)

Type introduction here

3.1 Introduction

<TEXT>

3.2 Related literature

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3.2.1 Subsection 1

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Part IV

Conclusions

4 Conclusions

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— **Name**
(Profession)

Type introduction here

4.1 Subsection

First subsection, for example, answer the research questions from the introduction.

4.2 Future work

Second subsection, e.g., reflect on research outlook.

Bibliography

Toth, Paolo and Daniele Vigo (2014). *Vehicle routing: problems, methods, and applications*. SIAM (cit. on p. 9).

Van Steenbergen, Robert M, Martijn R K Mes, and Wouter J A Van Heeswijk (2023a). "Reinforcement learning for humanitarian relief distribution with trucks and UAVs under travel time uncertainty". In: *Transportation Research Part C: Emerging Technologies* 157, p. 104401 (cit. on p. 9).

Van Steenbergen, Robert M., Eduardo Lalla-Ruiz, Wouter J A Van Heeswijk, and Martijn R K Mes (2023b). "The Heterogeneous Fleet Risk-Constrained Vehicle Routing Problem in Humanitarian Logistics". In: *Computational Logistics*. Ed. by Joachim R. Daduna, Gernot Liedtke, Xiaoning Shi, and Stefan Voß. Cham: Springer Nature Switzerland, pp. 276–291 (cit. on p. 9).

List of Figures

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List of Algorithms

Abstract

t.b.d.

Samenvatting

n.t.b.

About the author

Insert biography here.

List of Publications

Insert list of academic work here.