Writing a Thesis Proposal
Part Two: Key Parts of Your Proposal

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Learning Outcomes

By the end of this presentation (Part Two), you should be able to:

- Understand the Create a Research Space (CARS) model and apply it to the writing of your own proposal.
- Write a successful and well-organized abstract, introduction, literature review and methods section for your proposal.
Overview of Presentation (Part Two)

- The Create a Research Space (CARS) model
- Writing a proposal abstract
- Writing an introduction
- Writing a literature review
- Writing a methods section
Create a Research Space (CARS) Model

- Swales (1991) and Swales and Feak (2012) suggest that your proposal should create a research space.
- They developed a model called (CARS) to help you create your research space.
- The “CARS” model has three main consecutive moves.


The Moves in the “CARS” Model

1. Establish the research territory.
2. Identify a niche.
3. Occupy the niche.


Establishing the Research Territory

You establish the research territory by doing the following:

- Demonstrating that the research area is central, problematic or relevant,
- Presenting background information about the topic or problem, or
- Reviewing and synthesizing previous and current related research.


Identifying a Niche

You establish the niche for your research using one of the following strategies:

- Announcing a gap or shortcomings in the existing research or a real world problem,
- Questioning the findings or methods of the existing research, or
- Indicating your intention to continue a research tradition.


Occupying the Niche

You occupy the niche by doing the following:

- Stating the nature and purpose of your research,
- Listing research questions and hypotheses or objectives,
- Announcing expected findings (not in all fields),
- Stating the value of your research (optional), and
- Indicating the structure of the paper or proposal (optional).


The CARS Model in Each of These Sections

ABSTRACT → INTRODUCTION → LITERATURE REVIEW
**Abstract**

- Summarizes your proposed research in a few lines.
- Creates a research space (CARS) by
  - Establishing the research territory
  - Identifying the niche
  - Occupying the niche (includes purpose and proposed methods)
- Does not usually include references.


Sample Abstract

Snowmelt infiltration and the freezing and thawing of soil in cold, semi-arid regions of Canada influence ... hydrological processes. They govern soil ... properties such as hydraulic conductivity, water holding capacity and erodibility, all of which shape local surface and ground water hydrology, influencing local ecosystems and ... the development of mitigation strategies to reduce environmental risks such as flooding and drought. ... However, there is inadequate representation of snowmelt infiltration and the freeze thaw processes in most ... hydrological models, creating a need for improved models. ... A new physically-based Capillary Bundle Model shows promise in modelling complex snowmelt infiltration in seasonally frozen soil. This research aims to validate the model with field data ... The research findings are expected to improve simulation of snowmelt infiltration processes in seasonally frozen ground and thus to contribute to water security.

Courtesy of a former student
Problems with Abstracts

- Are too long and wordy.
- Fail to introduce the context or general research territory.
- Begin with the purpose of the student’s study.
- Fail to identify research gap or shortcomings, or intention to follow in a research tradition.
- Do not include expected findings (when these are required).
The Introduction

- Introduces the context, topic and/or problem.
- Moves from the general research territory to the specific study.
- Creates a research space (CARS) (Swales, 1991; Swales & Feak, 2012).
- Introduces the theoretical framework and assumptions (if applicable).
- Defines terms.
- Articulates research questions, hypotheses and/or objectives.


Sample Introduction

The Northern Hemisphere is characterized by a continuous climate gradient ranging from temperate ... to permafrost ..., encompassing the hydrological influence of both seasonally and perennally frozen ground (Ireson et al., 2012). ... Although there has been considerable progress in understanding permafrost regions, seasonally frozen ground has received comparatively less attention (Zhang et al., 2003). Limitations exist in forecasting streamflow and ground water discharge from snowmelt because the existing models are unable to accurately simulate the process of infiltration into frozen soils in seasonally frozen grounds (Granger et al., 1984). ....

Although it accounts for only about one third of annual precipitation on the Canadian prairie, snow produces 80% or more of the annual surface runoff (Gray & Landine, 1988). This runoff is important to agriculture, hydroelectric power generation, and the urban water supply. ...Because changes in snowmelt and infiltration can result in flooding and drought (Abudu et al., 2012), understanding the infiltration process is critical (Mekonnen et al., 2014).
Sample Introduction (*continued*)

The rate, type and volume of precipitation, temperature and snowmelt in spring are the major factors governing ... spring runoff. Improved models ... are needed to simulate these characteristics and estimate the rates and volumes of soil water recharge and runoff (Zhao et al., 1997). A new physically-based Capillary Bundle Model shows promise in modelling complex snowmelt infiltration in seasonally frozen soil. The current research aims to validate the model with field data. The purpose of the research is to investigate the snowmelt infiltration process in seasonally frozen ground, as well as to examine the influence of the freeze-thaw phenomenon. An improved model will help sustainable conservation as well as the management of the ground and surface water resources contributing to water security in Canada.

Research Objectives

The specific objectives of the research are as follows:
1. To analyze the field based observations of snowmelt infiltration,
2. To characterize the soil hydraulic properties under variably frozen conditions,
3. To validate and compare different models for snowmelt infiltration.

Courtesy of a former student
Problems with Introductions

- Fail to use general to specific pattern; introduce purpose of study too early.
- Do not include sufficient context and background.
- Do not identify the critical problem/question/research gap.
- Fail to present theoretical framework or to discuss alternative frameworks.
- Fail to define key terms.
Problems with Introductions *(continued)*

- Identify unrealistic objectives and/or vague hypotheses.
- Objectives contain imprecise wording.
- Do not present objectives in a numbered list set off from the text.
- Present objectives in an illogical order.
- The objectives contain details about the methods.
Examples of Precise Research Objectives

1.5 Objectives

My overall objective is to develop a systematic method to ... To achieve the overall objective of the thesis, specific research objectives are as follows:

1.5.1 Objective 1

To implement TO for the optimal design of CMs with prescribed translational input motions and rotational input motions for maximum energy efficiency. With actuators embedded in the structure of a CM and their motions prescribed, CMs are designed for maximum energy efficiency.

(This student had four specific research objectives as detailed as this one.)

CM = compliant mechanism; TO = topology optimization

Courtesy of a former student
The Literature Review

- Presents the rationale for your study.
- Reveals what is and isn’t known about your topic in a synthesis of the literature.
- Exposes gaps, shortcomings, inconsistencies and debates.
- Critiques the literature: shows how gaps or shortcomings led to your research.
- Is logically organized, according to the key concepts or themes in your study.
- May use the research questions or objectives as an organizing principle.
- Begins with a “roadmap” of the literature review.
Methodology

- Describes the methods, models, subjects, location, sampling technique, data collection procedures, instrumentation and apparatus.
- Links the methods with the research questions.
- Describes how the data will be analyzed.
- Tells why you chose these methods and rejected others.
- Addresses potential biases and other limitations or potential roadblocks with the methods.
Example of an Extract from a Methods Section

4.2 Methodology for Objective 2

Objective 2 is to design CMs and embedded actuators simultaneously for Motion Generation.

Forty-four types, numbers, locations, sizes and motions of actuators in a CM are to be optimized, as well as the structure of the CM, for the purpose of guiding a flexible member of the CM through a sequence of motions. The result will not simply be an optimized mechanism, but an optimized system with the number, size, location, and orientation of all actuators and structures of the CM being simultaneously synthesized. Such a system performs better than one in which the actuator is “integrated” after the design of CMs (Trease, 2008). ...

CM = compliant mechanism

Courtesy of a former student
Problems with Methods Sections

- No apparent connection between methods and objectives.

- No seeming relationship between the order in which information is presented and the order of the research objectives.

- Lack of information on why this method was selected and others rejected.

- Contain methodological flaws (e.g., control group too small).

- Omit detailed information on how the data will be analyzed.

- Fail to address researcher bias, other potential pitfalls or contingencies.
Summary

- Use the CARS model when writing your abstract, introduction and literature review.

- In all three of these sections, identify the research niche and explain how your research will occupy this niche.

- Make sure your objectives are precisely and clearly expressed.

- Your methods should be tied to your objectives.

- Include the reasons for choosing your methods and rejecting others, address potential biases and pitfalls, and include contingencies.