

**Department of Systems and Computer Engineering**

**Technology Innovation Management**

[www.carleton.ca/tim](http://www.carleton.ca/tim)

**TIM THESIS DEVELOPMENT**

**Last update: July 2006**

# 1. INTRODUCTION

The objective of this document is to help TIM students execute and document high-quality theses in a timely fashion. Feedback on what is in this document is welcome. Feedback is used to continuously improve the production of TIM theses.

Sections 3, 4, 10 and 11 of this document are edited versions of *How to Organize your Thesis* by Professor John Chinneck (<http://www.sce.carleton.ca/faculty/chinneck/thesis.html>). It has been customized for the particular case of TIM students.

Section 2 describes the Gate Review Process, an informal process used to complete TIM theses. The process is voluntary and visible.

Section 3 defines TIM thesis expectations.

Section 4 provides a template for TIM theses. While professors prefer their students to organize theses in different ways, the essential elements in any thesis are the same.

Section 5 describes five research approaches used to prepare TIM theses.

Section 6 organizes the research program into four sub-fields: i. Product and service development; ii. Sources of competitive advantage; iii. Technical entrepreneurship, innovation and commercialization; and iv. Engineering and technology. The first three sub-fields are part of the knowledge domain known as engineering management or engineering and technology management.

Section 7 provides a list of the journals most relevant to the engineering management and management aspects of the TIM program.

Sections 8 and 9 reproduce Carleton University's *Policies for the Ethical Conduct of Research and Instructional Offences*.

Sections 10 and 11 provide answers to frequently asked questions and tips.

Section 12 includes the feedback forms used during the Gate 0 and Gate 1 reviews as well as Carleton University's *Supervisor-Student Guidelines*.

## 2. GATE REVIEW PROCESS

### OBJECTIVES

The objectives of the Gate Review Process are to:

- help a TIM student complete a high-quality thesis on time
- prepare TIM students for the thesis defence
- reduce wasteful effort and time delays
- support a unique learning community anchored around TIM students' research efforts

### RATIONALE

The Gate Review Process provides a sense of structure and sequence to TIM thesis development. It reduces the ambiguity for TIM students regarding what to work on and when.

Gate Reviews:

- provide TIM students with a strong sense of responsibility and ownership
- motivate TIM students and allow them to assess their work activities and progress
- simplify identification of the requirements for a good thesis and allow earlier surfacing and resolution of potential problems
- promote communication among TIM students, faculty, TIM graduates, and key external stakeholders (e.g., company managers)
- aid TIM students and faculty in adopting a project attitude to thesis completion (e.g., milestones, clear deliverables, commitment to schedule, visible progress)
- facilitate creativity in problem solving, enhance learning, and increase attention to details
- strengthen the supervisor-TIM student relationship, one that grows with mutual respect and high levels of professional integrity

The Gate Review Process is one of the factors that contribute to the success of the TIM program. Faculty and students take it quite seriously because they believe that it leads to successful thesis production and excellent learning and networking opportunities.

TIM students relate well to the Gate Review Process because they follow similar processes when developing products in their companies.

### GATE REVIEWS

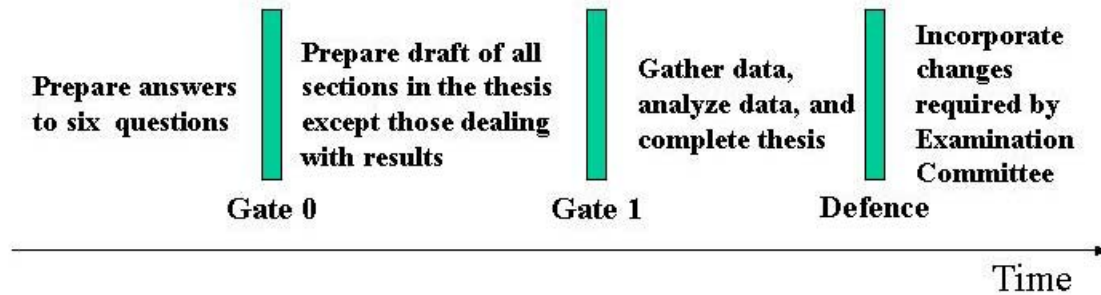
Figure 1 shows the Gate Review Process. Each TIM student goes through a Gate 0 Review and a Gate 1 Review before defending his/her thesis. To pass a Gate, your Supervisor must agree that you have satisfied the Gate requirements.

After his/her Gate 0 Review, a TIM student iterates various drafts of the thesis with his/her Supervisor. Typically, before the Gate 1 Review, the TIM student has:

- completed a draft of the thesis that includes all sections except those that discuss the results
- fixed the holes found by the Supervisor in the Gate 0 proposal

Every year, all TIM students are scheduled to present evidence of thesis progress at gate reviews. Faculty, TIM students, TIM graduates and guests attend these reviews, ask questions, make suggestions, and provide written feedback to the presenters. The written feedback is provided to the TIM student on a confidential basis.

**Figure 1**  
Gate Review Process for TIM Thesis Development



### **DATES FOR GATE REVIEWS**

Gate reviews are normally held in 4359 ME on a Friday afternoon in October, November, January, February, March and June.

### **GATE 0**

At a Gate 0 review, a TIM student provides evidence that:

- he/she understands what graduate level research is about
- he/she can deliver an effective presentation.

At a Gate 0 Review, a TIM student provides evidence that he/she understands what graduate level research is about by providing clear answers to the following seven questions:

- What is your research question or research problem?
- Why is your research question (or problem) an important one?
- What contribution will your thesis make?
- Which research method will be used?
- What variables will you measure and how will you measure them?
- What data will you collect, where will you get the data, how will you get the data?
- How will you analyze the data?

Each student has approximately 20 minutes to present and answer questions. The form the audience uses to provide feedback to a Gate 0 presenter is shown in Appendix 1.

Typically, all students who start the TIM program in September are scheduled to pass Gate 0 at the end of February of the subsequent year. If a student feels that he/she is not ready by then, he/she simply signs up for another date.

A TIM student does not need to select a Supervisor before his/her Gate 0 Review. However, most students have a Supervisor by the time they make their Gate 0 presentation.

### **GATE 1**

At a Gate 1 Review, the TIM student:

- provides evidence that he/she is ready to collect and analyze data
- prepares for the final thesis defence
- improves presentation skills

At a Gate 1 Review, the TIM student provides evidence that he/she is ready to collect and analyze data by providing clear answers to the following questions:

- What is your research question or research problem?
- Why is your research question (or problem) an important one?
- What contribution will your thesis make?

- What variables will you measure and how will you measure them?
- What data will you collect, where will you get the data, how will you get the data?
- How will you analyze the data?
- What results will you obtain and the results will be interpreted?
- What conclusions can you make based on the results?
- What are the limitations of your research?

The form the audience uses to provide feedback to a Gate 1 presenter is shown in Appendix 2.

A major difference between Gate 0 and Gate 1 Reviews is that a Gate 0 Review can result in major changes to the student's thesis proposal, while a Gate 1 Review usually results in refinements and patches. Another difference is that the Gate 1 Review is more detailed and specific.

### **VOLUNTARY AND VISIBLE**

The Gate Review Process is both voluntary and visible.

We see no strong argument for formally enforcing the Gate Review Process upon TIM students. The reasons for this are:

- Carleton University has excellent guidelines that define the responsibilities of supervisors and graduate students already (see Appendix 3)
- TIM students are too good, too motivated, and too experienced for faculty to waste their time adding more controls to those which exist already
- The Gate Review Process is part of the TIM culture already

We argue that when good people share a strong culture of leadership and success, there is no need for additional formal controls.

A TIM student who has a more effective thesis development process is free to use it and ignore the Gate Review Process altogether.

The Gate Review Process is visible. Information on expected thesis completion dates, and on who presents what, when is made public. Visibility creates the sense of community, pride for what we do, commitment to complete the thesis on time, and a taste of what you need to do to achieve excellence.

### **3. TIM THESIS EXPECTATIONS**

#### **WHAT IS THE TIM MASTER'S THESIS ABOUT**

The TIM Master's thesis is a formal document whose sole purpose is to prove that you have made an original and useful contribution to knowledge. The contribution to knowledge of a Master's thesis can be in the nature of an incremental improvement in an area of knowledge or the application of known techniques to solve a problem in a new area.

Your thesis must show that:

- you have identified a worthwhile research question which has not been previously answered, or a problem that has not been solved
- you have answered the research question or solved the problem

#### **MUST HAVE REQUIREMENTS**

Your Master's thesis must:

- provide a very clear statement of the research question or problem to be solved
- provide a thorough review of the existing literature on the subject and closely related subjects
- use the existing literature to demonstrate that your question (a) has not been previously answered and (b) is worth answering
- describe how you answered the research question or solved the problem
- clearly indicate what you did and distinguish it from what others did
- be a formal document (i.e., every item must be in the appropriate place, and repetition of material in different places should be eliminated)

#### **WHAT EXAMINERS LOOK FOR**

When examiners read a thesis they look to answer the following questions:

- what is this student's research question or problem?
- is it a good research question or problem? (has it been answered before? is it a useful question to work on?)
- did the student convince me that the research question was adequately answered? was the problem solved correctly?
- has the student made an adequate contribution to academic knowledge? to the practice of engineering management?

#### **WHAT IS EXPECTED OF A TIM STUDENT IN THE THESIS OPTION**

It is expected that at the end of his/her thesis, a student becomes a trusted specialist in a narrow domain and can point novices to the proper sources of knowledge. For this purpose, we expect TIM students to:

- know where to find the relevant information about a knowledge domain
- know how to look for relevant information about a knowledge domain
- read and understand what is published in the leading journals and books that specialize on what is known about the knowledge domain

## **4. THESIS TEMPLATE**

No two theses are organized in exactly the same way. The following is a template that can be used for any thesis. While professors prefer their students to organize theses in different ways, the essential elements in any thesis are the same.

### **1. INTRODUCTION**

This is a general introduction to what the thesis is all about – it is not just a description of the contents of each section. Briefly summarize the research question or the problem, some of the reasons why it is a worthwhile research question, and give an overview of your main results.

### **2. BACKGROUND INFORMATION (OPTIONAL)**

A brief section giving background information may be necessary, especially if your work spans two or more traditional fields. That means that your readers may not have any experience with some of the material needed to follow your thesis, so you need to give it to them. A different title than that given above is usually better; e.g., "A Brief Review of Equipment Vendor's Brand Differentiation."

### **3. LITERATURE REVIEW**

Here you review the state of the art relevant to your thesis. Again, a different title is probably appropriate; e.g., "Literature Review on Brand Differentiation." The idea is to present the major ideas in the state of the art right up to, but not including, your own ideas.

You organize this section by idea, and not by author or by publication. For example if there have been three important main approaches to Brand Differentiation to date, you might organize subsections around these three approaches, if necessary:

- 3.1 Business-to-Business brand differentiation
- 3.2 Image brand differentiation
- 3.3 Experiential brand differentiation

Be sure to summarize the lessons learned from your literature review that you intend to use in your thesis.

### **4. RESEARCH QUESTION OR PROBLEM STATEMENT**

You can refer to a "research question" to be answered or a "problem" to be solved. In either case, this section has at least three main parts:

- a concise statement of the research question or the problem that your thesis addresses
- justification, by direct reference to the literature, that your question is previously unanswered
- discussion of why it is worthwhile to answer this question.

### **5. DESCRIPTION OF HOW YOU SOLVED THE PROBLEM OR ANSWERED THE QUESTION**

This part of the thesis is much more free form. It may have one or several sections and subsections. But it all has only one purpose – to convince the examiners that you answered the research question or solved the problem that you set for yourself. You show what you did that is relevant to answering the question or solving the problem.

If there were blind alleys and dead ends, do not include these, unless specifically relevant to the demonstration that you answered the thesis question.

## **6. CONCLUSIONS**

You generally cover four things in the Conclusions section, and each of these usually merits a separate subsection:

- Conclusions
- Contributions to Academic Knowledge
- Contributions to Engineering Management Practitioners
- Future Research

Conclusions are short, concise statements of the inferences that you have made because of your work. It helps to organize these as short numbered paragraphs, ordered from most to least important. All conclusions should be directly related to the research question or problem you address.

The Summary of Contributions to Academic Knowledge and Contributions to Engineering Management Practitioners will be carefully read by the examiners. Here you list the contributions of new knowledge that your thesis makes. Organize from most to least important.

The Future Research subsection is included so that researchers picking up this work in future have the benefit of the ideas that you generated while you were working on the thesis. Again, concise numbered paragraphs are usually best.

## **7. REFERENCES**

The list of references is closely tied to the literature review. Most examiners scan your list of references looking for the important works in the field, so make sure they are listed and referred to in the body of your thesis. Truth be known, most examiners also look for their own publications if they are in the topic area of the thesis, so list these too. Besides, reading your examiners' papers usually gives you a clue as to the type of questions they are likely to ask.

All references given must actually be referred to in the main body of the thesis. Note the difference from a Bibliography, which may include works that are not directly referenced in the thesis. Organize the list of references either alphabetically by author surname (preferred), or by order of citation in the thesis.

## **8. APPENDICES**

Appendices include material that is important to justify the results of a thesis. Generally it is material that is of too nitty-gritty a level of detail for inclusion in the main body of the thesis, but which should be available for perusal by the examiners to convince them sufficiently. Examples include program listings, immense tables of data, lengthy mathematical proofs or derivations, etc.

## 5. RESEARCH APPROACHES

By the very nature of being the result of a research effort, a TIM thesis is a unique endeavour. The research approach in the thesis follows the nature of the research question or problem the thesis addresses.

To guide students in their understanding of the type of effort required, the quality of the results required, and examples of good research we provide a classification of research approaches. This classification permits faculty and graduate students to better explain what they are doing (e.g., we are working on approach X, we are working on a combination of approaches X and Y). The intent is to provide mature graduate students with a research approach classification that is helpful, not “cookie cutter” recipes for theses.

Five research approaches are described in this section:

- Constructive
- Positive
- Grounded
- Simulation
- Theoretical

### CONSTRUCTIVE

A TIM student uses the constructive approach to design, build a test a working system or prototype.

Students pursuing this approach must be very comfortable with the tools that they will use to build their systems (e.g., programming languages, network protocol stacks, operating system kernels, Web tools).

#### Advantage

The main advantage of this approach is that the student ends up with a real system/prototype.

#### Disadvantage

The main disadvantage is the time spent overcoming implementation issues that have little to do with the core of the thesis. For example, a student may be delayed weeks because of the need to change his/her code because the system administrator updated an old version of a required system to a newer one (e.g. time spent upgrading code that is required when version 7.3 of RedHat Linux is upgraded to version 8.0).

Examples of *constructive* TIM theses

- Chen, Fung (2002) *Policies as Design and Implementation Artifacts for Non Functional Requirements*.
- Pellerin, Karine (2003) *Multimode Verification System Using Fingerprint and Speech Information*.

### POSITIVE

A TIM student uses the positive approach to develop a theory with testable hypotheses and then to test these hypotheses. Hypotheses should be:

- clearly stated
- testable
- interesting
- likely true

The positive approach is applicable when a useful theory can be developed at the start of the research effort using available data and previous research results.

#### Advantage

The main advantages of this approach are two. First, the requirement for creativity and insight comes early in the research process. This means that thesis success can be ascertained before thesis completion.

The second advantage is that the student ends up with interesting data and clear insights on the elements of the theory and their relationships.

#### Disadvantage

The main disadvantages of this approach are two. First, the student needs to make a significant commitment to learn applied statistics. Second, the student needs to overcome the uncertainties and delays associated with collecting data.

#### Examples of TIM theses

- Izsak, Trevor (2001) *Product News Releases for Time to Market Competitive Intelligence*.
- Ochoa, Edgar (2002) *Coordinating Hardware and Software Development: Evidence of Success Factors*.

#### References

- Foddy, William (1994) *Constructing Questions for Interviews and Questionnaires: Theory and Practice in Social Research*, Paperback Reprint Edition, Cambridge University Press; ISBN: 0521467330.
- Norusis, Marija J. (2002) *SPSS 11.0 Guide to Data Analysis*, Prentice Hall ; ISBN: 0130348309.
- Stevens, James (2001) *Applied Multivariate Statistics for the Social Sciences*, 4th edition, Lawrence Erlbaum Associates; ISBN: 0805837779.
- Callahan, John R. and Brian Moreton (2001) "Reducing Software Product Development Time", *International Journal of Project Management*, 19(1), January.
- Eisenhardt, Kathleen M. and Behnam N. Tabrizi (1995) "Accelerating Adaptive Processes: Product innovation in the global computer industry", *Administrative Science Quarterly*, 40(1), March, 84-110.

### **GROUNDDED**

A TIM student uses the grounded approach to build a theory by closely observing real data.

The approach is used when rich, multi-aspect data is needed to investigate a management problem. The grounded approach is applicable when a useful theory cannot be developed at the start of the research effort using available data and previous research results. The grounded approach is exploratory.

#### Advantage

The main two advantages of this approach are that the student can use a wide variety of data types and sources, and that the research strategy and tactics can be adjusted as the research proceeds.

#### Disadvantage

The main disadvantages of this approach are two. First, the student needs maturity and communications skills to gather data.

The second disadvantage is that the requirement for creativity and insight comes at the end of the research process. Thus, there is uncertainty until the end as to whether or not the student has done or found something significant.

#### Examples of TIM theses

- Muegge, Steve (2004) *Independent Start-ups and Corporate Spin-outs in the Ottawa High-Tech Community*.

- Miller, Scott (2006) *Changes that Occur to Software Architecture following Organizational Change*.

#### References

- Carlile, Paul R. and Clayton M. Christensen (2005) "The Cycles of Theory Building in Management Research", Jan. 6, Version 6.0, (<http://www.innosight.com/documents/Theory%20Building.pdf>)
- Dyer, Jr., W. Gibb and Alan L. Wilkins (1991) "Better stories, not better constructs, to generate better theory: A rejoinder to Eisenhardt", *Academy of Management Review*, 16(3), 613-619.
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- Eisenhardt, K.M. (1989) "Building theories from case study research", *Academy of Management Review*, 14, 532-550.
- Leonard-Barton, Dorothy (1990) "A Dual Methodology for Case Studies: Synergistic use of a longitudinal single site with replicated multiple sites", *Organization Science*, 1(3), August, 248-266.
- Miles, Matthew B. and A. Michael Huberman (1994) *Qualitative Data Analysis: An Expanded Sourcebook*, Sage Publications; ISBN: 0803955405.
- Yin, Robert K. and Donald T. Campbell (2003) *Case Study Research: Design and Methods*, 3rd Edition, Sage Publications, Inc.; ISBN: 0761925538.
- Cusumano, Michael A., Yiorgos Mylonadis, and Richard S. Rosenbloom (1992) "Strategic Maneuvering and Mass Market Dynamics: The triumph of VHS over beta", *Business History Review*, 66, Spring, 51-94.
- Eisenhardt, K.M. (1989) "Making Fast Strategic Decisions in High-Velocity Environments", *Academy of Management Journal*, 32(3), Sep, 543-576.
- Lewis, Michael A. (2001) "Success, Failure and Organisational Competence: A case study of the new product development process", *Journal of Engineering and Technology Management*, 18(2), June, 185-206.
- Rosenbloom, Richard S. and Michael A. Cusumano (1987) "Technological Pioneering and Competitive Advantage: The birth of the VCR industry", *California Management Review*, 29(4), Summer, 51-76.
- von Corswanta, Fredrik and Claes Tunälvb (2002) "Coordinating Customers and Proactive Suppliers: A case study of supplier collaboration in product development", *Journal of Engineering and Technology Management*, 19(3-4), September, 249-261.

#### **SIMULATION**

A TIM student uses the simulation approach to build a simulation model of a real system, and then uses results from the simulation to make recommendations about the real system.

The biggest challenge of the simulation approach is validation (i.e., how to ensure that the simulation results are an accurate reflection of reality) and experimental design (i.e., which of the millions of experiments should be run to arrive at interesting results).

#### Advantage

The main advantage of the simulation approach is that the simulation allows a great range of experiments in a controlled manner.

#### Disadvantage

The main disadvantage is that the student may need to learn both simulation and statistical techniques.

#### Examples of TIM theses

- Carlos Yepez (2004) *Venture Capital Investment Dynamics: Modeling the Ottawa Boom-and-Bust*.

### **THEORETICAL**

A TIM student uses the theoretical approach to solve a well-known problem mathematically.

The student needs excellent mathematical and formal methods skills.

#### Advantage

The main advantages of the theoretical approach are completeness (the student can arrive at a definite answer) and significance (why the problem is relevant and what the importance of the student's results are, can be clearly shown).

#### Disadvantage

The main disadvantage is the uncertainty associated with intellectual capability (i.e., the student may not quite get the proof done even though he/she devoted significant time to it).

#### **Examples of TIM theses**

No TIM thesis has been prepared using this approach. Examples include:

- proof that an e-commerce security protocol is indeed secure (within certain parameters)
- demonstrate that "X" is impossible

## 6. RESEARCH PROGRAM

The TIM theses that students produce define the research program. A full list of the theses finished so far can be found at <http://www.carleton.ca/tim/sub/theses.html>.

A major research focus currently for the TIM is “open source”. We are convinced that the move to open source for the commercialization of technology is significant, and will become more so in the future. And not just in software, but in many fields of human endeavour including hardware, telecommunications, assembled products, architecture, publishing, bio-technology, etc.

Historically the TIM research program has been anchored around four sub-fields:

1. Product and service development
2. Sustainable growth and sources of competitive advantage
3. Technical entrepreneurship and commercialization
4. Engineering and technology

The first three sub-fields listed above are part of the knowledge domain referred to as engineering management or technology and engineering management.

Each of these sub-fields remains relevant and directly applicable to research in open source.

### **PRODUCT AND SERVICE DEVELOPMENT**

Examines the tools, processes, skills, and culture required to incorporate customer requirements into new products and services, integrate work in product development organizations, and manage development projects.

Examples

- Determinants of successful hardware-software coordination
- Politics of setting product development schedules
- Market repositioning and product line management
- Supplier involvement in product development
- Changes in architecture and changes in the development organization
- Developers’ psychological health and project outcomes
- Success-failure determinants in service development
- Intelligent collaborative support for project management

### **SUSTAINABLE GROWTH AND SOURCES OF COMPETITIVE ADVANTAGE**

Examines technical and non-technical means companies use to grow year after year, gain advantages over their rivals, and transform technology, engineering and management into customer value.

Examples

- Product news releases for time to market competitive intelligence
- Performance of telecommunications equipment suppliers during industry meltdowns
- Attracting and retaining talent
- Model for making investment decisions
- Success measures for standard management
- Best practices for acquiring technology companies
- Competitive intelligence in small and medium sized companies

### **TECHNICAL ENTREPRENEURSHIP, INNOVATION AND COMMERCIALIZATION**

Examines the start and growth of technology companies, technical innovation and the means to exploit technology, product and services for financial gain.

#### Examples

- Independent start-ups and corporate spin-offs
- Venture capital and new venture success
- Early sales of new products developed by small and large companies
- Adoption of Linux-based technological infrastructures
- Adoption of wireless LANs
- Formation, structure and performance of strategic alliances

### **ENGINEERING AND TECHNOLOGY**

Examines technical innovations, approaches and issues as well as technical solutions to known problems.

#### Examples

- Computer network security risk analysis
- Scalability of virtual private networks
- Multimode verification systems
- Ontologies of Electronic Devices for Product Design Services in the Semantic Web
- A CORBA-based approach to signaling for IP-based telephony services
- Interoperable Secure E-Mail Over the Internet
- Policies as design and implementation artifacts for non functional requirements
- Use of analysis contracts to improve the testability of object oriented code

## **7. ENGINEERING MANAGEMENT AND MANAGEMENT JOURNALS**

The journals most relevant to the engineering management aspects of the TIM program are:

- IEEE Transactions on Engineering Management
- IEEE Transactions on Software Engineering
- Journal of Engineering and Technology Management
- Journal of High Technology Management Research
- Journal of Product Innovation Management
- R&D Management
- Research Policy

The journals most relevant to both the management and the engineering management aspects of the TIM program are:

- Academy of Management Journal
- Academy of Management Review
- Administrative Science Quarterly
- California Management Review
- Communications of the ACM
- Creativity and Innovation Management
- Harvard Business Review
- IEEE Transactions on Engineering Management
- IEEE Transactions on Software Engineering
- Information Systems Research
- Journal of Business
- Journal of Business and Economic Statistics
- Journal of Consumer Research
- Journal of Engineering and Technology Management
- Journal of High Technology Management Research
- Journal of Management Studies
- Journal of Marketing
- Journal of Marketing Research
- Journal of MIS
- Journal of Product Innovation Management
- Journal of the Academy of Marketing Science
- Journal of the ACM
- Management Science
- MIS Quarterly
- Operations Research
- Organization Science
- Organization Studies
- R&D Management
- Research Policy
- Sloan Management Review
- Strategic Management Journal

Most of these journals are available online through Carleton University's Library.

## 8. POLICIES FOR THE ETHICAL CONDUCT OF RESEARCH

All research that involves human subjects as participants (including those projects that utilize questionnaires and interviews) must be reviewed and approved by a University Ethics Committee, before the research begins, regardless of

- whether it is funded (e.g., by grant, award, fellowship, contract) or is non-funded;
- whether funding is internal (i.e., from the University), or is from an external source (including domestic and foreign public and private sources);
- whether participants are drawn from University sources, or from any other sources (e.g., workplaces, residences, public places, day care centres, hospitals, other universities, the military, public/private/separate schools);
- whether participants are paid or unpaid;
- whether it is conducted inside or outside Canada;
- whether it is conducted on University property, or at another location;
- whether it is conducted in a laboratory or in the field;
- whether it is conducted in person, or by some other means (e.g., mail, telephone, computer link);
- whether information is collected via direct observation, apparatus, questionnaire, interview, or review of records or other materials not normally available to the public;
- whether it is experimental, correlational, qualitative, or descriptive in nature;
- whether it is conducted to acquire basic or applied knowledge (e.g., safety and function assessments of equipment and materials, product development assessments, personnel selection, consumer preferences, and product evaluation);
- whether the information collected has as its focus the human participant, or some aspect of the environment with which the human participant interacts;
- whether the research is a pilot study or a fully developed project;
- whether it is primarily for teaching or demonstration purposes, or whether the primary purpose is the acquisition of new knowledge.

The process to obtain University approval takes at least three weeks. When there is an issue the process takes longer. Thus, you need to take care of this early on in your research program.

The most recent version of Carleton's *Policies and Procedures for the Ethical Conduct of Research* can be accessed at [http://www.gs.carleton.ca/ors/forms/carleton\\_ethics\\_policy\\_2000.pdf](http://www.gs.carleton.ca/ors/forms/carleton_ethics_policy_2000.pdf).

Carleton University's web page for Policies Related to Research is at [http://www.gs.carleton.ca/ors/cu\\_policies.html](http://www.gs.carleton.ca/ors/cu_policies.html).

## 9. INSTRUCTIONAL OFFENCES<sup>1</sup>

The Senate of Carleton University has enacted the following regulations for instructional offences at the graduate level:

Any student commits an instructional offence who:

- (a) cheats on an examination, test, or graded assignment by obtaining or producing an answer by deceit, fraud, or trickery, or by some act contrary to the rules of the examination
- (b) submits substantially the same piece of written work to two different courses. Minor modifications and amendments or changes of phraseology do not constitute a significant and acceptable reworking of an essay or paper
- (c) contravenes the regulations published at an examination or which are displayed on the reverse side of a properly authorized examination booklet
- (d) commits an act of plagiarism. Plagiarism will be deemed to have occurred when a student either:
  - (i) directly copies another's work without acknowledgement; or
  - (ii) closely paraphrases the equivalent of a short paragraph or more without acknowledgement; or
  - (iii) borrows, without acknowledgement, any ideas in a clear and recognizable form in such a way as to present them as the student's own thought, where such ideas, if they were the student's own, would contribute to the merit of his or her own work
- (e) disrupts a class or other period of instruction if he or she:
  - (i) is a registered member of the class or period of instruction
  - (ii) is warned to discontinue any act or behaviour reasonably judged by the instructor of the course or period of instruction to be detrimental to the class, and having ignored such warning is ordered by the instructor to leave and refuses to leave
- (f) Any student found in violation of these regulations may be:
  - (i) expelled
  - (ii) suspended from all studies at the University
  - (iii) suspended from full-time studies; and/or
  - (iv) awarded a reprimand
  - (v) refused permission to continue or to register in a specific degree program, but subject to having met all academic requirements shall be permitted to register and continue in some other program
  - (vi) placed on academic probation
  - (vii) awarded a Fail or Absent in a course or examination

Allegations of instructional offence may be investigated by instructors and/or departmental chairs and, in all cases, will be reported to the faculty dean. The dean will promptly advise, in writing, the student and the University Ombudsman of the allegation and of the student's rights. The dean will review the allegation and if not resolved at that level, the allegation becomes subject to final disposition by a tribunal appointed by the Senate. Information about procedure governing tribunals is available from the Clerk of the Senate, Room 607, Robertson Hall.

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<sup>1</sup> Carleton University Graduate Calendar, General Regulations, Section 14. This section can be accessed online at [http://www.gs.carleton.ca/calendars/current/university/general\\_regulations.html#gr14](http://www.gs.carleton.ca/calendars/current/university/general_regulations.html#gr14)

## **10.ANSWERS TO FREQUENTLY ASKED QUESTIONS**

### **HOW LONG DOES IT TAKE?**

Writing a thesis may take longer than you think. Even after the research itself is all done – models built, calculations complete – it is wise to allow at least one complete term for writing the thesis. It's not the physical act of typing that takes so long; it's the fact that writing the thesis requires the complete organization of your arguments and results. It's during this formalization of your results into a well-organized thesis document capable of withstanding the scrutiny of expert examiners that you discover weaknesses. It's fixing those weaknesses that take time.

This is also probably the first time that your supervisor has seen the formal expression of concepts that may have been approved previously in an informal manner. Now is when you discover any misunderstandings or shortcomings in the informal agreements. It takes time to fix these. Students for whom English is not the mother tongue may have difficulty in getting ideas across, so that numerous revisions are required.

Bottom line: leave yourself enough time. A rush job has painful consequences at the defence.

### **WHAT SKILLS DO I NEED TO DO THIS TYPE OF RESEARCH?**

This type of research involves a synthesis. It requires an understanding of the relevant technologies and the use of social science research methods such as case analysis, questionnaire design, and statistical analysis. Students in the TIM program will have sufficient technology training from their undergraduate degrees and technology courses in the TIM program to understand the relevant technologies. The required social science research methods they will learn as part of their management courses and under the supervision of a faculty member.

### **MAY I SELECT MY OWN RESEARCH TOPIC?**

Yes, you can select and develop your own research topic. You will need to ensure that the faculty member you select to supervise you feels that he/she is competent in the area you have selected.

## 11. TIPS

### **ALWAYS KEEP THE READER'S BACKGROUNDS IN MIND**

Who is your audience? How much can you reasonably expect them to know about the subject before picking up your thesis? Usually they are pretty knowledgeable about the general problem, but they have not been intimately involved with the details over the last couple of years like you have: spell difficult new concepts out clearly. It sometimes helps to mentally picture a real person that you know who has the appropriate background, and to imagine that you are explaining your ideas directly to that person.

### **DON'T MAKE THE READERS WORK TOO HARD!**

You know what few questions the examiners need answers for. Choose section titles and wordings to clearly give them this information. The harder they have to work to ferret out your problem, your defence of the problem, your answer to the problem, your conclusions and contributions, the worse mood they will be in, and the more likely that your thesis will need major revisions.

A corollary of the above: *It is impossible to be too clear!* Spell things out carefully, highlight important parts by appropriate titles, etc. There's a huge amount of information in a thesis: make sure you direct the readers to the answers to the important questions.

### **A THESIS IS NOT A STORY**

A thesis does not follow the chronology of things that you tried. It is a formal document designed to answer only a few major questions.

### **DO NOT INSULT THE READER**

Avoid using phrases like: "Clearly, this is the case..." or "Obviously, it follows that ...". Phrases like these imply that, if the readers don't understand, then they must be stupid. The truth is that they might not have understood because you explained it poorly.

### **AVOID RED FLAGS**

Claims that are really only your personal opinion and not substantiated by the literature or the solution you have presented should not be made in the thesis.

## 12.APPENDICES

### APPENDIX 1: GATE 0 FEEDBACK FORM

#### PRESENTER:

#### UNDERSTANDING

<b>Defined an important research question or problem.</b>							
1	2	3	4	5	6	7	NA
Strongly disagree	Disagree	Will not go along	Probably will go along	Will go along	Agree	Strongly agree	Do not know

<b>Built on the existing literature to explain why the chosen research question or problem is important.</b>							
1	2	3	4	5	6	7	NA
Strongly disagree	Disagree	Will not go along	Probably will go along	Will go along	Agree	Strongly agree	Do not know

<b>Explained how the research would make a contribution to the academic literature and management practice.</b>							
1	2	3	4	5	6	7	NA
Strongly disagree	Disagree	Will not go along	Probably will go along	Will go along	Agree	Strongly agree	Do not know

<b>Understands the research method that will be used to develop the thesis.</b>							
1	2	3	4	5	6	7	NA
Strongly disagree	Disagree	Will not go along	Probably will go along	Will go along	Agree	Strongly agree	Do not know

<b>Explained what variables to measure and how they will be measured.</b>							
1	2	3	4	5	6	7	NA
Strongly disagree	Disagree	Will not go along	Probably will go along	Will go along	Agree	Strongly agree	Do not know

<b>Explained what data will be collected, from where, and how.</b>							
1	2	3	4	5	6	7	NA
Strongly disagree	Disagree	Will not go along	Probably will go along	Will go along	Agree	Strongly agree	Do not know

<b>Explained how the data will be analyzed.</b>							
1	2	3	4	5	6	7	NA
Strongly disagree	Disagree	Will not go along	Probably will go along	Will go along	Agree	Strongly agree	Do not know

#### PRESENTATION

<b>Understands the material presented.</b>							
1	2	3	4	5	6	7	NA
Strongly disagree	Disagree	Will not go along	Probably will go along	Will go along	Agree	Strongly agree	Do not know

<b>Presented excellent slides.</b>							
1	2	3	4	5	6	7	NA
Strongly disagree	Disagree	Will not go along	Probably will go along	Will go along	Agree	Strongly agree	Do not know

<b>Captured the audience's attention and spoke in a way that the audience could understand.</b>							
1	2	3	4	5	6	7	NA
Strongly disagree	Disagree	Will not go along	Probably will go along	Will go along	Agree	Strongly agree	Do not know

<b>Managed time properly.</b>							
1	2	3	4	5	6	7	NA
Strongly disagree	Disagree	Will not go along	Probably will go along	Will go along	Agree	Strongly agree	Do not know

## Recommendations on how to improve

To improve, I suggest you do the following:

1.

2.

3.

4.

5.

## APPENDIX 2: GATE 1 FEEDBACK FORM

### PRESENTER:

### READINESS TO COLLECT AND ANALYZE DATA

**Defined an important research question or problem.**

1	2	3	4	5	6	7	NA
Strongly disagree	Disagree	Will not go along	Probably will go along	Will go along	Agree	Strongly agree	Do not know

**Built on the existing literature to explain why the chosen research question or problem is important.**

1	2	3	4	5	6	7	NA
Strongly disagree	Disagree	Will not go along	Probably will go along	Will go along	Agree	Strongly agree	Do not know

**Explained how the research would make a contribution to the academic literature and management practice.**

1	2	3	4	5	6	7	NA
Strongly disagree	Disagree	Will not go along	Probably will go along	Will go along	Agree	Strongly agree	Do not know

**Understands the research method that will be used to develop the thesis.**

1	2	3	4	5	6	7	NA
Strongly disagree	Disagree	Will not go along	Probably will go along	Will go along	Agree	Strongly agree	Do not know

**Explained what variables to measure and how they will be measured.**

1	2	3	4	5	6	7	NA
Strongly disagree	Disagree	Will not go along	Probably will go along	Will go along	Agree	Strongly agree	Do not know

**Explained what data will be collected, from where, and how.**

1	2	3	4	5	6	7	NA
Strongly disagree	Disagree	Will not go along	Probably will go along	Will go along	Agree	Strongly agree	Do not know

**Explained how the data will be analyzed.**

1	2	3	4	5	6	7	NA
Strongly disagree	Disagree	Will not go along	Probably will go along	Will go along	Agree	Strongly agree	Do not know

**Explained what results will be obtained and how the results will be interpreted.**

1	2	3	4	5	6	7	NA
Strongly disagree	Disagree	Will not go along	Probably will go along	Will go along	Agree	Strongly agree	Do not know

**Explained what conclusions can be made based on the results that are expected.**

1	2	3	4	5	6	7	NA
Strongly disagree	Disagree	Will not go along	Probably will go along	Will go along	Agree	Strongly agree	Do not know

**Explained the limitations of the research.**

1	2	3	4	5	6	7	NA
Strongly disagree	Disagree	Will not go along	Probably will go along	Will go along	Agree	Strongly agree	Do not know

## PRESENTATION

<b>Understands the material presented.</b>							
1	2	3	4	5	6	7	
Strongly disagree	Disagree	Will not go along	Probably will go along	Will go along	Agree	Strongly agree	NA Do not know
<b>Presented excellent slides.</b>							
1	2	3	4	5	6	7	
Strongly disagree	Disagree	Will not go along	Probably will go along	Will go along	Agree	Strongly agree	NA Do not know
<b>Captured the audience's attention.</b>							
1	2	3	4	5	6	7	
Strongly disagree	Disagree	Will not go along	Probably will go along	Will go along	Agree	Strongly agree	NA Do not know
<b>Managed time properly.</b>							
1	2	3	4	5	6	7	
Strongly disagree	Disagree	Will not go along	Probably will go along	Will go along	Agree	Strongly agree	NA Do not know
<b>Spoke in a way that the audience could understand.</b>							
1	2	3	4	5	6	7	
Strongly disagree	Disagree	Will not go along	Probably will go along	Will go along	Agree	Strongly agree	NA Do not know

## Recommendations on how to improve

To improve, I suggest you do the following:

1.

2.

3.

## **APPENDIX 3: SUPERVISOR/STUDENT GUIDELINES<sup>2</sup>**

Fundamental to a satisfactory relationship between a supervisor and a student are mutual respect and a high level of professional integrity. What follows are guidelines to assist in the functioning of that relationship. These are necessarily rather general since it is recognized that different faculties and disciplines have different requirements and expectations which will supplement or give specificity to these general statements.

In those disciplines that do not assign a supervisor on admission, the student should understand that, while the department (the term includes school and institute) will make every attempt to assign the supervisor of choice, the supervisory relationship has to be consensual and determined primarily by competence in the field of the proposed thesis topic, and the availability of the supervisor.

Students in Science and Engineering should understand that their lines of research may encounter some restriction due to dependence upon the research direction of the supervisor who accepts them into the laboratory and provides a significant portion of their income out of his/her research grant.

When a supervisor-student relationship is established, the parties should understand that they assume the following responsibilities and can have the following expectations:

### Responsibilities of supervisors

- To be familiar with the regulations and standards of the Faculty of Graduate Studies and Research, and the department, especially as they pertain to the conduct of research and the production of the thesis, and to ensure that the student is aware of these regulations and standards.
- To be aware of and abide by the university's policies on conflict of interest, sexual harassment, and research ethics.
- To assist the student in identifying a suitable research topic and (where appropriate) setting up a program of study.
- To assist the student in the interpretation of research materials.
- To be available for regular and timely consultations with students and to provide notification of lengthy absences and the support mechanisms available under these circumstances.
- To convene meetings of the advisory committee as agreed with the student.
- To agree to continue supervision when on leave, or to assist the student in making arrangements for supervision during the period of the leave.
- To assist students in seeking financial support, especially in writing letters of good quality in support of scholarship and fellowship applications (e.g., well-written, informative, typed, on university letterhead), and to inform a student if a supportive letter cannot be written.
- To read in a timely fashion portions of the thesis submitted by the student and provide constructive suggestions especially vis-à-vis difficulties or deficiencies perceived in the draft.
- To indicate clearly when a draft thesis is in acceptable condition for examination or, if it is clear that the thesis will not be examinable, to advise the student in a timely fashion.
- To complete the supervisor's section of the annual audit form required by GSRO.

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<sup>2</sup> Source: Carleton University, Faculty of Graduate Studies and Research.

- To discuss with the student as early as feasible, any potential joint authorships or joint ownership of data or patents which might arise, provide a written version of any understandings reached on these matters, and also ensure that student contributions to publications are adequately acknowledged. (Granting agencies and major journals have guidelines which cover some or all of these items.)

#### Responsibilities of students

- To choose, with the supervisor's help, a research topic which the supervisor considers to be suitable and which he/she is competent to supervise.
- To work systematically and within agreed deadlines, as far as possible, in order to meet the program deadlines specified by the regulations of the Faculty of Graduate Studies and Research.
- To be well prepared for meetings with the supervisor.
- To submit to the supervisor all research materials, as requested, and, at the agreed times, drafts of parts of the thesis for comment.
- To give serious attention to the advice and direction of the supervisor.
- To realize that the supervisor has duties and commitments that may delay access at short notice or slow down the return of a draft.
- To acknowledge direct assistance of material drawn from other scholars and researchers.
- To produce a thesis which meets the specifications and standards of the Faculty of Graduate Studies and Research and the department.
- To submit the thesis to the judgment of the department via the examination procedures specified and to abide by the judgment of the examiners, subject to any appeal on grounds of procedural irregularities.

This array of responsibilities imparts certain expectations on the part of both the supervisor and student.

#### Expectations of the supervisor

- To expect the student to pursue the agreed research topic, unless a change has been mutually agreed upon.
- To expect the student to give serious attention to advice concerning perceived deficiencies in the research and the thesis, and to receive a reasonable explanation when this advice is not followed.
- To terminate supervision if the student is not displaying a reasonable effort, if he/she fails to heed advice on changes deemed essential, or if the student changes the agreed thesis topic without consent.
- To have his/her contribution to the thesis appropriately and clearly acknowledged.
- To have permission from the author of the thesis for the research set out in the thesis to be used as part of the larger project, when the student has produced the research as a research assistant employed on the larger project (with the understanding that the student will retain scholarly credit).

Expectations of the student

- To be assisted by the supervisor in developing a clear and feasible research topic and in solving problems and assessing progress as the work develops.
- To be assisted to a clear understanding of the substantive and formal requirements of a thesis (e.g., length; methodology; validation of topic; degree of originality, especially in masters theses).
- To receive within a reasonable time frame a fair and thorough assessment of both the drafts and the completed thesis, and clear explanations of negative comments.
- To be permitted to seek a new supervisor if it can be clearly shown that the supervisory relationship has broken down or if the student and supervisor cannot agree on a suitable research topic (although it is understood that a department cannot, in every circumstance, guarantee a suitable replacement).
- To be protected from arbitrary changes in research direction which are detrimental to the timely completion of the thesis.
- To have his/her contribution to the thesis fairly reflected in the attribution of authorship of publications and of patents.