Filamer Christian University
COLLEGE OF COMPUTER STUDIES
Roxas City

GUIDELINES
RESEARCH/THESIS CAPSTONE PROJECTS

CHAPTER 1

FRAMEWORK

1.1 Difference between Undergraduate Thesis and Capstone Project

The undergraduate thesis or capstone project allows the student to develop deeper knowledge, understanding, capability, approach and attitude in the area of the programme of study. This is done at the end of the program and offers the opportunity to investigate more deeply into and synthesise knowledge acquired in their baccalaureate curriculum. A thesis or capstone places emphasis on the technical, scientific and imaginative aspects of the study.

The *undergraduate Thesis* is a requirement for BS Computer Science program and focuses on the theories and concepts of computing problem. This may include solution, scientific investigation and development of result that leads to the solution of the problem which must be anchored on Computer Science principles. The development of the solution must be algorithm based.

The *undergraduate Capstone Project* is a requirement for BS Information Technology programs.

Information Technology Capstone Project focuses on infrastructure, application, and processes which provide students an opportunity to apply their theoretical knowledge to a practical problem in developing useful solution in the area of information technology.

1.2 Suggested Area of Study

A. Computer Science

1. Advance Database Management
2. Advance Software Development
    - Mobile Computing System
    - Software Extension and Plug-ins
    - Expert Systems and Decision Support System
    - Intelligent System
    - Signal Processing such as Image Processing
    - Natural Language Processing
    - Pattern recognition and Data Mining
    - Bioinformatics
    - Graphic application
    - Cloud Computing
    - Parallel Computing
    - Embedded Systems
    - Emerging Technologies
    - Game Design and Development
    - Data Science and Analytics
    - Multimedia Systems and Apps

3. Computer Science Foundations
    - Automata and Formal Languages
    - Data Structures and Algorithm Design and Analysis
    - Web Semantics
    - Coding Theory
    - Computer and Architecture
    - Modelling and Simulation
    - Semantic, Social and Sensor Web
    - Machine Learning and Artificial Intelligence

B. Information Technology

1. Advanced System Administration
    - Advance Operating Systems
    - Information System Security, Analysis, Planning and Implementation
    - Information Technology Strategic Plan for enterprise
    - Network Design and Implementation
    - Server Administration

2. Advance Software Development Software Customization
    - Information System Development for actual client
    - Web Application Development
    - Mobile Computing Systems
    - Game Development
    - E-Learning System
    - Interactive Systems
    - Information Kiosk

3. Advance Database Management
    - Performance Tuning
    - Implement and Administer Datawarehouse

CHAPTER 2

POLICIES AND GUIDELINES

2.1 Thesis and Capstone Stages

Students enrolled in Thesis I, Thesis II, Special Project I or Special Project II are expected to observe the following stages to comply the requirements of the subjects.

Each Thesis or Special Project group should have three (3) members and a maximum of four (4) members designated by the Thesis Teacher. Each group should have a thesis adviser and a document editor other than the Thesis Teacher.

Student groupings are encouraged to be of the same discipline, however if the students wish to combine with different discipline like Information Technology and Computer Science, they are allowed to provided they need to propose study on Computer Science areas.

The entire Thesis or Special Project program starts with the thesis proposal presentation and ends with the submission of an approved thesis hardbound and other deliverables. The four stages are discussed below:

A. Proposal Paper (CS Thesis Writing 1 or Capstone Project and Research 1)

1. Each thesis group will start with the identification of a thesis project which include the following activities:
    1. Identification of the proposed problem;
    2. Specification of the research objectives;
    3. Search of related literature; and
    4. Identification of appropriate methodology to be used in the proposed study.

2. The proposal should be in line with the track they previously enrolled in their ITE subjects.

3. They are allowed to choose between client-based system development or an innovative study.

4. Each group is required to submit their proposal document (Chapter I-III) before they can be scheduled for proposal evaluation.

5. The proposal evaluation/defense is done before the panel consisting of a chairman and two members. A proposal may be approved, approved with revision or disapproved. Disapproval of the proposal may be based on the following grounds:
    a. Limited scope of proposal (LS)
    b. Proposed work is not exhaustive (NE)
    c. Inadequate understanding of the proposal (IU)
    d. None conformance of thesis proposal with the college prescribed Thesis Form and Style (NC)

6. Criteria for evaluating the thesis or capstone proposal are specified in the Thesis or Capstone Evaluation Form. (Appendix F)

7. Only approved proposals are subjected for succeeding evaluation.

B. Midterm Evaluation (CS Thesis Writing 2 or Capstone Project and Research 2)

1. Each group is required to have a thesis adviser who will monitor their system and will sign endorsement letter prior to the schedule of the midterm evaluation.

2. Each group is required to submit a complete midterm thesis or capstone document which includes the following:
    1. Chapters I-IV and appendices;
    2. developed program with at least 50% running logic; and
    3. endorsement letter signed by their thesis adviser and the dean. (Appendix G)

These requirements should be submitted to the Thesis Teacher for evaluation at least one week before the scheduled midterm panel evaluation otherwise, a group will not be recommended to join the midterm panel evaluation.

3. Criteria for evaluating thesis or capstone work are specified in the Thesis or Capstone Evaluation Form. (Appendix F)

4. Any group who failed in the midterm evaluation will be given a chance to present their revised work to the panel for re-evaluation provided they comply with the requirements as agreed during the midterm evaluation. The date of the re-evaluation should be set by the Thesis Teacher. If in the re-evaluation, a group still obtained a failing grade, they will be given a grade of 5.0 in Thesis I or in Special Project I.

5. Failure to comply with all the requirements for Thesis I or Special Project I prohibits the group to enrol in Thesis II.

C. Final Evaluation

1. Groups who are recommended for final evaluation by the Thesis Adviser and Thesis Teacher are scheduled for final presentation. The following are the requirements for final thesis or capstone evaluation:
    a. complete thesis or capstone document and its appendices;
    b. 100% working program/system, and;
    c. endorsement letter signed by their thesis adviser and the dean. (Appendix G)

2. Any group who failed in final evaluation will be given a chance to present their revised work to the panel for re-evaluation provided they comply with the requirements as agreed during the final evaluation. The date of the re-evaluation should be set by the Thesis Teacher. If in the re-evaluation, a group still obtained a failing grade, they will be given a grade of 5.0 in Thesis II or in Special Project II.
3. Groups who obtained passing grades in the final evaluation will be given an INC (incomplete) grade until a final thesis or capstone document, thesis or capstone program, and other deliverables are approved by the panel and accepted by the college.

D. Panel Fees

1. The following are standard panel fees for Thesis or Capstone evaluation set by the College of Computer Studies and should be paid by the students enrolled in Thesis I, Thesis II, Special Project I and Special
Project II.

Proposal Evaluation	500.00	per panel and adviser	2,100.00	per group
Mid-term Evaluation	600.00	per panel and adviser	2,600.00	per group
Final Evaluation	700.00	per panel and adviser	3,000.00	per group
Technical Editing	1,000.00	per editor	1,000.00	per group

2.2 Duties and Responsibilities

The development and defense of the Thesis I, Thesis II, Special Project I or Special Project II involves the following individuals:

A. Students

Responsibilities of the Thesis/Capstone Writer/s

1. Keep informed of the University and college Thesis/Capstone Guidelines and Policies.

2. Keep informed of the schedule of the thesis/capstone activities, required deliverables and deadlines posted by the research teacher/facilitator.

3. Identify and define a research problem in line with the field of concentration in close coordination with the thesis teacher or an adviser.

4. Develop a research proposal with the guidance of the thesis teacher or an adviser.

5. Defend the proposal before the panel of examiners based from the stages specified in section 2.1.

6. Revise and finalize thesis/capstone according to comments and recommendations of thesis panel and according to the format recommended by the college.

7. Have the final copies approved by the members of the thesis panel, reproduce, bind and submit the desired number of copies to the college/unit.

B. Teacher

The Thesis Teacher, appointed by the Department, shall:

1. Handle a maximum of two (2) sections of research subjects.

2. Provide students with a list of possible research areas at the start of the term.

3. Identify panel members for each thesis individual/group.

4. Conduct meetings with the students at every stage of the thesis project to discuss the Thesis Guidelines and Policies, and to allow students to raise and clarify issues.

5. Furnish every member of thesis defense panel with all the necessary thesis documents few days before the defense.
6. File at least one copy of the thesis evaluation forms(including revisions) and the revised and approved draft at every stage of the thesis.

7. Documents issues and special cases as they arise.

8. Convene the necessary body (composition: thesis adviser, thesis defense panel, and or Department Chair) to resolve issues and handle special cases as they arise.

C. Thesis Adviser

Selection

1. Thesis adviser is chosen by the students but if they cannot have one, the thesis coordinator can appoint upon consultation with the students, dean or department chair, from the pool of department or college faculty based on the following criteria:

    a. Faculty member's field of expertise.
    b. Faculty member's research experience; and
    c. teaching/administrative load of the faculty.

2. In case there is not enough qualified faculty member within the college/department to advise the student/s, the teacher/facilitator in consultation with the dean/department chair may ask faculty members or staff from other units/colleges of the university. The same criteria as mentioned above are applied.

Responsibilities

1. Guide and assist the students in problem identification and definition, literature review and preparation of instrument/system.

2. Ensure that the thesis is feasible and can be implemented within one school year. The thesis adviser sees to it that the objectives, scope and limitations, and methodology of the project are well defined.

3. Sit in the oral defense of the students.

4. Monitor research implementation regularly to answer questions and help resolve impasses and conflicts. In meritorious cases, the adviser may request the removal of a delinquent proponent from the thesis group. A letter detailing failed attempts to resolve the issue, and justification for his/her decision must be submitted to the teacher/facilitator.

5. If it is applicable and necessary, the adviser should ensure that the workload is equally distributed among the proponents.

6. Review thoroughly all deliverables at every stage of the thesis, to ensure that they meet the department's standard. The adviser may also require his/her thesis/capstone groups to submit progress reports regularly.

7. Ensure the thesis deliverables conform to the guidelines, format and standards stated in the university research guidelines and policies.

8. Recommend for oral defense.

9. Ensure that all required revisions are incorporated into appropriate documents and/or software.

- Adviser's Fee

  The amount and mode of payment to the adviser should be based on the guidelines and policies set by the university.

D. The Thesis Defense Panel

The defense panel should be at least composed of three members. In special cases, the teacher/facilitator, in consultation with the department chair and thesis adviser, can recommend additional members to the panel.

- Selection

1. The panelists must come from the College of Computer Studies.

2. In special cases, a faculty member from another unit/college of the university may be invited provided he/she has an expertise in line with the proposed study/thesis.

- Responsibilities

1. Review and evaluate research proposals/report.

2. Sit in the oral defense of the students.

3. Give comments, suggestions and recommendations.

- The lead panelist, has the following additional responsibilities:

1. Brief the thesis group about the defense program during the actual defense.

2. Summarize panelists' comments, suggestions and recommendations.

2.3 Editing Guidelines

1. Adviser guides advisee in preparing research report.

2. Advisee prepares research report and adviser reviews completed manuscript as to prescribed format and substance.

3. Adviser refers advisee to technical editor for editing.

4. Technical editor reviews the completed manuscript, gives comments and suggestions and returns the same to the adviser. Maximum number of days for technical editing shall be five days only.

5. Adviser returns the manuscript to the advisee.

6. Advisee revises the manuscript based on comments and suggestions.

7. Advisee submits the revised manuscript to the technical editor through the adviser.

8. Technical editor reviews the revised manuscript and recommends for style editing. (Number of days for reviewing the manuscript shall be less than the first technical editing)

9. Style editor reviews manuscript as to prescribed format, and mechanics of style. Maximum number of days for style editing shall be five days only.

10. Style editor returns the manuscript with comments and suggestions to the advisee through the adviser.

11. Advisee revises manuscript based on comments and suggestions of the style editor.

12. Advisee returns the manuscript to the style editor through the adviser.

13. Style editor reviews the revised manuscript and recommends for final typing. Number of days for final review shall be less than the first style editing.

14. Advisee prepares manuscript for final encoding and binding.

NOTE: Maximum number of days for editing, revising and finalizing the research report is one (1) month. The process can be shortened if the technical editor also acts as the style editor.

CHAPTER 3

OUTLINE, CONTENT AND FORMAT

3.1 Thesis/Capstone Outline and Content

Title Page
Adviser's Recommendation Sheet
Panels' Approval Sheet
College's Acceptance Sheet
Company's Acceptance Sheet
Acknowledgment
Abstract

From 150 to 200 words of short, direct and complete sentences, the abstract should be informative enough to serve as a substitute for reading the thesis itself. It states the rationale and the objectives of the research. Do not put citations or quotes in this section. Avoid beginning the abstract with "*This paper/document/thesis/study/project/…*"

Table of Contents
List of Figures
List of Appendices

CHAPTER

I. INTRODUCTION

- Overview of the Current State

This section gives the reader an overview of the specific technology or field in the international or local setting. The information regarding the technology or field should be contemporary and not based on outdated sources. Discussion must not be too technical or too detailed.

This section ends with a discussion on the problems faced by or that still exist in the specific technology or field (e.g., limitations of existing software or algorithms). The problem statement would lead to the research objectives.

- Objectives of the Study

General Objective

This section states the overall goal that must be achieved to answer the problem.

Specific Objectives

This subsection is an elaboration of the general objective. It states the specific steps that must be undertaken to accomplish the general objective. These objectives must be ***specific, measurable, attainable, realistic, time-bounded***. Each specific objective may start with "to design/survey/review/analyze…"

Studying a particular programming language or development tool (e.g., to study Windows/Object-Oriented/Graphics/C++ programming) to accomplish the general objective is inherent in all thesis and, therefore, must not be included here.

- Theoretical and Conceptual Frameworks

This section discusses the theories and concepts to be used in the course of designing or developing the thesis. Include only those concepts that you feel will be needed. DO not copy the whole source material. Use the topics stated in the objectives as a guide in determining the contents of this section.

- Scope and Limitation of the Study

This section discusses the boundaries (with respect to the objectives) of the research/proposed system and the constraints within which the research will be developed.

- Significance of the Study

This section explains why research/system must be done in this area. It rationalizes the objective of the research/system with that of the stated problem. Avoid including here sentences such as "This research will be beneficial to the proponents/department/college" as this is already an inherent requirement thesis projects. Focus on the research's contribution to the Computer Science field.

II. REVIEW OF LITERATURE AND STUDIES

This section discusses the features, capabilities, and limitations of existing research, algorithms, or software that are related/similar to the thesis. The reviewed works and software must be arranged either in chronological order, or by area (from general to specific). Observe a consistent format when presenting each of the reviewed works.

III. METHODOLOGY

This section lists and discusses the specific steps and activities that will be performed by the proponents to accomplish the project.
Examples of activities include inquiry, survey, research, brainstorming, canvassing, consultation, review, interview, observe, experiment, design, test, document, etc. or as defined by the chosen Software Development Life Cycle Model. The methodology also includes the following information:

- who is responsible for the task
- the resource person to be contacted
- what will be done
- when and how long will the activity be done
- where will it be done
- why should be activity be done

IV. THE SYSTEM <indicate name of system>

- System Overview

This section gives an overall view of the main features and capabilities of the software.

- System Objectives

This section states the specific requirements that must be met by the system.

- System Functions

This section provides a listing of all the functions that must be performed or delivered by the system, and a description of each. Screen designs may be included, to help visualize the function being discussed. Usually, the functions are based on the menu and toolbar options. If a function generates reports, the report formats must be included in this section.

- Physical Environment

This section discusses the hardware and software resources needed to implement and to execute the system. If the system has a special set of target users, this section also includes the user specification (e.g., educational level, experience, and technical expertise). For certain uncommon resources, a discussion of why such resources are necessary must also be included (cost benefit analysis).

- Architectural Design (Database structure, Data flow diagrams, network layout, UML)

  This section presents the initial internal design of the system, by discussing its major components and their interactions. These components include the software components (e.g., modules, database systems, etc.), as well as the hardware components (e.g., processors, devices, etc.). The components and their interactions are graphically represented using design tools, such as hierarchical charts, structure charts or object models. Data flow diagrams may also be included to show how information passes among processes. In addition, discussion on why certain alternative and trade-offs were chosen must be included (e.g., issues on software decomposition, cost of hardware).

- Design and Implementation Issues

  This section discusses the design and implementation of the major data structures and algorithms used in the software. It included a discussion on the major issues and problems encountered, and the corresponding solutions and alternatives employed by the proponents. Parts of the design tools in the Technical Manual may be lifted as figures in this section.

V. SUMMARY, CONCLUSION AND RECOMMENDATIONS

This chapter gives an assessment of what happened in this project. It presents explanations and justifications on how the objectives of the thesis were met, to what extent and why some objectives were not met.

This chapter also includes a discussion of possible improvements that can be made on the software, as well as future directions of the research topic in general. This serves as a springboard for projects that may be done by future thesis groups.

BIBLIOGRAPHY

APPENDIX
…
Gantt Chart
Organizational Chart
Present DFD
Top-Down Design
ER Diagram
Screen Layout
Source Code
Resource Persons
For each resource person: full name
and title, e.g., Dr. Juan de la Cruz>
<profession, e.g., faculty>
<department, e.g., College of Computer Studies>
<name of institution, e.g., De La Salle University>
<e-mail address>

Proponents' Personal Vitae
Certification of the Technical Editor
Certification of the Style Editor

USER'S MANUAL

3.2 User's Manual Outline and Content

Most of the contents of the User's Manual are based from chapter 4 of the main thesis document (specifically on the system functions and features). The difference lies in the manner of presentation. Chapter 4 of the main thesis document is oriented towards highly technical systems designer, thus it gives an overview of the major modules of the system and their interactions.

On the other hand, the User's Manual is oriented towards end users, who might be naïve users. Therefore, it gives a detailed step-by-step instruction on how to use each function and feature of the system.

The suggested outline of the User's Manual is as follows:

Title Page (see Section xxx, but add the line USER'S MANUAL below the thesis title)
Table of Contents

1.0. INTRODUCTION
This section gives an overview of the system. It includes the following subsections:

1.1. SYSTEM REQUIRMENTS
This section lists the minimum hardware and software requirements needed to properly execute the system.

1.2. INSTALLATION
This subsection contains instructions on how to install the system, and the list necessary files and their respective directories.

1.3. CONVENTION This subsection presents the convention used in the manual, e.g., text in boldface for emphasis on important concepts, text in italics are inputs from the users, etc.

2.0. GETTING STARTED
This section tarts with instructions on how to run the system, and the initial screen that will be displayed. It then explains the major components of the system, e.g., tool bars, menu options, status bar, etc.

3.0. <MODULE / FEATURE 1>
Succeeding sections, from 3.0 to N-1, focus on the major modules or features of the system. Each section contains detailed instructions on how to use the particular modules, the available features and limitations of the module.

N.0. Messages
This section lists all system messages – error message, status message, information, and instruction message – that the user may encounter while using the system. For each message, include a brief description and the possible courses of action that the user may take in response to the message. Below is a sample format:
<Message Text>
Description:
Action:
The messages must be arranged in ascending order, and may be grouped into subsections (e.g., N.1 Error Messages, N.2 Status Messages, etc.).

3.3 Document Format and Style

A. Paper

Use white, twenty-pound, 81/2- by 11-inch paper. Erasable paper tends to smudge and should be avoided for a final draft. If you prefer to use erasable paper in the preparation of your paper, submit a good photocopy to your instructor.

B. Type-Face and Size, Printing

- Select 12-point fonts for main text unless indicated otherwise.
- The thesis/capstone project should be written in 12 pt. Times New Roman font.
- Unless otherwise specified, use the same type-face and size throughout the document; including equations, tables, figures and appendices.

C. Margins

- Left margin – 1 ½ inches to allow the binding

- Top margin – 1 inch above the first line of type Right and bottom margin – should be at least 1 inch Indentions – first line of paragraph (.7).

- Left aligned all text.

D. Pagination

- The preliminary pages (pages that come before the introduction) are numbered with lower-case Roman numerals (ii, iii, etc.) except the first page (title page); are placed at the top of the page, at the right margin (1" down from the top edge and 1" from the right edge).

- Beginning with the first page of the text and continuing to the end of the manuscript, number pages in sequence in Arabic numbers (1, 2, 3, etc.); are placed at the top of the page, at the right margin (1" down from the top edge and 1" from the right edge).

E. Spacing

- Double-space the main body of the thesis/capstone project

- Single-space long quotations, tables, footnotes, endnotes, figure labels, bibliography entries

- Three single spaces between entries (sub headings)

F. Main Headings

Main headings of front matter (abstract, acknowledgement, tables of content, figures and appendices) as well as the bibliography or references must be positioned one inch from the top margin. All main headings must be capitalized and centered across the page.

G. Chapter Headings and Titles

Each chapter of the thesis/capstone project must begin on a separate page. The chapter heading must be placed one inch from the top margin, centered, capitalized followed by Roman Numerical to indicate the chapter number. The chapter title must be placed three single spaces below the chapter heading, centered, and capitalized.

H. Section Headings and Titles

Each section of the thesis/capstone project, with the exception of the first section for each chapter, should begin ½ inch from the previous section. The very first section in a chapter should be positioned after the three single spaces from the chapter title. Section titles should be left aligned, italicized, and lower-case capitalizing only the first letter of each word.

I. Figures

All figures must be scaled to fit within the standard margins. Figure captions must appear at the bottom of the figure, centered across the page. In the text of the thesis/capstone project, figures should be referred to as, for example, Fig. 1. Figures, exclusive of those in the appendix, must be numbered consecutively throughout the thesis/capstone using Arabic numbers.

J. References

The list of reference should be given at the end of the text arranged according to citation. Direct citations of a reference in the text are made by indicating first the author's surname followed by the reference number enclosed in square brackets (e.g. "The scheme was proposed by Dela Cruz [9]"). References may also be indirectly cited for cases in which the author is not the subject of the sentence by indicating only the reference number enclosed in square brackets (e.g. "An iterative scheme has been used to solve this type of problem)

REFERENCES

Sta. Romana, Cherry Lyn C., Gamboa, Randy S., Marcial, Dave E., Gabison, Gregg Victor D., Sioson, Allan A., PSITE Undergraduate Research and Capstone Project Manual, 2012-2104

Chua, Caslon, Graduate Studies College of Computer Studies De La Salle University Thesis Guidelines and Policies

Central Philippine University Guidelines for Thesis Writing, Advising and Editing, 2009

LIST OF APPENDICES

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