UNIVERSITY OF BOTSWANA
DEPARTMENT OF COMPUTER SCIENCE

Final Year Projects

Student's Project Guide

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1. Introduction

This document is a brief guide to the ISS402 and CSI408 final year projects. It has been produced to answer some of the questions which students ask and to provide information about certain aspects of the project process such as project diaries, reports and assessment. It is not intended to be definitive. Projects by their very nature are individual and it is not possible to set down rules which will apply to and govern all aspects of them in all cases. What is presented here is a mixture of things which are common to all projects (eg project diaries) and **guidelines** which attempt to ensure that the difference between projects is kept to a minimum.

The material covered includes the responsibilities of the student and of the supervisor, the various milestones along the way and the assessment process. If there are any points about which you are unsure, please discuss them with your project supervisor in the first case and with the Project Coordinator if that doesn't resolve your problems.

2. Aims

Conducting Project work enables students to gain experience in a number of areas, which are relevant to a professional career. From an educational point of view, it enables you to
- apply your technical knowledge and skills to solve a real world problem of reasonable size
- develop your project management skills
- develop your professional skills including, communication skills (report writing, oral presentations, interviewing), organisational skills, and time-management
- conduct some research

You will spend a lot of time on your project so it is important that you choose a subject area that interests you. You are expected to manage your time and plan your work to keep to the milestones (or Deadlines) specified in section 3. Your supervisor will assist and monitor your progress but it is **your responsibility** to carry out the work and meet the deadlines.

3. Project Supervision

- Students should meet with their supervisors <u>weekly</u> to discuss progress and problems they are encountering.

- <u>NOTE:</u> it is the student's responsibility to seek supervision - it is not a supervisor's responsibility to seek out absent students.

- Students must submit a copy of their <u>weekly diary sheet</u> (see Appendix A) to their supervisor at each meeting, and both student and supervisor sign the diary sheet. The diary should indicate:

  ➢ work done so far,

  ➢ matters to be discussed with the supervisor,

  ➢ next phase of the project as agreed with supervisor,

- It is envisaged that the project diary will serve as a basis for the weekly meeting of the student with the supervisor. In addition it will be a valuable aid when the time comes for writing the project reports. One important use for the diary will be in the storing of references.

- **The project diaries must be submitted with the project reports and will be used in assessment of the Project Management marks.**

4. Project Documentation

All Reports should be professionally presented (word processed) and proof-read. See Appendices B and C for guidelines on the content and presentation of these reports.

4.1 Progress Reports

As well as assessing your final product, your progress through the project lifecycle will be assessed. This assessment is done by your supervisor based on the weekly meetings you have had and various reports you are required to produce.

- Progress Reports should be submitted to the relevant *Project Coordinator* by the appropriate deadline (see section 3).

- A description of the Progress Report is given below:-

	Contents
Progress Report	Introduction, Literature Survey/Review, Requirements Analysis & Specification, System Design Specification, References

Therefore a project progress report must minimally have:-

PR.1 **Introduction**

See the introduction in the detailed project proposal. It is required that there should be substantial improvement from the detailed project proposal.

PR.2 Literature Survey / Review There should be proper and enough evidence of the literature survey or review having been done. It is required that there should be substantial improvement from the detailed project proposal.

PR.3 Requirement analysis and specification

It is essential that the requirements analysis and specification should have progressed and hence there should be substantial improvement from the detailed project proposal.

PR.3.1 A good usage of the methodology (or methodologies): -

There must be a good substantial improvement from what was done in the in this section in the detailed project proposal.

PR.3.2 Key components to indicate usage of methodology (or methodologies)

Amongst others, as evidence of the use of the methodology the following would have to be accounted for:-

a) Data reading and writing

b) Data storage (databases, file systems, …)

c) Processing (e.g. calculating statistics, searching, sorting, drawing, etc.)

d) Communication (process to process, sockets, etc)

e) APIs, (Java, POSIX, Win32, OpenGL, etc)

f) Programming Language (novel or old)

g) User Interface (Command Line, GUI, Web, etc)

h) Interface with other Systems

PR.4 System Design Specification

It is essential that the design specification is traceable from the requirements analysis and specification exercise.

PR.4.1 **A good usage of the methodology (or methodologies)**: -

Good usage of appropriate design method and design tool(s) in line with the requirements analysis and specification methodology.

PR.4.2 **Design of key components to indicate usage of methodology (or methodologies)**

Amongst others, as evidence of the use of the methodology the design for the following would have to be accounted for:-

a) Data reading and writing

b) Data storage (databases, file systems, …)

c) Processing (e.g. calculating statistics, searching, sorting, drawing, etc.)

d) Communication (process to process, sockets, etc)

e) APIs, (Java, POSIX, Win32, OpenGL, etc)

f) Programming Language (novel or old)

g) User Interface (Command Line, GUI, Web, etc)

h) Interface with other Systems

PR.5 **References**

Appropriate references and proper citation of reference must be present as evidence of literature survey or review. It is required that there should be substantial improvement from the detailed project proposal.

4.2   Final Reports

Documentation or the final report

The project documentation which is professional shall comprise of the:-
- introduction

- Literature review

- Requirement analysis and specification

- System design specification

- Implementation summary. Critical reflection on:- − What was achieved
    − What was not achieved
    − For each of those not achieved, why?
    − What did the student learn
    − Future work

Implementation
- Project implementation of a working version that meets:- − the objectives
− requirements specification and model
− the design specifications and models
− application of good implementation qualities such as modularity, cohesiveness, integration, understandability, appropriate complexity level,

- The actual implementation of the design attributes in PR.4.2 whose total score shall not exceed fifteen (15).
- Unit implementation and integration to meet the requirements
- evaluation not necessarily limited towards fulfillment of requirements

- Testing
    Not necessarily restricted to:-
        − Testing approach used
        − Test cases and results of each

- User manual
    Addressing issues such as:-
        − Installation
        − Operational or usage
        − Maintenance

- Source code summary
    Confirming to good attributes such as:-
        − Summary of modular structure
        − Formatting style
        − Programming style
        − Self documenting code

- References
  There should be a substantial improvement from those in the progress report.

- Electronic copy to be submitted
  The complete software system (or product) from the CSI405 project must be submitted. This would be in both the source code and the executable version. Confirming to good attributes such as:- − easy to use

    − easy to install and run

- Final project report should detail all work carried out for the project and appropriate system documentation.

- Copies of all diary sheets should be included in the Final Report as an appendix.

- You are to submit **three bound copies** of your final report and a **disk copy** of the software implementation to the *Project Co-ordinator*, <u>latest</u> 1600hrs on the due date

4.3. Submission of Reports and Project Demonstration

- *You must adhere strictly to scheduled milestones.* **Due-dates are the latest dates for submission and not the days for printing.** Penalties will be applied where there are no acceptable official reasons for noncompliance.

- In particular **Final Reports** must be submitted to the *Project Coordinator*, <u>latest</u> by 1600hrs on the due date. Lateness will be penalized with:

  ➢ Loss of 1 mark per day, for a maximum of 1 week.

  ➢ Thereafter, it shall be treated as non-submission and will attract 0 mark.

- Project Implementation forms part of the project assessment and must be **demonstrated** to the examiners at the time specified - see section 3.

- Failure to submit the final report **and** present your project implementation for evaluation will attract the following penalties:

  ➢ The project shall normally be treated as non-submission.

  ➢ With acceptable official reasons, such a project may be regarded as incomplete, provided the regulation for incomplete applies.

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5.   Project Management

- As well as implementing a product, the Project is concerned with the <u>process</u> of designing and implementing the product. A certain number of marks are therefore dedicated to assessing how well you develop and demonstrate your project management skills throughout the duration of the project.

- A project management mark is assessed at various points in the project - at each progress report assessment and at final report assessment (see section 9 for details). This mark focuses on your performance to date in areas such as initiative, commitment, planning and scheduling. Your supervisor will assess you based on your weekly meetings and your diary sheets.

- The project management deliverables (which includes diary sheets) should be submitted to the project supervisor on or before the submission of the progress report or the final project report.

- The student must interact regularly with the supervisor. During these interactions, there must have been some significant pieces of work assigned to the student, which the student has to carry-out and submit to the supervisor.

  The supervisor awards a mark of:-

    a) **Two (2)** <u>if the assigned work was done satisfactorily</u>

    b) **One (1)** <u>if it was partly done</u>

    c) **Zero (0)** <u>if it was not done</u>

  In a semester the supervisor must record the best five of such progress meetings. Supervisors are to make use of a form similar to the one in table 1.

6.   Grading/Assessment Framework

The following framework of marking will be applied when assessing your project work.

CATEGORY	EVIDENCE	EXAMINER	MARK
Alpha, Beta version	Basic functionality of the prototype in line with design guidelines especially **PR.4.2 (**though with different weight scores).	Supervisor & Co-examiner	10%

Project Management	**Project Management** based on diary sheets and weekly meetings to date (up to Final Report submission)	Supervisor	10%
Project Implementation	The product **Implementation** (code, testing, evaluation, etc)	Supervisor & Co-examiner	30%
Project Reporting	**Final Report,** full report and documentation (including layout and presentation), evidence of project management.	Supervisor & Co- examiner	30%
	articulate professional & **visual Presentation**, Response to Questions, understanding as demonstrated	Supervisor & Co-examiner	20%

6.1   Project Implementation Details

See PR 4.2

6.2   Project Reporting Details

		Max score (%)
FR.1 Introduction (10)		2
FR.2 Literature Survey / Review (10)		2
FR.3 Requirement analysis and specification) (3)	Already assessed in PR.3	8
FR.4 System Design Specification (3)	Already assessed in PR.4	8
FR.5 Implementation Summary (20)		
	− What was achieved? − What was not achieved? − For each of those not achieved, why not achieved? − What did the student learn? Future work −	2
	− testing approach − used test cases and results for each − system evaluation	3
	User manual − installation − operational − maintenance	3

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	Source code − summary of modular structure − programming styles − self documenting	2

6.3   Presentation Details

- The presentation should be articulate, visual, professional and organized. Presentation is about the overall project, focusing on what problem is addressed, models of the problem & solution, implementation. Important issues include what has been done, what has not been achieved and what has been learned.

- Project presentation will **only be permitted after submission** of the final report. Project presentation will be **fifteen minutes** followed by **five minutes** demonstration of your project implementation. This will be followed by comments, queries, questions from the audience and the examining panel.

APPENDIX A: Guidelines for Project Final Reports

These guidelines aim to assist you in producing your final report by outlining requirements for the presentation of the document and the suggested content. Please consult with your supervisor.

B1. Presentation of the Report:

The Report should be well structured and presented. All text should be wordprocessed and where possible all diagrams should be developed using appropriate software tools (not hand drawn). There should be no spelling errors (use a Spellchecker) and no blank pages or pages with large sections of white space. All figures/diagrams/tables should be numbered and labelled. All pages should be clearly numbered and presented in the correct order. All chapters and sections should be numbered appropriately.

Consistent fonts should be used throughout (for headings/sub-headings and text) and all fonts and typefaces used should be appropriate for a professional scientific report. The main font for the body of the text should be *Times New Roman 12point*. Line spacing should be single-spaced, and paper-size A4.

The algorithms, pseudo-code, listing or code should be Courier 10point and two pages shall be printed on a single physical page of a sheet of paper.

Any diagrams, figures or tables in the report should be labelled. Each of these should be referred to in the (main) text of the report.

The report should be bound and the cover page should be in a form as indicated in section B2.

Generally, examiners will look for:
- Clarity and general organisation of the whole report
- Presentation including typographical errors, tidiness, consistency, etc
- Accuracy and comprehensiveness of Table of Contents (page numbering etc)

B2. Contents of the Report:

The report should contain the chapters outlined in the following pages. Included within each chapter is some indication of what the examiners will look for when assessing the report.

i. Cover Page

This page should form the outer cover for your report.

UNIVERSITY OF BOTSWANA
DEPARTMENT OF COMPUTER SCIENCE

Title of Project

Name of Student
(Student Number)

Supervisor

Date (e.g. APRIL 2019)

ii. Title Page
This page should be the first page once the cover is opened.

Title of Project

Name of Student
(Student Number)

- *a Project Submitted In Partial Fulfilment of the Requirements for the Award of a Degree in Computer Science of the University of Botswana XOR*
  - *Degree in Information Systems of the University of Botswana*
    -
    -
    -

  - *Date (e.g. APRIL 2019)*
    -
    -
    -
    -

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iii. Certification

iv. Abstract
A general overview of the project should be given.

v. Table of Contents
Each main section and chapter heading should be listed with their relevant page number.

vi. Acknowledgements

1.   INTRODUCTION

This chapter outlines the project aims and sets its context. The reader should be able to gain a clear picture of what area the project is in, the rationale for doing the work, the aims of the project and the approach that has been taken.

1.1 Project Definition

1.1.1   Project Overview; Motivation for and background to the study; Introduction to the study.
1.1.2   General and Specific Objectives.
1.1.3   Scope (including target users)
1.1.4 Project   Schedule
1.1.5 Resources

Refer to the section on writing the **Initial Project Proposal**.

Examiners will look for:
- Clear presentation of project objectives
- Rationale for the project
- Clear boundaries of what will be attempted (and why) and what will not
- Project management (and scheduling) skills

1.2 Methodology

Give an account of methods and techniques used together with a justification for the selection of each method (or technique) over others.

Summary of methods and techniques used for data gathering. Sources should be identified. Examples include Questionnaire, Interview, Case Study, Literature Search, Documents Review, Web searching, etc.

Software Engineering approach used. Summary of methods and techniques used for systems design (such as object-oriented analysis and design, prototyping, relational data modelling, etc.), systems development (such as object-oriented programming, functional programming, etc), and system testing & evaluation.

Examiners will look for:
- Appropriate Techniques
- Comprehensiveness / Relevance
- Indication of Sources Used
- Reasoned justification of methodologies used

1.3 Definition/Explanation of key terms and concepts, where applicable.

2. LITERATURE REVIEW/SURVEY

This chapter aims to show how well you have been able to conduct some research into relevant subject areas. The subject matter depends on the project but should show what "background research" you carried out in order to do your project work. It should be presented in your own words and adequately referenced (ie. you should clearly indicate the sources of the material you cover – see appendix C on Referencing.)

Content should cover a review of related literature that you consulted, and a report on progress in research in your chosen area of study/project (eg. webbased technologies, artificial intelligence, distributed systems, etc). It should include an analysis of the current state of the art, major tools/techniques in use, likely directions for advancement in the field and an indication of how your project/study fits into the picture.

*NOTE: this **should not** include background information about an organisation that you have used as a case study for your project's use or how "the current system works".*

Examiners will look for:
- Relevance
- Adequacy
- Organisation
- Reference to Previous Work (if any)
- Indication of Sources Used (links to citations, correct referencing style, etc)

Refer to **Error! Reference source not found.** and **Error! Reference source not found.** for some of the key aspects required.

3. SYSTEM INVESTIGATION & ANALYSIS

This chapter should clearly specify the requirements of the system. It should include,

3.1 Functional/Processing Requirement Analysis
All specific functionalities (or tasks) the system is required to support should be identified and clearly analysed and specified. Usage of appropriate requirements modelling and specification techniques should be evident.

3.2 Data Analysis
Data modelling and specification should be clear and evident. The static model specification of the system such as class diagrams or entity relationship diagrams should be well formulated and understandable. Any file/database requirements there are should be documented.

3.3 Input Requirement Analysis

All inputs to the system should be identified/specified relating to each functional requirement/task.

3.4 Output Requirement Analysis

All outputs from the system should be identified/specified relating to each functional requirement/task.

3.5 Interface Requirement Analysis

(including user analysis, user-task analysis and functional considerations/issues). All system users should be identified and described with any specific interface requirements they may have. Their tasks (user-tasks) should be clearly indicated. Any environmental constraints/requirements should also be specified.

3.6 Dynamic model specification of the system

The dynamic model specification of the system should be evident. The specification should utilise formal language specification, informal language specification and natural language specification, with more bias towards formal specifications.

The specification model minimally to show partly complete unambiguous specification of:-

- each of the key tasks (functionality) in the system
- the system's behaviour and composition to realise the required outlined functional requirements.

Some examples include data flow diagrams, state transition diagrams, petri nets, sequence diagrams.

Examiners will look for: ☐ Relevance
- Comprehensiveness
- Accuracy
- Appropriate techniques / illustrations
- Appropriate use of modelling tools, such as Data flow diagrams, E-R diagrams, etc
- Indication of Sources Used
- Evidence of both static and dynamic specifications of the system
- Modularity, understandability, cohesiveness, … of the system specification

Refer to **Error! Reference source not found.** and **Error! Reference source not found.** for some of the aspects to be graded.

4.   DESIGN

This chapter should specify your design for the system and include your rationale for the choices you have made. The design should be evident that it is derived from your requirements and systems specifications.

4.1 Functional design specification
Detailed specifications for every processing task should be given using accepted methods such as processing algorithms, structure charts, object models, etc. Overall system structure or architecture should also be included.

4.2 Interface Design specification
Details of screen/output templates and general interaction guidelines should be specified.

4.3 Input design specification (forms, etc) Every
input should be specified.

4.4 Output design specification (report layouts). Every
output should be specified.

4.5 Database/file and data structures design specification
Full database/file specification should be given (e.g. normalised tables, data descriptions, etc) derived from your static and dynamic models in chapter 3.

Examiners will look for:
- Comprehensiveness/Relevance
- Accuracy
- Logical Inference
- Clarity and organisation
- Appropriate use of diagrammatic tools, such as structure charts, object models, etc
- Reasoned justification of methodology used
- Originality of Thoughts
- Evidence of design model specifications derived from the specification of both the system and requirements
- Modularity, understandability, cohesiveness, … of the system's design model specification

5.   IMPLEMENTATION AND EVALUATION

This chapter should detail the specifics of the software system developed and how it was tested and evaluated.

5.1 Implementation Environment:
Software (programming language/systems) used, hardware used.

5.2 Documentation:
a. Detailed description of specific program modules and associated data files/ database implemented on the system design. (**note:** Actual code listings should be included as an Appendix and referenced here.)
b. User Manual: Detailed description of how to use the implemented system (**note:** the User Manual itself should be put into an Appendix and referenced here).

Examiners will look for:
- Comprehensive details of functional elements of software
- Written to a level of a system maintainer (programmer)
- Clarity, organisation and presentation of User Manual, written to the level of the target user group

5.3 System Testing:
Description of approach used to testing (black box, white box, etc). The summary of Test Plan with test data and results to be included here. The full details of the test plan with test data and results to be put in the appendix and referenced here.

Examiners will look for:
- Relevance of the testing approach used
- Comprehensiveness of testing carried out
- Evidence of results obtained

5.4 System Evaluation:
a. Details of any user evaluation carried out (where appropriate).
b. Discussion of the strengths and limitations of the system; may include comparison with any existing similar systems (if any) or some benchmarks.
c. Discussion as to what extent the project has met its objectives.

Examiners will look for:
- Relevance to objectives
- Comprehensiveness/Relevance
- Reasoned discussion
- Clarity and organisation

6.   CONCLUSION

This chapter should provide the reader with a summary of the project and the conclusions drawn. You should also include some suggestions for further work.

Examiners will look for:
- Indication of reflective thought
- Evidence (elsewhere in the report) of claims made
- Feasibility and reasonableness of suggestions for further work

REFERENCES

A complete Citation of References (using Standard Formats see Appendix C)

Examiners will look for:
- Sufficiently widespread sources
- Adequate number of citations and relevance
- Correct and complete format

APPENDICES

These should be labelled A,B etc with a suitable title, and contain items such as program source listings, data dictionaries, User Manual, etc.

APPENDIX C: Referencing

It is important to reference your sources (of ideas, definitions, etc) in the body of your reports and list separately the details of where the sources can be found. Failure to reference appropriately material that you have obtained from someone else is called **plagiarism** and is treated seriously as a form of cheating.
There are several accepted methods of referencing, one of which is given here.

In the Body of the Report:
When discussing the idea/definition/findings which originated in a work you have used as research material, you must give reference to that source. Below are some examples of doing this (taken from *Preece J. et al, Human-Computer Interaction, Addison-Wesley 1994*):

Example 1: discussing someone's work directly,

> *This view is recognised in many traditions, and has been stressed by* (Checkland, 1981)*.*

Example 2: giving credit to the source of a fact/statement you are making,

> *One of the most popular descriptions of this systems or holistic view is known as the Soft Systems Methodology* (Checkland, 1981) *....*

Listing the Details in the References section:
The full reference details of all sourced material should be listed in your References section. The list of items should be <u>sorted alphabetically</u> and each item should contain the following details. If it is from a book or a journal paper:

> Author, (Date of publication), Title of paper, Book/Journal title, Publisher, Place of Publication, Volume (Number), Pages

If it is from a paper/document downloaded from a website:

> Author, (Date of publication), Title of paper/document, Book/Journal title, full web site address, (date of download) Below are some examples:

Example 1: a book item,

> *Checkland P.B. (1981) Systems* (Checkland, 1981)*Thinking, Systems Practice. John Wiley*

Example 2: a journal paper item,

> *Bourges-Waldegg P. and Scrivener S.A.R. (1998) Meaning, the Central issue in cross-cultural HCI design. Interacting with Computers 9(3), 287-309* <u>Example 3: a web-based item,</u>

> *UML OCL specification.* <u>*http://www.omg.org/spec/OCL/2.2/*</u> *(3 August 2011)*