



HiLCoE

**School of Computer Science & Technology
Graduate Programme Research Office**

M. Sc. Thesis/Project Guideline

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1. Introduction

HiLCoE School of Computer Science & Technology is a leading institution and a centre of excellence that adheres to computing technology and quality of education since August 1997. It is a specialist College of Computer Science and Technology and it always gives opportunity for its students to be superior in qualification and best fitting to this competitive world of knowledge economy. This can be witnessed by the employment opportunities secured by its graduates. One can find HiLCoE graduates in different international, governmental, nongovernmental, and private organizations and institutions. This is because HiLCoE graduates are trained to be proficient in the latest information technology tools and use them to solve real world problems.

HiLCoE currently offers master's programmes in two streams; namely Software Engineering and Computer Science. The programmes are well organized in staffing and teaching learning facilities. The curricula for the master's programmes are designed to inculcate the essence of science and technology by applying the methods, techniques, and principles of all courses with hands on action project. This is a tradition at HiLCoE that is inherited from other programmes such as the phased-out Diploma programme, the Postgraduate Diploma programme, and the currently active B.Sc. programme, all in Computer Science.

HiLCoE has established an inspiring academic environment. It is probably the only private institution where computer laboratories are equipped with latest computers and are accessible 24 hours a day, 7 days a week, almost all days of a year closing only for maintenance and upgrading purposes. Its library has collections of latest text and reference books.

Students in the master's programmes are equipped with current trends and research methodologies that will give them ability to discover and learn advanced issues independently. This is also a tradition that has been developed in the B.Sc. programme where students carryout real-life projects as partial fulfillment of their degrees. HiLCoE aspires its graduates for best fitting to the world job opportunity as good as local options. It is also in HiLCoE's interest for graduates of the master's programmes to proceed to their PhD studies. It is with this in mind that the curricula of the master's programmes offer three options: course work with thesis, course work with project, and course-work only. The former two options are intended to give students a chance to learn how to do research so that they can proceed to their PhD studies. These options are intended to make the programmes flexible so that decisions are made based on interests of students, resource limitations such availability of advisors, etc.

It is HiLCoE's commitment for continuous improvement. This can be verified/demonstrated in many ways. Firstly, the core staff of HiLCoE is composed of PhD and M. Sc. degree holders in Computer Science, Software Engineering, and related

fields with extensive teaching experience both in Ethiopia and abroad. In addition, HiLCoE avails qualified instructors for course offering who are specialists in the field and exposed to state of the art research and industry practices. Recruiting instructors from the industry is a means by which the College can link and align education and research with the interests and needs of the industry. Moreover, in order to maintain its high standards and ensure quality, adjunct professors both from within the country and abroad, be it practitioners or university researchers and professors, mainly from USA, UK, and Germany are assigned for course delivery, supervision, and to give talks in seminars. Secondly, HiLCoE always upgrades its programmes. It started offering education at a Diploma level in Computer Science, and then moved to Post Graduate Diploma, B. Sc., and M. Sc. levels. Thirdly, it is the pioneer in Ethiopia as a private initiative and mainly in terms of providing an ICT focused advanced education that tackles ICT in an integrated approach comprising education, research, and development to promote the development of ICT in the country.

In addition to the Prospectus for Graduate Programmes (MS1001 HiL10/2009) and other rules and regulations of the College, this guideline is prepared in the hope that it will provide the necessary information for students, advisors, examiners, reviewers, the Graduate Programme Office, the Graduate Programme Research Office, the Registrar Office, the Academic Council, and the Executive Management on rules and procedures pertaining projects and theses. It outlines the details from inception to completion of theses and projects.

It is hoped that if master's students know and practice the details in this guideline, they will find it easy to cope with the rigours of high academic study and make their stay at HiLCoE as fruitful and successful as possible.

It is also believed that thesis and project advisors would benefit from this guideline in fulfilling their advising duties. Moreover, it is a way of encouraging and creating a supportive research environment for students and academic staff.

HiLCoE always gives high priority to quality assurance and continuous improvement as described above. As a result, this document will be reviewed regularly and updated as required. Users of this document are, therefore, encouraged to contribute to the review process by providing constructive and written feedbacks on issues for improvement.

2. Differences between a Thesis and a Project

One of the difficult questions students have in mind is: “what is the difference between a thesis and a project?” The distinction between a thesis and a project is not crystal clear. Both a thesis and a project allow students to demonstrate and build on abilities to reflectively apply knowledge and expertise. Both are completed under the guidance of a faculty member and carried out in accordance with standards and procedures appropriate to the area of study. In general, they vary in depth and breadth. Some points to be

considered in categorizing a piece of work either as a thesis or a project are outlined in this Section.

2.1 Project

A **project** addresses a practical problem and offers the student a chance to put what has been learnt in the different courses into practice. A project requires background analysis and involves an applied project that results in solving a specific business or scientific problem. It is more focused on the application of theory. A project may end up in developing a piece of software as a solution to a given problem. A project often addresses practical questions such as how best to solve a real-world business problem. While projects may not constitute original research, they nonetheless require significant background analysis. This background analysis may include, but is not limited to, conducting literature review, exploring comparable technologies, reviewing best practices and models, examining similar projects, exploring costs and benefits, and an analysis of findings.

Problems pursued under a project may be predominantly analytical, involving exploration and extension of theoretical structures, or may pivot around the design/development of solutions for particular applications drawn from different areas. A project serves as a focal point for crystallizing the concepts, techniques, and methodologies encountered throughout the curriculum.

Although the emphasis in a project is to show that a given problem is solvable with the available techniques, it is also required to show alternative solutions to a given problem and make comparisons in terms of the pros and cons of the various alternative solutions.

Contributions and results from a project work are compiled into a project report. The report describes or documents the background analysis performed, the methodologies used, references to works that were reviewed through the analysis, and lessons learnt in the process.

2.2 Thesis

The purpose of a **thesis** is to give the student the opportunity to practice what has been learnt in the various courses and ultimately to develop the capability to conduct research independently after completing the program. A thesis requires an extensive literature survey on existing works and has the potential to generate new knowledge or improve upon existing techniques. One of the primary goals of masters-level thesis work is to teach students how to do research.

Different scholars define/describe a thesis in different ways. The following are two of the possible approaches.

“... a thesis gives the student training in planning, carrying out, and presenting an independent piece of work and provides contact with research and development.”

“ ... a thesis is a scholarly treatment of a subject or an investigative treatment of a problem, which is sufficiently limited in scope to ensure thoroughness.”

In a thesis, the student investigates an original work including a study of its possible implications, its potential applications, and its relationship to previous related works reported in the literature.

In terms of effort, content, and presentation, a thesis goes well beyond the level of a project. The results of a thesis, which is documented as a report, should be able to produce a material that can potentially be acceptable for publication in a journal or a conference proceeding.

The primary difference between a thesis and a project is that a thesis is a “scholarly treatment”. The literature review is more thorough; the experimental design and analysis is more complete.

Contributions and results are synthesized and compiled into a thesis report just similar to that of a project.

2.3 Examples of a Thesis and a Project

The following examples are intended to better clarify the distinction between a thesis and a project. They are both taken from Addis Ababa University Libraries Thesis & Dissertation Database with minor editorial modifications (at <http://etd.aau.edu.et/dspace/>). Only the titles and objectives are included in the hope that they provide sufficient information in categorizing each as a thesis or a project.

Example 1: Thesis

Title: Amharic Question Answering System for Factoid Questions

General Objective

The general objective of this research work is to develop a prototype for Automatic Amharic Question Answering System for factoid questions.

Specific Objectives

The specific objectives of this research are:

- a. Studying the general grammatical structure of Amharic statements related to factoid question types.
- b. Identifying the relationship between Amharic factoid questions and statements.
- c. Investigating the different types of question types, expected answer types, and question particles.
- d. Analyzing question and answer patterns.
- e. Developing a general architecture of Amharic Factoid Question Answering.
- f. Developing an algorithm for Amharic Factoid Question Answering system.
- g. Developing a prototype for the new system.

- h. Evaluating the new system.

Example 2: Project

Title: Electronic Vital Events Registration System

General Objective

The general objective of this project is to explore and acquire the electronic birth and death registration practices in developed countries and in Africa and explore the techniques, technologies, and methodologies with the aim to come up with a working prototype for electronic vital events registration for Ethiopia.

Specific Objectives

The specific objectives of this project are the following.

- a. Investigate the main challenges and opportunities for e-vital events registration system in Ethiopia.
- b. Propose a system that works on the existing Ethiopian condition.
- c. Validate the proposed system by developing a prototype.
- d. Test the system whether it meets the objectives or not.

2.4 Basic vs. Applied Research

As described above, the core task of a thesis is research. Hence, let us elaborate what is meant by research and the different types of research. Research is the systematic study directed towards fuller scientific knowledge of the subject studied. In research, we move from established knowledge to new knowledge. Research is classified in two categories: basic research and applied research.

Basic (although known as fundamental or pure) research is driven by a curiosity or interest in a scientific question. The main motivation is to expand knowledge, not to create or invent something. The objective is to gain fuller knowledge or understanding of the fundamental aspects of phenomena without specific applications towards a process or products in mind. In other words, there is no obvious commercial value to the discoveries that result from basic research. The benefits are only seen in the long-term.

Applied research refers to a scientific study designed to solve practical problems rather than to acquire knowledge for knowledge's sake. The objective is to use the knowledge or understanding gained from research, directed towards the production of useful materials, devices, systems, or methods. Hence, applied research is used to find solutions to everyday problems and develop innovative technologies.

There is a feeling these days for a shift in emphasis away from purely basic research and toward applied research. This trend is necessitated by the problems faced by many countries as a result of overpopulation, pollution, etc. Many organizations are not also interested to avail financial resources for basic research since they don't envisage any immediate commercial or otherwise benefits.

However, there are also some who believe that a basic and fundamental understanding of all branches of science is needed in order for progress to take place. In other words, basic research lays down the foundation for the applied science that follows.

Regardless of the controversies and despite the fact that both basic and applied research are required, the emphasis at HiLCoE is on applied research in Computing that contributes to solving national problems in agriculture, health, industry, etc. We believe that, although basic research has a scientific merit, poor countries like Ethiopia cannot afford the financial and human resources needed for carrying out basic research. Moreover, world-wide trend shows a shift from basic research to applied research. Hence, students are encouraged to select thesis topics in applied research.

2.5 Summary

In summary, a project differs from a thesis in one significant way. A thesis presents a research result that contributes to the scholarly literature of Computing. A project, in contrast, contributes to the Computing profession via implementation of known ideas and theories and/or creative accomplishment. With a project, the student spends the vast bulk of his/her time investigating and implementing solution(s) to real world problems. With a thesis option, the student spends more time on investigation and experimental design and implementation.

3. Focus Areas of Research in Computer Science and Software Engineering

This Section tries to outline the focus areas of research in Computer Science and Software Engineering. However, it has to be noted that it is sometimes very difficult to categorize a piece of research work to belong to any one of the study areas as these two disciplines are highly related and usually Software Engineering is considered to be a specialization of the broader discipline of Computer Science.

But students can try to identify the focus areas of research in Computer Science and Software Engineering from the nature of courses offered in the two programs. It will also give some insight if the two disciplines are defined/described.

HiLCoE will formulate more focused research programmes in the future so that students can take part as part of a research group in charge of a particular research programme. Hence, interdisciplinary, practice-oriented, and problem-centered national research agenda (application areas) will be identified and corresponding research programmes will be developed so that government sector ministries, the private sector and other interested institutions can be attracted in providing financial and material assistance for research programmes. In the mean time, students are encouraged to come up with thesis/project titles that can attract such collaborators and secure funding for their work.

3.1 Computer Science

Different scholars define/describe Computer Science in different ways. The following are some of the possible approaches.

“Computer science is a discipline that spans theory and practice. It requires thinking both in abstract terms and in concrete terms. Computer science is a science of problem solving. Problem solving requires precision, creativity, and careful reasoning.”

“Computer science is a discipline that involves the understanding and design of computers and computational processes. In its most general form, it is concerned with the understanding of information transfer and transformation. Particular interest is placed on making processes efficient and endowing them with some form of intelligence. The discipline ranges from theoretical studies of algorithms to practical problems of implementation in terms of computational hardware and software.”

“Computer Science is the study of principles, applications, and technologies of computing and computers. It involves the study of data and data structures and the algorithms to process these structures; of principles of computer architecture both hardware and software; of problem solving and design methodologies; of computer-related topics such as numerical analysis, operations research, and artificial intelligence; and of language design, structure, and translation technique.”

The central focus is on processes for handling and manipulating information. Thus, the discipline spans both advancing the fundamental understanding of algorithms and information processes in general as well as the practical design of efficient and reliable software and hardware to meet given specifications. It includes theoretical studies, experimental methods, and engineering design all in one discipline. This differs radically from most physical sciences that separate the understanding and advancement of the science from the applications of the science in fields of engineering design and implementation. In computer science there is an inherent intermingling of the theoretical concepts of computability and algorithmic efficiency with the modern practical advancements in electronics that continue to stimulate advances in the discipline. It is this close interaction of the theoretical and design aspects of the field that binds them together into a single discipline.

Computer science has a wide range of specialties. However, because of the rapid evolution, it is difficult to provide a complete list of computer science areas. Yet it is clear that some of the crucial areas are theory, algorithms and data structures, programming methodology and languages, and computer elements and architecture. Other areas include software engineering, artificial intelligence, computer architecture, computer networking and communication, database systems, parallel computation, distributed computation (cluster computing, parallel processing, grid computing, peer-to-peer computing, Internet computing, etc.), human-computer interaction, computer

graphics, operating systems, multimedia systems, and mobile and pervasive computing. Drawing from a common core of computer science knowledge, each specialty area focuses on particular challenges.

Computer science is practiced by mathematicians, scientists and engineers. Mathematics provides reason and logic. Science provides the methodology for learning and refinement. Engineering provides the techniques for building hardware and software.

It has to be noted that computer science has strong connections to other disciplines. Many problems in science, engineering, health care, business, and other areas can be solved effectively with computers, but finding a solution requires both computer science expertise and knowledge of the particular application domain. Thus, computer scientists often become proficient in other subjects.

Some of the areas for computer science research are artificial intelligence, natural language processing, computer-supported cooperative work, computer security, databases, speech recognition, localization, machine translation, speech recognition, information retrieval, knowledge representation, reasoning, and acquisition, natural language processing (computational linguistics), wireless sensor networks, mobile and pervasive computing, etc.

3.2 Software Engineering

Similar to the approach for Computer Science, different scholars define/describe Software Engineering in different ways. The following are some of the possible approaches.

“Software Engineering is the application of a systematic, disciplined, quantifiable approach to the development, operation, and maintenance of software, and the study of these approaches.”

“Software Engineering is a systematic approach to the analysis, design, assessment, implementation, test, maintenance, and reengineering of software.”

“Software engineering is a branch of computer science that creates practical, cost-effective solutions to computing and information processing problems, by applying scientific knowledge, and developing software systems to the service of mankind. Software engineering entails making decisions under constraints of limited time, knowledge, and resources.”

The technical foundation of software engineering is a body of core computer science concepts relating to data structures, algorithms, programming languages and their semantics, analysis, computability, computational models, etc. This technical knowledge is applied through a body of engineering knowledge related to architecture, the process of engineering, tradeoffs and costs, quality assurance, etc. These are complemented by the social and economic context of the engineering effort, which includes the process of

creating and evolving artifacts, as well as issues related to policy, markets, usability, and socio-economic impacts.

Hence, software engineering research is concerned with improving our ability to systematically and predictably analyze and develop software that must satisfy complex, ill-specified requirements and that must evolve during its lifetime. It is concerned with developing improved models and techniques for the design and implementation of large complex software systems and developing improved models and techniques for formal analysis of software components to assure or determine specific formalizable properties.

Software engineering research results may be established qualitatively, through empirical study of software systems, through empirical study of the software development process, or through formal analysis. The results often take the form of methods for development and analysis; they may also be new or improved models or theories.

Among the areas where research ideas can be conceived are software architecture, service-oriented architectures, value-based design, software usability, enterprise systems, software quality assurance, etc.

4. Thesis/Project Proposal Preparation, Submission, and Defense

A student wishing to do a thesis or a project must first select a topic, write a proposal, and submit the proposal to the Graduate Programme Research Office in three bounded copies. It is preferable if the proposal is prepared in consultation with a prospective advisor. The prospective advisor can help in many ways. The advisor is better suited to advise the student if a given problem qualifies for a thesis or a project, if the proposal is prepared by incorporating all required components, and most importantly, if the work can be considered as original and the objectives are achievable with the given time frame. The list of potential advisors can be collected from the Graduate Programme Research Office. The proposal is then defended and finally approved by the Graduate Programme Office (see later in Section 4.2 for the procedure of defense).

4.1 Proposal Writing Guideline

The organization of the thesis/project proposal shall be in adherence to the standard template provided in Annex A - Master's Thesis/Project Proposal Template. The guideline for thesis/project report writing that is presented in Section 5 also applies for writing a proposal. Some of the items to be included in the proposal are described in this Section. Note that the proposals for a thesis and a project have similar structures. The materials to be included are also more or less the same. The variation is only in depth and breadth of coverage and, of course, the magnitude and nature of the problem to be solved.

1. Introduction/Background

This section should provide background and context, clearly identifying the topic area. For a thesis, it should show how the proposed research fits into what is already known and contributes to knowledge and the production of new products, services, methods or techniques in the subject area.

Describe the background of the problem, giving a measure of its magnitude (how widespread and important it is). For a thesis, clearly identify the research goals. Give summary of the objectives of the proposed research, its significance, how the data (if any) will be collected, how it will be analyzed, and what results (possible outcomes) are expected.

While this section is the first presented, it is better to write it after completing the rest of the proposal since most of the text for this section emanates from the rest of the sections.

2. Statement of the Problem

This section should consist of a brief summary of the problem that is proposed to be investigated, what question/hypothesis is intended to be addressed, and how the student envisions doing it. It should provide a clear and concise description of the central problem to be investigated and the questions to be answered.

3. Objectives

Clearly outline the general and specific objectives of the thesis research or project. List the general objective, describing the ultimate goal of the research, and the specific objectives. The objectives should be specific and realistic in terms of capacity, resources, and time. During the actual work, it is possible that these objectives may be modified.

4. Methods

Usually, this section lists the list of activities to be carried out in order to achieve the objectives. Describe in general terms the methods to be employed to achieve the objectives of the research including data sources, collection, experimentation and processing of data, and method of arriving at the conclusions.

Show how each specific objective will be achieved, with enough detail to enable an independent and informed assessment of the proposal.

5. Literature Review

The proposal should show its position with respect to the literature in the proposed study (connecting the proposed study to the body of knowledge as found from literature). The review of literature represents the researcher's level of knowledge in the area of his/her proposed topic of research. By reviewing related work, the proposal should show what has been done by others and the gap to be bridged by the proposed work.

6. Scope (Limitations and Delimitations)

Limitations that may be beyond the control of the researcher and restrict the research's conclusions should be indicated here. The restrictions that may be placed on the research by the student and that may affect conclusions need to be specified. The proposed work could be one that tries to achieve part of a bigger problem. In this case, the scope has to be limited based on time and other resources. The remaining part can be proposed as future work later in writing the thesis/project report which can be done by the researcher himself/herself or by others.

7. Application of Results

Outline the probable application of results and who will benefit from your results and how.

8. Timetable

An estimate of the time needed to carry out the proposed research by indicating each principal phase should be indicated.

Give a breakdown of the thesis/project into its component stages, estimating the amount of time which will be required for the work involved in each of the stages and giving an approximate timetable for the completion of each stage, and the thesis/project as a whole, including the write up of the report.

9. References

Provide a list of references to works cited in the proposal. You may refer to Section 5 for details about the use of references.

4.2 Thesis/Project Proposal Submission and Oral Defense

A thesis/project proposal shall be submitted to the Graduate Programme Research Office in three bounded copies (one copy for the advisor, one copy for the reviewer, and one copy for the Graduate Programme Research Office). The Graduate Programme Research Office in consultation with the Graduate Programme Office appoints an Examination Committee consisting of the advisor (who also chairs the defense session) and one academic staff who serves as a reviewer. At least one member of the Graduate Programme Research Office or the Graduate Programme Office must also attend the defense. The date and venue of the defense must be posted by the Graduate Programme Research Office at least one week prior to the defense date. The proposal must also be distributed to the reviewer and the advisor at least one week prior to the defense date.

The student defends his/her proposal before the examination committee. The defense session is open to any member of the College who is interested to attend.

The objective of the proposal defense is mostly to provide feedback to the student. It is intended to clarify the thesis/project proposed and gain agreement from the committee on the amount and quality of work expected.

The major points that must be considered in evaluating a proposal include, but are not limited to, the following:

- Soundness of hypotheses to be tested or objectives to be achieved (in terms of method/new technology to be developed or improved, etc.)
- Originality and innovativeness of the proposed research,
- Relevance/importance of the proposed research,
- Contribution of the proposed research to knowledge,
- Contribution to national goals, priorities, and aspirations,
- Adequacy of the review of literature,
- Demonstration of awareness of previous and alternative approaches to the identified problem,
- Clarity and consistency of objectives/hypotheses with the problem statement,
- Suitability and feasibility of the descriptions of methods,
- Adequacy of time allocated,
- Expected significance of the impact of the results,
- Probability of success of the research/project within the scheduled time, and
- Format and overall organization as per the guideline.

The decision of the examining committee on a proposal may be one of the following:

- *Approved:* The proposal successfully addresses all of the review criteria. No further action is required from the student.
- *Clarification Required:* The proposal meets most of the review criteria but lacks one or more minor requirements that must be addressed in a revised version. The proposal will not require resubmission in a subsequent review cycle. The adviser and the Graduate Programme Research Office shall ensure that the indicated revision requirements are met.
- *Revise and Resubmit:* The proposal fails to meet one or more of the major criteria, but is deemed to be of sufficient potential merit to encourage a resubmission and defense.
- *Rejected:* The proposal fails to meet most or all criteria, and does not have the required scientific merit.

A report of the decision of the examining committee is then submitted by the reviewer to the Graduate Programme Research Office using the form attached as Annex C - Thesis/Project Proposal Defense Result Submission Form.

5. Thesis/Project Report Writing Guideline

A thesis explores one or more research questions or tests a hypothesis. It is important that the thesis be conceptualized and structured.

All writing must be coherent, logical, and easy to follow, keeping the audience in mind. Arguments or positions presented must be clearly supported with facts or citations. Unsubstantiated generalizations must be avoided. Organization is a critical component of clear writing. It helps the reader understand the central idea of what is being written and provides a logical sequence of communication.

The following aspects must be addressed.

- The problem and question(s) being pursued.
- The theoretical base and the literature within which the question(s) has been framed.
- The process or method of investigation.
- Findings or observations. For a project, a description of the purpose of the project, a discussion of the process used in its development, and the final “product” (usually included as an annex). If the project is implemented, a description of the process along with observed results should be included.
- Conclusions, recommendations (if any), and future work.

5.1 Typing Considerations

- The thesis/project report must be typed on A4 size paper, preferably on one side of the paper only.
- Font and size: One of the following fonts should be used: Times, Times New Roman, or Calibri. Use a 12-point font size. Use bigger fonts (incrementing by 1) for titles and subtitles depending on the depth (hierarchy) of titles.
- There must be a margin of 1.3 inch on the left hand side of the page to allow for binding, and minimum margins of 1 inch for the top, right, and bottom.
- The typing must be 1.5-spaced.
- All pages are numbered consecutively in the bottom, center position. The pages must be numbered starting from the introduction page.
- The thesis/project report must be a maximum of 100 pages excluding annexes, if any.

5.2 Organization of the Thesis/Project Report

The organization of the thesis/project report shall be in adherence to the standard template provided in Annex B - Master’s Thesis/Project Report Template. A description of some of the items is provided in this Section.

1. Front/Title Page

The front (title) page must be as follows:



HiLCoE

School of Computer Science & Technology

Title of the thesis/project

Full name of the student

A [thesis/project] submitted to the Graduate Programme
Research Office of HiLCoE in partial fulfillment of the
requirements for the Degree of Master of Science in (*insert
name of degree*)

Date

2. Signed approval sheet by the Examining Committee

The following must be included after the title page.

HiLCoE		
School of Computer Science & Technology		
<i>Title of the thesis/project</i>		
<i>Full name of the student</i>		
<i>Full name of the advisor</i>		
Name and Signature of Members of the Examining Committee		
<u>No.</u>	<u>Name</u>	<u>Signature</u>
1.	Name of Advisor	
2.	Name of External Examiner	
3.	Name of Internal Examiner	
4.	Name of Examining Committee Chairperson	

3. Table of Contents

Table of contents must be generated automatically and not manually. Unnecessary breakdown of sections must be avoided, i.e., avoid having section numbers for very short text.

If there are many tables and figures (more than 5 each), and acronyms/abbreviations, then a “List of Tables”, “List of Figures”, and “Acronyms/Abbreviations” should be included on separate pages after the Table of Contents page.

4. Acronyms and Abbreviations (if any)

If there are many acronyms and/or abbreviations, it is advisable to have a List of Acronyms/Abbreviations page for quick reference. In any case the acronym’s expanded version must be written at first use, which afterwards only the acronym can be used.

5. Acknowledgments

Credit must be given to all who have made significant contribution to the research. These may, for example, include instructors (professors), advisors, technicians, individuals who in one way or another have contributed to the success of the thesis/project, and organizations (e.g., providers of financial support, facilities, etc.).

6. Abstract

An abstract is a brief, comprehensive summary of the contents of the thesis/project report. It gives readers an overview of all the key ideas presented.

The abstract bridges the gap between the title and the main body and thus should be brief and informative. It should broadly summarize the overall content of the report, point out new information, and it replaces the need for a summary.

A good abstract is accurate: it reflects exactly what is in the report; it is self-contained; it defines any technical terms and avoids using any acronyms or abbreviations; it is concise and specific; and it is brief and to the point. Normally, an abstract is written after the report is complete.

The abstract should be restricted to approximately 500 words. Keywords ranging from five to seven should be given following the abstract.

7. References

It is understood that all of the writing (both wording and ideas) in the project or thesis is the student's own, unless appropriate attribution is made. Failure to reference properly, even though unintended, constitutes plagiarism, as well as poor scholarship or academic dishonesty.

Every reference cited in the text must appear in the reference list (usually called "References"). By the same token, all entries in the reference list must have been cited in the text at least once. The following are examples of citations.

This may be true as pointed out in [2]. (Note that if the citation is at the end of a sentence, the period appears after the parenthesis.)

Rabinovich and Spatscheck [1] concluded that ...

As presented in Sen *et al.* [4], a mobile entity is ... (Use *et al.* if the authors are more than two.)

The authors in [6] argue that ...

Don't mention names of people who provided information; but a list of interviewees may be included at the end of the report.

References have two major objectives. Firstly, the thesis/project author is acknowledging the works of others thereby avoiding plagiarism. Secondly, readers who need more information can access the referred material. Hence, all references must be traceable. Formats vary, but an entry for a book usually contains the following information to be traceable:

- author(s)
- title
- publisher
- date of publication

An entry for a journal or a conference proceeding paper usually contains:

- author(s)
- article title
- journal title or conference details
- volume and number
- pages

- date of publication

For information obtained from the Web, include the URL and the date when the site was last accessed.

Different authors use different styles for citation. The commonly used style in the Science and Engineering fields is the one by the Institute of Electrical and Electronics Engineers (IEEE) where a citation number is enclosed within square brackets and the reference list is arranged by the order of citation in the report, not by alphabetical order. The following are example styles for a book, a journal paper, a conference proceeding, and a Web reference, respectively.

- [1] J. Watkinson, *The MPEG Handbook*, Focal Press, Oxford, 2001.
- [2] R. J. Flynn and W. H. Tetzlaff, "Multimedia - An introduction," *IBM Journal of Research and Development*, Vol. 42, No. 2, 1998, pp. 165-176.
- [3] C.-H. Chi, Y. Cao, and T. Luo, "Scalable Multimedia Content Delivery on Internet," in *Proceedings of the IEEE International Conference on Multimedia*, Lusanne, Switzerland, August 2002.
- [4] Zona Research, "The Economic Impacts of Unacceptable Web Site Download Speeds," white paper, 1999, retrieved from <http://also.co.uk/docs/speed.pdf>, Last accessed on June 10, 2011.

8. Annexes

These include short source program listings and other detailed information that cannot be put within the body of the report. Each annex should be titled and listed in the Table of Contents.

9. Signed Declaration Sheet

The last page of the thesis/project report must contain a signed declaration by the student with the following statement:

"This [thesis/project] is my original work and has not been presented for a degree in any other university, and that all sources of material used for the [thesis/project] have been duly acknowledged".

A signature of confirmation by the advisor and that of the student is also included on the same page.

5.3 Some tips in using Tables and Figures

Each figure and table must be numbered separately and labeled. The table/figure is numbered using section number, a full stop, and serial number, such as 2.1, 3.4, etc. The labels should be informative. The style may vary. Pick a style that you think is best from books or papers. A table or figure that is taken from a different source requires a citation. Put the citation in the body of the report and not on the labels. See the following example on citations of tables from a different source (which also applies for figures).

The position of labels must be below the figure for figures and for tables above the table and both must be centered.

Each figure and table must be referred in the body of the report at least once. The following are examples on how to refer to tables and figures.

Table 5.1 [23] shows so and so. or As shown in Table 5.1 [23], [put here any conclusions]. Figure 5.1 shows so and so. or As shown in Figure 5.1, [put here any conclusions].

Overcrowding tables with lines should be avoided. Horizontal lines should be included only for the heading and at the end of the table. If there is no row of totals or something similar, use only a single line for the bottom of the last row. If a table spans more than one page “Repeat Heading Rows”. The following examples demonstrate the idea.

Table 5.1: List of Courses to be offered in the first Term

Course Code	Course Title	Credit Hours
CS601	Research Methodology	3
CS662	Advanced Computer Networks	4
CS764	Distributed Computing	4
Total		11

Table 5.2: Nationally set Annual intake Targets from 2001 to 2005

Year	2001	2002	2003	2003	2005
Annual Intake - ICT	6, 000	9, 000	11, 000	11, 000	11, 000
Annual Intake - All	90, 000	110, 000	110, 000	110, 000	110, 000
% ICT Intake	6.67	8.18	10	10	10



Figure 5.1: Logo of HiLCoE

6. Roles and Responsibilities

This section outlines the roles and responsibilities of the advisor and the student in carrying out a thesis/project. It has to be emphasized that an advisor has only an advisory role and as such the responsibility of carrying out all activities required for a thesis/project towards its completion is that of the student. Taking all initiatives such as

meetings with the advisor, presentations, submitting papers to conferences, workshops, journals, etc. are also the responsibilities of the student.

6.1 Roles and Responsibilities of Advisors

The thesis or project is undertaken under the guidance of a project/thesis advisor who is appointed and approved by the Graduate Programme Research Office in consultation with the Graduate Programme Office. The assignment of advisors to students is arrived at by mutual agreement and shall be based on common research interests. The advisor should have the expertise in the area of the thesis research/project preferably with a minimum academic rank of senior lecturer or equivalent. Equivalence will be decided by the Graduate Programme Office based on individual merit and experience in research.

The role of the advisor is to work with the student throughout the entire process, including selection and determination of procedures, and preparation of the final product, in addition to helping ensure all requirements are met.

It is important that the student maintain communication with his/her thesis/project advisor throughout the work. The advisor should be available to meet regularly with the student, to evaluate the progress of his/her research, to discuss the problems that might arise, and to provide whatever encouragement or direction that is deemed necessary. These meetings should be regular to review the student's progress in writing the thesis/project. Results or major discussion points of such meetings should be summarized by the student and approved by the advisor using a form that will be prepared by the Graduate Programme Research Office and submitted to same within three days.

It is the advisor's responsibility to approve the student's thesis/project as complete prior to review by the examining committee.

In general, an advisor has the following responsibilities:

- To guide the thesis research/project activity: the advisor shall provide appropriate guidance on the nature of research, the expected standards, and about how to plan and conduct the research so as to ensure that the normal expectation of submission will be met.
- To be available for consultation at relatively short notice: an advisor shall maintain regular contact with his/her student through meetings according to mutually agreed frequency and duration. Normally a minimum of one hour per week (on average) shall be set aside for consultation. All communication should not necessarily be face to face; other electronic means can also be used as alternative means of communication.
- To be as helpful as possible in suggesting the next course of action and in assisting the student in carrying out the research.
- To inform/guide the student approximately how long it will be before written work, such as drafts of chapters/sections, can be returned with comments.

- To guide the student on the use of original literature and sources and shall give guidance on avoiding plagiarism.
- To be thorough in the examination of thesis/project chapters/sections, supplying, where appropriate, detailed comments on such matters as literary form, structure, use of evidence, relation of the thesis/project to published works on the subject, footnoting, and referencing techniques, and making constructive suggestions for rewriting and improving the draft.
- To encourage and guide the student to publish the results in journals and/or present in national and international conferences and workshops.
- To know and understand that the ownership and the right of distribution of all software and other products that are developed as a result of a thesis/project work belong to the College.
- To indicate clearly when a draft is in a satisfactory final form or, if it is clear to the advisor that the thesis/project cannot be successfully completed, to advise the student accordingly.
- To advise and help the student to approach other faculty members for assistance with specific problems or even to request the reading of a section of the thesis/project.
- To keep a record of the progress made by the student for advisor appreciation during the grading of a thesis/project. These include discipline on project work such as punctuality in meetings and carrying out activities as advised, perseverance, motivation, seminar participation, publications (if any), and other efforts.
- To submit a progress report to the Graduate Programme Research Office once every month.
- To comply with all ethical requirements.

6.2 Roles and Responsibilities of Students

When a student undertakes a thesis/project, s/he assumes several roles and responsibilities, the most important of which are listed below.

- To choose a topic (often with the advisor's help) and to produce a thesis/project report that is essentially his/her own work. The report should meet the standards of scholarship including demonstration of the capacity for independent scholarship and research in the field.
- To submit (after getting the approval of the advisor) to the Graduate Programme Research Office results or major discussion points of meetings made with the advisor using a form that will be prepared by the Graduate Programme Research Office within three days.
- To acknowledge direct assistance or borrowed material from other scholars or researchers which otherwise is considered as plagiarism even if unintentional.

- To realize that the advisor has other duties which may at times delay the student's access to the advisor at short notice.
- To give serious and considered attention to the advice and direction from the advisor.
- To submit a work to the judgment of the College.
- To apply for a regarding. The appeal must be submitted to the Graduate Programme Research Office within one week from the date of defense. It has, however, to be noted that since the defense is done in public and the grade is decided by a committee through an open debate and a clear set of criteria, the likelihood of a change to a grade is very low.
- To abide by the decision of the College when any rights of appeal, if exercised, have been exhausted.
- In situations where any form of publication is produced from the thesis/project work, the authorship has to be jointly with the advisor.
- To know and understand that the ownership and the right of distribution of all software and other products that are developed as a result of a thesis/project work belong to the College.
- To understand clearly the requirements of the program.
- To know the College's regulations and standards to which the writer of a thesis/project is required to conform.
- To submit the thesis/project report on time. Failure to do so may entail financial consequences to the student (for duration of a thesis/project and extension, see Section 8 of this guideline).
- To know that once a student registers for a thesis/project, all rules on dropping of courses and others are as per the rules of the College like any other course and may entail financial consequences on the student.
- To know that the advisor may cancel advisement under certain circumstances including but not limited to the following: if the student doesn't demonstrate a progress in his/her work, or is not in a regular contact with the advisor, or is not following the advises given by the advisor, etc.
- To comply with all ethical requirements.

7. Thesis/Project Progress Follow-up, Submission and Defense

7.1 Progress Follow-up of Thesis/Project

For quality assurance, the Graduate Programme Research Office, in consultation with the respective advisors, shall schedule a series of progress report sessions. The minimum number of sessions per student is two, preferably, one at the middle of the work, and another one towards the end.

The advisor, instructors, students, and all other interested members of the College can attend these sessions. The student presents the status of his/her work, responds to questions, and takes notes of comments and suggestions. The objective of these sessions is to check if the student is progressing as per the schedule and also to provide comments and feedback.

At the end of a session, the advisor shall submit a summary report to the Graduate Programme Research Office on the status of the work and performance of the student, by focusing on the critical aspects of the work. Such reports will be considered as additional inputs to the evaluation of the student at the end of the thesis/project work.

7.2 Submission of Thesis/Project

The format of the thesis/project shall be as that provided in Annex B - Master's Thesis/Project Report Template. A thesis/project report shall be submitted to the Graduate Programme Research Office in three bounded copies at least one month before the date of defense.

7.3 Thesis/Project Defense

When a student, after conferring with the advisor, submits his/her thesis/project report, the Graduate Programme Research Office appoints an Examination Committee. At least one member of the Graduate Programme Research Office or the Graduate Programme Office must attend the defense. The defense is conducted as outlined below.

- The date and venue of the defense shall be posted by the Graduate Programme Research Office at least one week prior to defense.
- Thesis/project reports shall be distributed by the Graduate Programme Research Office to the examiners and advisors at least two weeks before the date of defense.
- The student shall defend his/her thesis/project before the examination committee. The defense session is open to any member of the College interested to attend.
- The thesis/project defense is presided over by an impartial person appointed by the Graduate Programme Research Office as chairperson.
- The student first presents his/her thesis/project orally with whatever aid s/he requires to make an effective presentation to the Examining Committee.
- After the defense, which includes a maximum of thirty minutes for presentation and twenty-five minutes for cross-examination, the decision of the Examining Committee may fall under the following categories:
 - **Accepted:** The thesis/project is accepted with no change or with only minor changes.
 - **Accepted with modifications**
 - The thesis/project requires substantial changes, which are to be made to the satisfaction of the Examining Committee or its designate.

- The Examining Committee's report must include a brief outline of the nature of the changes required and must indicate the time by which the changes are to be completed.
- If the required changes are not made to the satisfaction of the Examining Committee or its designate in the indicated time, the thesis/project is automatically considered as rejected.
- **Rejected:** A thesis/project will be rejected if:
 - The work is found by the Examining Committee not to have met the required standards; or
 - The work is plagiarized as judged by the Examining Committee; or
 - The thesis/project was accepted with modification but the required changes are not made to the satisfaction of the Examining Committee or its designate in the indicated time; or
 - The work has already been used to confer a degree from this or another institution. However, this shall not preclude the student from submitting such work provided enough extra work has been carried out to expand the scope and depth of the subject.
- Effect of Rejection
 - The Graduate Programme Office shall decide on what should be the next course of action for a master's student whose thesis/project has been rejected.
 - The Graduate Programme Office shall decide on the dismissal or suspension of a student whose thesis/project has been rejected due to plagiarism.

Thesis/Project Rating

- A thesis/project that is defended and accepted shall be rated "Excellent", "Very Good", "Good" or "Satisfactory".
- A rejected thesis/project shall be rated "Fail".

A student who successfully defended his/her thesis/project should submit the items listed in Annex D - Guideline for Submitting Final Master's Thesis/Project - to the Graduate Programme Research Office.

7.4 Tips on Slide Preparation and Presentation

Students shall prepare a PowerPoint presentation and present their work. The following are some tips regarding slide preparation and presentations.

a. Slide Preparation

- Slides must be numbered.
- Use bigger fonts (at least 22 point) for readability.

- Don't overcrowd the slides with text; be selective.
- Choose a plain background that is simple and makes the text readable.
- Don't include new material that was not covered in the thesis/project report although additional diagrams, illustrations, and examples are acceptable.
- Use effects when absolutely necessary.
- Show it to your advisor for comments and suggestions of improvement.

b. Presentation

- Rehearse it many times so that you can finish within the allotted time.
- Dress neatly.
- Be confident - read and understand the material beforehand and try to present without reading. Note that the whole purpose is to convince the examiners that you have mastered the subject matter.
- Be neither very fast nor very slow (this is very subjective).
- Face participants; don't be shy.
- During the question and answer session
 - Address questions properly.
 - Be ready to be challenged; don't be offended; it is the way of life in academics.
 - Say I don't know if you don't know the answer.

8. Thesis/Project Extension

Normally a thesis/project must be completed in four months, i.e., one term, after a successful proposal defense. In circumstances where the student is unable to finish, s/he shall discuss the issue and get the agreement of the advisor. Then an extension request, supported with a justification and approved by the advisor and stating the duration of extension (normally one term), shall be submitted to the Graduate Programme Research Office. The Graduate Programme Office makes a final decision on the acceptance or rejection of the extension. If extension is granted, the student is required to register for the thesis/project in the new term. Payment for extension will be decided by the College from time to time.

An extension is granted only once unless there are justifiable and compelling reasons or circumstances.

Annexes

Annex A - Master's Thesis/Project Proposal Template

Identification (on cover page)



HiLCoE

School of Computer Science & Technology

Programme (please tick): ☐ MSCS ☐ MSSE

Title of Thesis/Project: _____

Name of Student: _____

Name of Advisor: _____

1. **Introduction/Background**
2. **Problem Statement**
3. **Objectives**
4. **Methods**
5. **Literature Review**
6. **Scope (Limitations and Delimitations)**
7. **Application of Results**
8. **Timetable**

References (no chapter/section number is given)

Submitted by:

_____	_____	_____
Student	Signature	Date

Approved by:

1. _____	_____	_____
Advisor	Signature	Date

2. _____	_____	_____
Coordinator, Graduate Programme Research Office	Signature	Date

3. _____	_____	_____
Director, Graduate Programme Office	Signature	Date

Annex B - Master's Thesis/Project Report Template

The organization depends on the nature and material contained. However, the following general format is suggested:

- **Preliminaries**
 - Title Page
 - Signed approval sheet by the Examining Committee
 - Acknowledgments
 - Table of Contents
 - List of Tables (if any)
 - List of Figures (if any)
 - List of Annexes (if any)
 - Acronyms and abbreviations (if any)
 - Abstract
- **Text of the Thesis/Project**
 - Introduction/Background
 - Statement of the Problem
 - Objectives
 - Methods
 - Literature Review
 - Related Work
 - Solution Design
 - Experimentation/Prototype and results
 - Discussion
 - Conclusions, Recommendations (if any), and Future Work (optional)
- **References** (no chapter/section number is given)
- **Annexes (if any)** (no chapter/section number is given)
- **Signed Declaration Sheet**

Annex C - Thesis/Project Proposal Defense Result Submission Form



HiLCoE

School of Computer Science & Technology

Name of Student: _____

Programme (please tick): ☐ MSCS ☐ MSSE

Title of Thesis/Project: _____

Decision of the examining committee, please tick.

- ☐ Approved
☐ Clarification Required
☐ Revise and Resubmit
☐ Rejected

If the decision is other than “Approved”, please provide the details below indicating why the proposal is not approved. You can attach your comments on separate sheets of paper if extra space is required.

- | | | | |
|----|----------|-----------|-------|
| 1. | _____ | _____ | _____ |
| | Reviewer | Signature | Date |
| 2. | _____ | _____ | _____ |
| | Advisor | Signature | Date |

Annex D - Guideline for Submitting Final Master's Thesis/Project

A student who successfully defended his/her thesis/project should submit the following to the Graduate Programme Research Office. No services will be provided by the College before submitting these requirements.

1. Three bounded copies of the thesis/project report after incorporating the comments given by the Examining Committee during defense.
2. Electronic copies on a CD:
 - a. Soft copy of your thesis/project document (both in MS Word and PDF format),
 - b. Abstract of the thesis/project as a separate file,
 - c. Users' guide of the prototype system developed (if any),
 - d. Source code of the developed system (if any),
 - e. Sample data used in the system or database (if any),
 - f. Relevant electronic reference materials that were used during the work (under a directory); and
 - g. The slides of the presentation during the defense.
3. Signed approval sheet by members of the Examining Committee.
4. The declaration page should be signed by the student and the advisor.

Please verify with the advisor the completeness of the documents before submission.