NORTHWESTERN UNIVERSITY SCHOOL OF CONTINUING STUDIES IN COLLABORATION WITH MCCORMICK SCHOOL OF ENGINEERING AND APPLIED SCIENCE MASTER'S OF SCIENCE IN COMPUTER INFORMATION SYSTEMS (MSCIS)

I. Thesis Process

a. <u>What is the MSCIS Thesis?</u>

The thesis is the capstone of the MSCIS program designed to allow a candidate to pursue an area of interest and demonstrate mastery of the core competencies of the program. The candidate will, throughout the duration of the thesis, be under the guidance of a MSCIS faculty member. The faculty advisor will supervise the student in crafting, expounding upon, designing, and delivering all components necessary for the thesis. The thesis must address the various core class competencies of Database Systems, Programming, Local Area Networking, Operating Systems, and Software Project Management.

Examples of thesis proposals and final thesis projects are on file and available for review in the SCS offices on the Chicago and Evanston campuses.

b. <u>Qualifications to Begin Thesis</u>

In order to qualify for candidacy, a candidate must have completed all core courses and have no more than 1 course outstanding for completion. The candidate will only be permitted to enroll in 1 course outside of the thesis in the quarter that the thesis is to be performed.

Candidates must meet with their advisor twice per month at a minimum.

c. <u>Thesis Proposal Guidelines</u>

The candidate, upon garnering approval from SCS administration to participate in the thesis process, must submit a proposal to the MSCIS faculty and administration pertaining to the subject matter the thesis will address. The thesis will consist of three components: Written, Presentation, and Prototype. Each section will be described in detail further in this document.

The candidate must submit, with their advisor's signature, the MSCIS Thesis Proposal Form. The proposal form consists of a four-section explanation of the candidate's thesis. The four sections along with their explanations are as follows:

Situational Analysis [minimum 1 page – maximum 3 pages]

The situational analysis will comprise of the following concepts:

- Problem statement
- Relevance of problem
- Preliminary background information on the problem (i.e. current tools, processes, etc. that can be considered a root cause of the problem)

The situational analysis will <u>not</u> comprise of the solution itself.

Solution Focus [minimum .5 pages – maximum 1 page]

The solution focus will comprise of the total solution for the problem. It is recognized by the MSCIS program that time constraints will not permit the derivation of a complete implementation. As a result the implementation shall be in a scale of a working prototype.

Review of Literature Focus [minimum .5 pages – maximum 1 page]

The review of literature focus will comprise of a sufficient literature review for the research problem stated in the problem statement. Students may deviate slightly in their literature review for their selected research area contingent of advisor approval.

Prototype Specifications [minimum .5 pages – maximum 1 page]

The prototype specifications will detail the technologies and toolsets used to create the prototype. Additionally the functionality and preliminary design and architecture of the prototype will be described. Examples of technologies and toolsets include but are not limited to: ASP, JSP, Java, UNIX, Windows, MySQL, Oracle, MS-SQL, Structured Query Language (SQL), HTML, XML, MS-IIS, or Apache. An example of a preliminary architecture includes but is not limited to: (1) web based user interface [describe technology used to create it] connecting to an ODBC complaint database [describe database technology used], (2) a Visual Basic or Java application connecting to an ODBC complaint database, (3) a web based user interface connecting to an ODBC compliant database to execute Store Procedures. An example of functionality includes but is not limited to: (1) performing database queries through the use of Structure Query Language (SQL) to produce reports, (2) the use of SQL query results in mathematical computations embedded within the application, or (3) the use of stored data to perform simulation or modeling [and a description of the simulation and modeling techniques used].

d. <u>Proposal Review Process</u>

The proposal review process

1.   Candidate and Advisor agree upon topic, complete thesis proposal form, and submit to MSCIS faculty members for review.

2. Faculty reviews and gives recommendations for improvements or clarifications (if required)
3. Advisor submits proposal to MSCIS administration
4. MSCIS administration reviews and either approve or rejects proposal
5. If approved proposal forwarded to the Chair of the Computer Science Department for final approval; if rejected the MSCIS administration will provide an explanation to the advisor and candidate and request to resubmit the proposal upon completion of changes – resubmission process begins at Step 3. A 30 day resubmission window will be granted otherwise the candidate and advisor will be required to begin at Step 1.
6. If initially approved by MSCIS administration, the Chair of the Computer Science Department will review the proposal and either approve or reject.
7. If approved proposal forwarded back to MSCIS administration to file in the candidates permanent file; if rejected the Chair will provide an explanation to the MSCIS administration and request to resubmit the proposal upon completion of changes – resubmission process begins at Step 6.
8. Resubmission process will continue until the Chair is satisfied that the requirements are met or requests a new topic be selected.

The timeline a candidate should expect for each phase of the proposal process is as follows:

- MSCIS Faculty review and recommendations – 1 week
- MSCIS Administration review and response – 1 week
- Computer Science Department Chair review and response – 1 week

The candidate must take into account any amount of time required for any modifications recommended or required as outcomes of the process. It is recommended that the candidate begin the approval process from 1 to 2 quarters prior to the actual quarter of thesis enrollment.

e. Proposal Acceptance / Denial

The candidate should be aware that prior to submittal to MSCIS Administration, the MSCIS faculty will be presented with the proposal for review. Upon completion of the review, the candidate's advisor will be given recommendations for improvements to the proposal, if any. It will be the responsibility of the advisor and candidate to revise if so chosen and to submit to the MSCIS Administration.

Throughout the proposal review process the possibilities exist that the proposal will be denied for various reasons. Common reasons for denial include but are not limited to: insufficient explanation of prototype functionality, inadequate satisfaction of minimal prototype guidelines, or insufficient explanation of the problem to be solved.

Should denial of the proposal occur the candidate will be provided with reasoning behind the denial. The candidate should be aware and take note of the approval flow depicted in

the Proposal Review Process section that the advisor may approve the project and it may be denied by MSCIS Administration. Additionally the MSCIS Administration may approve the proposal while the next level of authority, the Chair of the Computer Science Department, denies it. Regardless of level of denial the candidate and advisor will be given a full explanation for the denial. Remediation steps will be the responsibility of the faculty advisor and the candidate. Upon completion of changes the proposal will be resubmitted through the same process.

II.   Thesis Components

1. Written Component

   a. Overview

   The purpose of the written component is to provide the requisite research to the problem that the thesis addresses as well as the solution being derived. Candidates must clearly and succinctly state the problem and its relevance as well as the recommended solution. The candidate should take care to validate their problem and solution with, primarily, academic and, secondary, professional research.

   The candidate should take care to thoroughly explain any subcomponents of the underlying problem and solution. As an example if the candidate wishes to create a prototype and utilize Object Oriented Programming (OOP) as part of the solution the candidate must state why an OOP approach was chosen over a non-OOP approach.

   b. Use of Academic and Professional Journals

   It is expected that candidates will utilize academic journals, refereed computer magazines, and conferences as the major source of contributing information with professional journals as a secondary source. Academic journals are those that are peer reviewed. The information in these journals is built upon a foundation of scientifically performed research by academic researchers. In contrast a professional journal generally comprises industry specific information that may or may not have a solid foundation of research. It is viewed that professional journals are considered opinions of businesses, vendors, and industry analysts; papers published as part of workshop proceedings can be referenced as well, however, the advisor may approve or disapprove the inclusion of these papers in the student's work

2. Presentation Component

   a.   Presentation Materials

All presentations are to be created in Microsoft PowerPoint. Candidates must bring on the day of the colloquium the following materials:

- 10 bound copies of the written component
- 20 stapled copies of the presentation (it is recommended to print 4-6 slides per page to reduce the number of pages printed)
- 1 electronic copy of the research paper, presentation, application code and database – to be submitted to the School of Continuing Studies

Candidates must submit an electronic copy of the research paper 1 week prior to the date of the colloquium for faculty to adequately prepare.

b. Presentation Time Limits

Each candidate will be allotted a fifty minute time limit where 30 minutes will comprise of the candidates presentation as well as the demonstration of the prototype. Following the presentation and demonstration the candidate will respond to questions from the MSCIS faculty, administration and student body.

c. Colloquium Scheduling

The MSCIS administration will schedule colloquia as needed and will announce the date of the colloquium to the entire MSCIS student body with as much notice as possible. MSCIS students should ensure that the MSCIS program has the latest contact information (e-mail address) in order to effectively communicate with the student body.

3 – 4 students will be scheduled per colloquium.

d. Request for Special Equipment

Should a candidate require any special equipment outside of the provided computer system and projector (such as a second projector, etc.) it is the responsibility of the candidate to make the proper arrangements and reservations.

3. Prototype Component

The prototype component is the practical display of the application development knowledge gained during the MSCIS program. The MSCIS requirement for the prototype includes a User Interface, Application Logic, a Database, and a certain moderate level of functionality.

There is no specific requirement for a student to utilize either a 2-tier application architecture or a 3-tier application architecture however the fundamental architecture of an information system is required – front end user interface and

backend database. Candidates are allowed to be creative on the use of the database as it applies to their research. As an example if a candidate is performing a simulation of some sort the database component is capable of housing the requite variables for the simulation.

The MSCIS program understands that complete functionality cannot be included in the prototype however a moderate level of functionality is required. A simple user interface that allows the input and storage of data into a database as well as the retrieval of the data is **NOT** sufficient as a demonstration of programmatic aptitude. The MSCIS program requires that the candidate would go beyond the scope of the general programming instruction given in coursework to the point of possibly learning a new language however the difficulty of the new programming interface is not a consideration when application functionality is being reviewed.

The final guideline in place for the prototype component is that a database application such as Microsoft Access **CANNOT** be utilized as the backend. It is recommended that MySQL be utilized due to its free availability and ease of use.

III. Thesis Form and Style

a. <u>Style Manual</u>

Candidates must utilize the 5th Edition of the American Psychological Association (APA) Publication Manual. More information on the APA style can be found at www.apastyle.org.

All guidelines for citations, tables, charts, graphs, etc. are to abide by APA guidelines.

b. <u>Writing Style</u>

The writing style for a thesis document differs from writing styles that most candidates are accustomed to. The APA manual describes various techniques to modify ones writing style to one that is appropriate for a thesis. General advice for improvement includes:

- Do not utilize contractions
- Avoid emotional modifiers (*very* important, *extremely* important – it is either important or it is not)
- Understand the differences between think, feel, and know
- Do not write in the first person
- Be succinct; generally requires a strong vocabulary in order to compact strings of words efficiently
- Do not tell a story or carry on a conversation in the paper
- Do not use any form of slang (general, business, technical, etc.)
- Figures and tables shall be placed on a page after they have been referenced in the text

c. <u>Arrangement of Content</u>

All thesis papers are to be arranged in the following manner:

1. Title Page
2. Table of Contents
3. Acknowledgements
4. Abstract
5. Problem Statement and Goals
6. Relevance and Significance of Research
7. Review of Literature
8. Research Findings
9. Errors and Omissions in Previous Research
10. Constraints and Limitations of Research
11. Summary
12. References
13. Annotated Bibliography
14. Appendices (application code, database design, slide presentation, etc.)

IV. Thesis Evaluations

    a. <u>Grades Awarded</u>

In accordance with the guidelines set forth by the McCormick School of Engineering and Applied Science and the School of Continuing Studies for Master's programs the grades awarded for the MSCIS thesis are: A, A-, B+, B, B-, C+, C, and C-.

    b. <u>Evaluation Criteria</u>

During the colloquium all faculty and staff will complete the MSCIS Candidate Evaluation Form and discuss the individual evaluations in order to derive a group decision on the candidates' performance.

    c. <u>Notification of Decision</u>

Candidates will be notified within 3 days after the presentations have been performed of their thesis grade and if any additional work on one or more components is required.

    d. <u>Process for Additional Work</u>

After evaluations have concluded should a candidate require additional work on one or more components, the candidates' advisor will consult with the candidate on the requisite modifications and the time frames allotted for the modifications. Dependant on the depth of modifications the candidate may be required to re-present their thesis to the MSCIS faculty and staff.

    e. <u>Permission to Reproduce and Distribute</u>

Upon notification of successfully defending their thesis, candidates will be requested to authorize the School of Continuing Studies to reproduce and distribute their thesis for academic purposes only. This is an optional action on the part of the candidate. Should the candidate not wish their work to be reproduced and distributed the university will respect the candidates' decision and not reproduce and distribute the thesis material.

V. Appendix A – Limited List of Academic Journals

The following is a limited list of peer reviewed academic journals that candidates are able to consult for research purposes. The university has direct access to most of the journals and indirect access, through inter-library loan, to others.

IEEE Publications
 Transactions on Communications
 Transactions on Computers
 Transactions on Education
 Transactions on Engineering Management
 Transactions on Information Technology in Biomedicine
 Transactions on Knowledge and Data Engineering
 Transactions on Medical Imaging
 Transactions on Networking
 Transactions on Professional Communications
 Transactions on Software Engineering
 Transactions on Wireless Communications

ACM Publications
 Communications of the ACM
 Journal of the ACM
 Transactions on Computer Systems
 Transactions on Information and System Security
 Transactions on Information Systems
 Transactions on Internet Technology
 Transactions on Software Engineering & Methodology
 Transactions on Modeling and Computer Simulation
 Transactions on Computer-Human Interaction
 Transactions on Database Systems
 Journal of Educational Resources in Computing
 Transactions on Programming Languages and Systems
 Crossroads
 Queue
 netWorker

Other Publications
 Journal of Network and Systems Management
 International Journal of Network Management
 Knowledge and Information Systems: An International Journal
 MIS Quarterly
 Journal of Management Information Systems
 International Journal of Information Management
 Journal of Information Technology Management
 Journal of Global Information Technology Management
 Information Management and Computer Security