

**Instructions to complete this form:**

1. Answer all questions on the E-ship Thesis Proposal page, with responses immediately following the number or bullet and attach to this cover sheet.
2. An E-ship Thesis requires identification as one of three options: 1) Business Concept Thesis; 2) Product Development Thesis; or 3) Business Plan Thesis. Please see Thesis Proposal Option Descriptions.
3. Submit the proposal to [CUEproposal@kettering.edu](mailto:CUEproposal@kettering.edu). CCUE will schedule a once a month meeting for the E-ship Thesis Proposal Review Committee to evaluate all submitted proposals. Additionally, the student proposer will be asked to summarize his/her topic in a five minute presentation to the committee, either in person or via teleconference if appropriate.
4. Upon committee approval, the student proposer is encouraged to identify an appropriate faculty member as the Faculty Thesis Advisor and a Committee Member will be assigned by CCUE.
5. CCUE will facilitate securing required signatures which are needed in order to register the student for the CUE 495-E project (Module 2 of the 4 Required CUE Module – see attached document "CUE Required Modules")
6. Once all required signatures are secured, the proposal is considered approved and the student can begin work on the project.

## E-ship Thesis Proposal (CUE-495-E)

CUE Module 2 of 4

### PROPOSAL COVER SHEET

E-ship Thesis Project Title: Diagnostic Assistance Software for Mental Health Care Providers

### AGREEMENT

**The individuals who sign below agree to the following:**

1. The student agrees to perform and manage the project. The student will be required to submit to CCUE:
  - a. A progress report (after the 1<sup>st</sup> term of conducting research - Module 3 of the 4 Required CUE Modules).
  - b. A formal written thesis document following CCUE guidelines upon successful completion of the project (required by 1<sup>st</sup> week Friday of the students last academic term (Module 4 of the 4 CUE Modules).
2. The research conducted and the documentation (thesis) completed by the student is to take the equivalent of two terms (6 months), working 20 hours per week. In other words, approximately 480 hours of student effort is typical to include all research and documentation (writing of thesis). Student and Faculty Thesis Advisor signatures below indicate agreement to these expectations, and any variations must be mutually agreed to.
3. The proposal description & timeline for this research are documented in this proposal. Changes to the description and/or timeline will require approval by all who sign this agreement.
4. The formal written thesis document will be assessed by both the Faculty Thesis Advisor and the Committee Member (2<sup>nd</sup> faculty reviewer of the formal written document).
5. Department Head signatures are necessary for faculty load purposes and acknowledgement of students pursuance to complete the E-ship Thesis option.

Tya Chuanromanee

(Student – Please Print)

Tya Chuanromanee

(Student Signature)

11/11/16

Date Signed

(E-ship Proposal Review Committee (Topic Approval) – Please Print)

GIUSEPPE TURINI

(Faculty Thesis Advisor – Please Print)

(E-ship Proposal Review Committee Signature)

[Signature]

(Faculty Thesis Advisor Signature)

Date Signed

11/14/2016

Date Signed

(Committee Member – Please Print)

John G. Geske

(Faculty Thesis Advisor's Department Head – Please Print)

(Committee Member Signature)

[Signature]

(Faculty Thesis Advisor's Department Head Signature)

Date Signed

11/14/2016

Date Signed

John G. Geske

(Student's Degree Department Head – Please Print)

[Signature]

(Student's Degree Department Head Signature)

11/14/2016

Date Signed

# **E-ship Thesis Proposal (CUE-495-E)**

## ***E-SHIP THESIS PROJECT PROPOSAL & PLAN***

Name Tya Chuanromanee

Date 11/11/16

As framed by Curt Carlson and William Wilmot in their book "Innovation – The Five Disciplines for Creating What Customers Want," innovation is a process of "creating and delivering new customer value in the marketplace." The fundamental basis of an E-ship thesis is a value proposition that goes beyond the design/build/technology of what may -- or may not be -- a new idea, gadget, solution or improvement ("a better mousetrap"). As such, the E-ship proposal contains criteria for consideration of the possible markets (customers), needs, approach, benefits, and competition. A proposal for research, design, or development that does not include this consideration will not be classified as an E-ship thesis.

1. Please indicate E-ship Thesis type: Business Concept Thesis \_\_\_\_; Product Development Thesis X; or Business Plan Thesis \_\_\_\_ . (Please review the attached descriptions.)
2. What is the important customer and market need being addressed in the thesis?
  - What is the problem/need for which you want to supply a solution?
  - Specify and quantify the need (social, economic or otherwise)?
  - Describe your solution and the benefits and/or positive change (solutions) you anticipate from this project.
  - Define and quantify the marketplace (who/customer) that would benefit from this solution.
3. Define your approach to satisfying that need.
  - What due diligence and/or validation will be needed (i.e., market research, competition analysis and comparison, alternatives consideration, prototyping, actual or simulated testing, etc.)?
  - By whom and how will you be assisted in completing this project?
  - In what forms will the project be presented on completion (i.e., thesis/investigative report, prototype, business plan, other)?
4. Define the competition.
  - What other solutions to this need already exist and what are the benefits and features of those solution(s)? (If not, did you do any literature review?)
  - Who is providing those solutions and what are their strengths and weaknesses?
  - What would be your solution's competitive advantage as compared to the competition?
5. Define the barriers to market entry (such as cost advantage, capital requirements, incumbents with production and market advantages, know-how, location, time to market, state of technology, etc.)
6. How will the project provide an opportunity for the student to demonstrate the academic and experiential competence?
  - What are the specific knowledge, experience or skill sets on which this project will draw?
  - In what ways will this project allow student to demonstrate creativity, planning skills, problem solving, and/or independent thinking?
7. What is the project timeline?
  - What are the proposed starting and completing terms (two 12-week terms)?
  - Define a schedule and plan for managing and completing the project within the thesis terms (including some landmarks such as mid-project progress review, writing the thesis draft and final thesis review.

Tya Chuanromanee  
Product Development Thesis Proposal and Plan

## 2. What is the important customer and market need being addressed in the thesis?

All mental health providers must provide at least one diagnosis for each patient if they are working with health insurance companies to comply with requirements. Many patients may have more than one diagnosis, and it can be frustrating to look at all possible factors of diagnosis, such as comorbid disorders. Therapists want an easier way to find possible diagnoses for patients rather than just relying on their own memory (which may not be perfect) and manually searching the DSM (Diagnostic and Statistical Manual of Mental Disorders), which could be wasting time.

- Economic need: less time spent in the books mean more time with clients and more time doing more productive tasks.
- Social need: by using a tool to help with diagnoses, therapists will be less likely to misdiagnose patients, thus avoiding wasted time and effort. This will help patients get the help they need faster.

This proposed software will allow mental health care providers to enter patients' symptoms and other relevant factors and output possible diagnoses for the patient, ranked from most probable to least probable. The therapists will make the final diagnosis for the patient themselves. The diagnostic information will come from the Diagnostic and Statistical Manual of Mental Disorders (DSM5) and later will implement the ICD10 (International Statistical Classification of Diseases and Related Health Problems) standards. It will help therapists to save time and account for different possible diagnoses that they may not have considered, allowing for increased accuracy in diagnosis.

Potential customers will primarily be individual mental health care providers. This group of practitioners include, but are not limited to, LPs (Licensed Psychologists), LLPs (Limited Licensed Psychologists), LPCs (Licensed Professional Counselors), LMSWs (Licensed Master Social Workers), psychiatrists, graduate student therapists, and temporary limited license holders.

Mental health care networks are another possible customer base because they employ many therapists. The Hope Network and Catholic Family Services are examples of such organizations.

Once the product is sufficiently developed and tested, practitioners in hospitals and health systems may be another potential customer group.

## 3. Define your approach to satisfying that need.

Market research will be done to determine which features will be included in addition to the core functionality. The development process will take into consideration the competing software's features and usability.

A prototype will be developed, with one category of mental disorders used (e.g. somatic disorders). Testing will be done on this prototype, and the results will be used to further refine development on the rest of the disorders. Test results may determine the necessity to keep the current method of analysis or switch to a more efficient method.

If recurrent neural networks (RNN) are used, much training and validation will need to be done in order to ensure that the results are proper. If this option proves to be not viable for the

project scope, alternatives will be explored, such as different forms of machine learning and/or using database systems to manage the queries.

In addition to the student's advisor, Dr. Giuseppe Turini, the student will be assisted by Dr. Jaerock Kwon of the Computer Engineering department in learning about and setting up the neural networks and other machine learning-related topics.

Dr. Sean Ma, an entrepreneur and postdoc fellow at the University of Michigan's School of Psychiatry and School of Business will be assisting the student in the psychological aspects of the project. He will also work with the student to develop a business model and work with potential customers.

Several therapists from Amazing Grace Counseling Outreach, a nonprofit counseling organization, will be assisting the student by performing usability testing from a customer's point of view. They will be providing feedback on the accuracy of the software. These therapists include an LPC, LLP, and maybe a graduate student therapist or an LLPC/TLLP.

Upon completion, a prototype will be developed as well as a thesis report detailing the process of development and what conclusions were reached. If time permits, a business plan may be detailed that will show possible growth opportunities and market analysis.

#### 4. Define the competition.

There are many software programs that manage patient information, diagnostics, and treatment plans, but they offer no help with the diagnosis itself.

- The closest comparable software is the DSM-5 Mobile App developed by the APA (American Psychiatric Association). However, this application only has the contents of the DSM and nothing more (that is, it functions similar to an e-book but with more features). It does not help with diagnostics at all. Furthermore, it is a mobile application only, and costs \$69.00. It has a 4.0 review from Google Play and mixed reviews (~2.0) from the Apple Store.
- HealthFusion's MediTouch has a software that helps with medical coding for ICD-10 disorders. It allows users to enter an ICD-10 code to search for a specific disorder. It has no DSM-5 coverage and does not assist with diagnostics, just coding.
- TheraScribe is a patient manager, which keeps record of treatment plans, progress notes, and diagnoses. It supports DSM and ICD diagnoses but does not offer diagnostic help at all. It offers a library of homework for clients.
- There are other similar programs to TheraScribe, such as:
  - SimplePractice, which manages a whole clinic or practice, and
  - Psyquel, which is for coding for billing.

There is no company that is directly competing with the proposed software. Thus, this software's competitive advantage is that it is the first of its kind. There are no direct competitors currently. If the developers of this software decide to implement additional features after the completion of this thesis (such as a patient manager or a treatment plan suggestions or tracker) then this software will be able to compete with the above companies, and even hold an advantage because of its diagnostic capabilities.

#### 5. Define the barriers to market entry (such as cost advantage, capital requirements, incumbents with production and market advantages, know-how, location, time to market, state of technology, etc.)

When starting out, there may be some cost disadvantages, but they can be overcome. For example, the student will not have access to state-of-the-art equipment to test or run the program. The student will also be working primarily individually to develop the product, with no additional programmer working on the project. Thus, the project will take longer to complete.

There will be no significant capital requirements for development. No office space or new equipment will need to be purchased at this time.

The possible incumbents with production and market advantages could be the APA itself, however, it is unknown if they will produce a similar software in addition to what they already have on the market.

6. How will the project provide an opportunity for the student to demonstrate the academic and experiential competence?

This thesis project will strongly enhance the student's knowledge in computer science and business. Skills needed to work on this project include knowledge of which programming language to use and why, design of a software system, algorithm design, learning a new programming language, self-teaching machine learning with assistance from faculty and resources, learning about neural networks and training them, problem-solving, and working in an entrepreneurial environment.

By working on the project, the student must work in a cross-disciplinary team. Combining psychology and computer science allows the student to rethink about the problem in a different light, incorporate principles of psychology into the functions of the program, and be willing to try different ways of solving a problem.

Since the student's work is mostly self-directed, the student must plan each milestone and work to meet them.

7. What is the project timeline?

The proposed official starting term is Summer 2017. The proposed completing term is Winter 2018. The completed report is expected to be finished Spring 2018.

More specifically, work will begin on the first work term after proposal approval, Winter 2017. The student will work on this part-time while working at the co-op company full-time. Work anticipated to be done this term would be research and preliminary product development. The project will be anticipated to reach 25% completion by the end of that work term.

During the next work term, Summer 2017, the student plans to work on this project full-time. This will be mainly development and testing.

A progress report will be submitted to CCUE in the Winter 2018 term, and the student will start to write the thesis draft during this term. If there is still some development/testing work uncompleted from the previous Summer term, they will be completed this term. By the end of this term, a thesis draft will be sent to the faculty advisor.

The final written report will be completed in Spring 2018, the student's last academic term. Final thesis review is expected to be completed this term, and the final thesis is expected to be submitted to CCUE this term.

The Gantt chart proposed is shown in the next page.



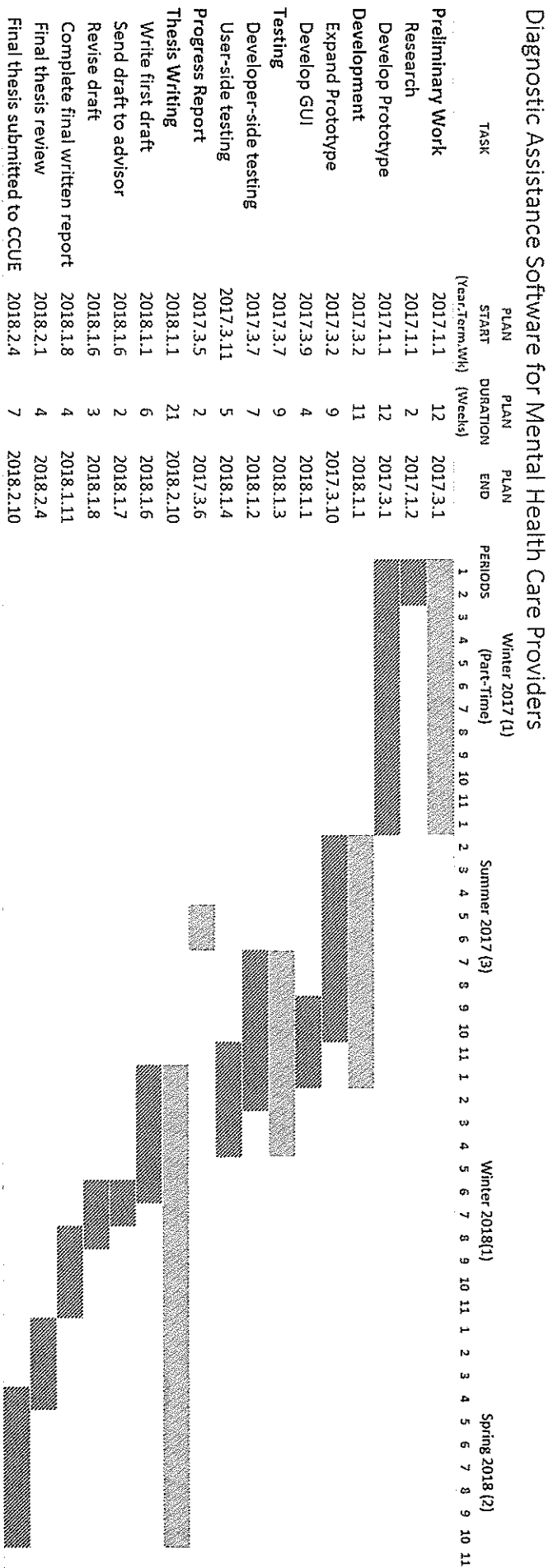


Figure 1. Gantt Chart for Proposed Thesis.