SYST 542

Decision Support Systems Engineering

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http://mason.gmu.edu/~pcosta

Course Description

Fall 2013

The main focus of this course is the design of computerized systems to support individual or organizational decisions, providing a systems engineering approach to the decision support system (DSS) lifecycle process. The course topics include factors leading to effective computerized support for decisions, characteristics of tasks amenable to computerized support, basic functional elements of a decision support system, the decision support lifecycle, and factors leading to successful integration of a DSS into an organization. Additional topics include support for multi-person decisions, support for distributed decision processes, support for time-critical decisions, and how to refine and improve an organization's DSS development capability. A DSS is built on a theory (usually implicit) of what makes for successful decision support in the given context. Empirical evaluation of the specific DSS and underlying theory should be carried on throughout the development process. The course examines some prevailing theories of decision support, considers the issues involved in obtaining empirical validation for a theory, and discusses what if any empirical support exists for the theories considered. Students design a DSS for a semester project.

Class Details

> *Prerequisites: SYST 210 – Systems Methodology and Design I, or graduate standing*
> *Equivalent to: EEP 602 - Decision Support for Enterprise Integration*
>
> *Classes*
> ** This course includes concurrent face-to-face (F2F) and distance learning (DL) sessions.*
> ** Class time for all sessions will be on Wednesdays, from 4:30 p.m. to 7:10 p.m.*
> ** F2F sessions will be held at room 2608 of the Nguyen Engineering Building.*
>
> *Office hours*
> ** Room 2227 of the Nguyen Engineering Building.*
> ** Wednesdays, from 3:00 p.m. to 4:00 p.m., or by appointment.*
> ** Virtual office hours (DL students): by appointment.*
> ** Prof. Costa contact data: (703) 993-9989 / pcosta@gmu.edu.*

Administrative
  * *Registration deadline (and last day to drop without penalty): September 3rd.*
  * *Last day to drop with 33% Tuition Penalty: September 18th.*
  * *Final drop deadline (with 66% Tuition Penalty): September 27th.*

Course Logistics

1. Students attending the DL sessions **_must_** have a headphone plugged to their computer. Failure to do so incurs in unacceptable background noise levels, which interfere with the class. The offending student will be forced to mute status, which is not compatible with the course format.

2. All course communication will be done via the Blackboard system. Students are expected to have access and be able to use the system before classes start. Blackboard is accessible via the MyMason portal at https://mymasonportal.gmu.edu/. Instructions for using the Blackboard system are provided in the "resources" link at the bottom of the portal page.

3. DL students will use Blackboard Collaborate to connect to this class. This means that to attend class they must log into Blackboard and connect to the Collaborate session within Blackboard. In addition to the instructions at the "resources" link, A student guide for using Collaborate is located at https://gmucollaborate.pbworks.com/w/file/51844314/Collaborate_Student_Guide.pdf

4. Failure to access the system due to lack of knowledge on Blackboard or Collaborate is not an excuse for missing classes, late assignments, or failing course deliverables.

5. Volgenau School Computing Resources has answers to many questions about school systems on their web site: http://labs.vse.gmu.edu and will try to help you if have problems connecting to school computing systems. However, they will not provide assistance with general computing questions or course assignments. Please contact me if you have any questions about how to use software to complete your assignments. Other resources that you may find helpful may be found at: http://ctfe.gmu.edu/teaching/student-support-resources-on-campus/.

6. Accommodations for disability: If you have a documented learning disability or other condition that may affect academic performance you should: 1) make sure this documentation is on file with Office of Disability Services (SUB I, Rm. 4205; 993-2474;http://ods.gmu.edu) to determine the accommodations you need; and 2) talk with me to discuss your accommodation needs.

7. Inclement weather: Class sessions cancelled due to inclement weather or other University emergencies may meet online in Blackboard Collaborate. Check the Announcements area for the course for updates.

Expected Behavior

1. Attendance in class is essential, no matter whether you are in the F2F or in the DL sessions. Information will be presented that will not necessarily be in the book, and is almost certain to be needed in course assignments.

2. You are allowed to enter or leave class at any time, provided you do your best to avoid disrupting the activity going on.

3. Please make sure you have your electronic devices in silent mode. Should you find yourself in extreme need to answer an incoming call, just leave the room to do so.

4. Students are encouraged to interact on homework assignments, but your write-up must be your own. Assignments are intended to provide practical, hands-on experience with the ideas presented in the course.

5. Assignment dates and scheduling provided below are subjected to changes, which will be posted to Blackboard but not necessarily warned. It is the students' responsibility to keep abreast of changes.

6. With a few exceptions, almost all of the course deliverables are submitted electronically (e.g. reports), scheduled in advance, and with some flexibility for students to change. Should any scheduled event impact a student's participation in class activities and assignments, it is the student's responsibility to coordinate with me in advance.

7. Religious observances are one common example of events that might impact students' activities. Students are responsible for planning ahead. Please, refer to the GMU's calendar o f religious holidays at http://ulife.gmu.edu/religious_calendar.php.

8. Late assignments, when properly justified, will receive reduced credit in accordance with the late assignment policy (below in this document). No points will be awarded if homework is turned in after solutions have been posted.

9. Academic Policy: All academic policies as given in the Honor System and code will be strictly followed. These are available at http://catalog.gmu.edu/content.php?catoid=19&navoid=4113.

10. General Policies: All general policies defined in the University Catalog are in place for this course. You can access those at http://catalog.gmu.edu/content.php?catoid=19&navoid=4114.

Mason Diversity

Mason Diversity: George Mason University promotes a living and learning environment for outstanding growth and productivity among its students, faculty and staff. Through its curriculum, programs, policies, procedures, services and resources, Mason strives to maintain a quality environment for work, study and personal growth.

An emphasis upon diversity and inclusion throughout the campus community is essential to achieve these goals. Diversity is broadly defined to include such characteristics as, but not limited to, race, ethnicity, gender, religion, age, disability, and sexual orientation. Diversity also entails different viewpoints, philosophies, and perspectives. Attention to these aspects of diversity will help promote a culture of inclusion and belonging, and an environment where diverse opinions, backgrounds and practices have the opportunity to be voiced, heard and respected.

The reflection of Mason's commitment to diversity and inclusion goes beyond policies and procedures to focus on behavior at the individual, group and organizational level. The implementation of this commitment to diversity and inclusion is found in all settings, including individual work units and groups, student organizations and groups, and classroom settings; it is also found with the delivery of services and activities, including, but not limited to, curriculum, teaching, events, advising, research, service, and community outreach.

Acknowledging that the attainment of diversity and inclusion are dynamic and continuous processes, and that the larger societal setting has an evolving socio-cultural understanding of diversity and inclusion, Mason seeks to continuously improve its environment. To this end, the University promotes continuous monitoring and self-assessment regarding diversity. The aim is to incorporate diversity and inclusion within the philosophies and actions of the individual, group and organization, and to make improvements as needed.

Academic Integrity

George Mason University is an Honor Code university. Please see the Office of Academic Integrity website (http://academicintegrity.gmu.edu/honorcode/) for a full description of the honor code and the honor committee process.

The principle of academic integrity is taken very seriously and violations are treated gravely. What does academic integrity mean in this course? Essentially this: when you are responsible for a task, you will perform that task. When you rely on someone else's work in an aspect of the performance of that task, you will give full credit in the proper, accepted form. Another aspect of academic integrity is the free play of ideas. Vigorous discussion and debate are encouraged in this course, with the firm expectation that all aspects of the class will be conducted with civility and respect for differing ideas, perspectives, and traditions. When in doubt (of any kind) please ask for guidance and clarification.

Graduate work is often best completed in a collaborative manner. Active discussion and support between students is encouraged. You will be assigned to a project group for the course's final assignment. This collaborative project may be divided up so that individual group members complete portions of the whole, provided that group members take sufficient steps to ensure that the pieces conceptually fit together in the end product. Other assignments are designed to be completed independently. For these assignments, you are encouraged to discuss your ideas with others and conference with peers on drafts of the work and to incorporate the results of those discussions in the work; however, the final product you submit must be your own individual work.

Course Outline

8/28	Week 1	Course Logistics, "SYST 542 Crew" exercise, Unit 1, Definition of Facilitator teams
9/4	Week 2	Unit 2, DQ1 debate, suggested paper due, group assignments, definition of the paper review presentation schedule

9/11	Week 3	Unit 2, DQ2 debate, Unit 3
9/18	Week 4	Unit 3, Unit 4
9/25	Week 5	Unit 4, invited lecturer
10/2	Week 6	Unit 4, paper presentation
10/9	Week 7	Unit 5, DQ3 debate, paper presentation, group progress report due
10/16	Week 8	Unit 6, DQ4 debate, report presentations
10/23	Week 9	Unit 6, paper presentation
10/30	Week 10	Paper presentations, DQ5 debate, Unit 7
11/6	Week 11	Unit 7, paper presentation, DQ6 debate, Unit 8
11/13	Week 12	Unit 8, paper presentations
11/20	Week 13	Unit 9, paper presentation, DQ7 debate
11/27	No Classes	Thanksgiving break
12/4	Week 14	Group presentations
12/10	No Classes	Group report due

> **This is a very dynamic and intensive course. Exercise planning, be proactive and do your best to stay ahead of schedule.**

Textbook
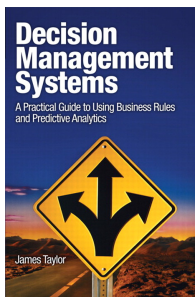
Decision Management Systems: A Practical Guide to Using Business Rules and Predictive Analytics
James Taylor
IBM Press; 1 edition (October 10, 2011). 320p.
ISBN-10: 0132884380
ISBN-13: 978-0132884389

In addition to the course text, this is a graduate course in which different aspects of DSS are going to be explored and the ability to conduct independent research is expected. Therefore, students are encouraged to also refer to the following resources when performing their assignments:

- [Decision Support Systems and Intelligent Systems](), 8th edition, by Ephraim Turban, Jay Aronson, Ting-Peng Liang, and Ramesh Sharda, Prentice-Hall, 2007. ISBN-10: 0131986600.
- [Decison Support Systems](), 2nd Edition, by George Marakas, Prentice-Hall, 2003. ISBN-10: 0130922064.
- [Making Hard Decisions](), 2nd Edition, Robert Clemen, Duxbury, 1997. ISBN-10: 0534260349.
- [Value-Focused Thinking: A Path to Creative Decisionmaking]() (Paperback), Ralph L. Keeney, Harvard University Press, 1996. ISBN-10: 067493198X.
- Decision Support Systems Hyperbook, Power, D.J., accessed August, 2006 at [http://dssresources.com]().
- [Spreadsheet Modeling & Decision Analysis](), 5th Edition, Cliff T. Ragsdale, Thomson; South-Western, 2007. ISBN-10: 0324312504.

Disclaimer: the links to amazon.com above were provided solely as a reference to facilitate students in their research (e.g. via the University's library system). Neither the instructor is recommending this store nor these references are required for this course.

Lecture Notes

Lecture notes for each chapter will be made available from the Blackboard course page before class. You will need to [download Adobe Acrobat Reader]() to read these lecture notes.

Grading

The grading structure of this course is as follows:

- Group Project (45% of grade)
- Weekly Discussion question (30% of grade)
- Facilitating and reporting on a Weekly Discussion question (5% of grade)
- Paper Review (20% of grade)

Group Project

Overview. Students should divide themselves in the first class into groups of 3 to 5 people. Each group will design and implement a DSS for a problem of their choice. Group assignments will be made by the second week of classes. Groups may meet in person or via virtual sessions as often as necessary and are encouraged to interact between meetings. The problem you choose is entirely up to you.

Progress report. Groups should provide one 5-page written progress report during the course and present it in class. This report is intended to provide me with both an update on each group progress as well as with a means to support each group in

succeeding with their goals. The progress report is evaluated and accounts for 10% of the Group's grade.

The progress report must be submitted via Blackboard by Wednesday, 10/9 (week 7 of the course), 11:59 p.m. eastern time. This report should include:

- Description of the DSS Concept;
- User requirements (draft); and
- Project management plan.
- Description of the model, dialogue and data subsystems;
- Implementation plan (what will be implemented in your prototype); and
- Evaluation plan (how will you evaluate your prototype).

A progress report presentation should be given in class on Wednesday, 10/16 (week 8 of the course). Details regarding this presentation will be given closer to the event. . The progress report presentation is evaluated and accounts for 10% of the Group's grade.

Group Project Oral presentations. Each group will have 30 minutes to present their work, while at least 5 minutes will be reserved for questions. Slides must be submitted via Blackboard no later than 2 p.m., Eastern Time, of the day before the presentation! It is tolerable to make changes to your presentation after submitting it, although you are expected to handle a reasonably "close-to-final" version of the actual presentation.

All group components are expected *to present* and *to be available for questioning*. A demo of your prototype is required and will count towards your final grade, but you must ensure that all aspects of your project are evenly represented.

The final presentation must include a live demonstration of a DSS prototype. Usually, DSS prototypes were based on an excel model implementing some of the techniques learned in the course to solve the problem chosen by the group. There have been groups in the past using more sophisticated approaches, such as a python or a java-based front end to an excel model. Although polished and sophisticated prototypes are welcomed, the minimum requirement is only an Excel-based implementation of a DSS.

Group Project Final report. A 10-15 pages written report is due on Wednesday 12/10, 11:59 p.m. Eastern Time. It must be submitted via the Blackboard system, which will have a suggested outline available to students. Neither the bibliography section nor the appendices count towards the page limit.

Group Grading. Groups may select any implementation environment they judge appropriate for their respective problem. The Group Project grading is structured as follows:

- Progress report (10%);
- Progress report presentation (10%)
- Oral presentation and demo (40%); and
- Final report (40%).

Individual Grading. Your grade on this project will be partly a group grade and partly an individual grade. You are expected to rate each person of your team – including you - on a 100-point scale. The rating scale is as follows:

- **90-100** Participated enthusiastically, exhibited strong leadership, attended regularly and was essential to meetings, performed tasks responsibly and on time, work was extremely high quality, took excellent initiative and was highly self-motivated;
- **80-90** Good participation, attended and contributed to meetings, exhibited leadership, performed tasks responsibly and on time, work of dependable high quality, took good initiative and was self-motivated;
- **70-80** Adequate participation, usually attended and contributed to meetings, exhibited some leadership, performed tasks responsibly and usually on time, work of dependable good quality, took reasonable initiative and was reasonably self-motivated;
- **50-70** Participation could have been better, performed tasks when asked but may have been late and/or needed reminders, quality could have been better, needed guidance and usually did not take enough initiative;
- **up to 50** Participation was minimal or non-existent; any work that was turned in was of inadequate quality.

The individual grade of each student will be based on the average of your peer evaluations, on your self-critique, and on my own observations.

Weekly Discussion

Each week (with occasional weeks off) a discussion question will be posed to the class for asynchronous electronic discussion prior to the next class. Discussion questions are based on a common theme and cumulatively lead to a collaboratively developed case study. The overall discussion process includes an open discussion and a written response. The Blackboard System's resources must be used during all phases of the process.

- ***Logistics:*** The discussion question will be posted by noon the day after class and will be based on issues raised during the previous class. As soon as the discussion question is posted it starts the open discussion process, which involves two distinct phases: a forum debate and an in-class debate. In order to

receive at least 50% of the grade, each student is required to post at least one comment to the group forum during the forum debate phase.

- **Grading Criteria for the Weekly Discussion:** Each student will receive his or her grade by email during the week following submission. The grading structure is as follows:
  - ○ Participation in the forum (60%)
  - ○ Final response (40%).

- **Participation in the forum:** It is composed by two phases, the offline debate and the in-class debate. All students will receive an overall participation grade for their respective contributions to both the offline debate and the in-class debate. To receive at least 50% of your final participation grade, you must submit a post to the forum that has non-trivial contribution: For example, "I agree with Joe Average," does not count as a meaningful participation. However, a brief summary of Joe's position, how it contrasts with the positions given by other students, and your reasons for agreeing with Mary, will receive full participation grade for this phase.
  - ○ **Offline debate**. It will be conveyed via the Blackboard system, starting as soon as the discussion question is posted and ending at 5:00 PM EST of the following Tuesday. In the event that Blackboard is down at the time of the deadline for posting for open discussion, you may email your post to me and submit to the forum later. You are expected to engage in at least one discussion thread of the forum, and provide meaningful input to this thread. A latest-hour, single post to the offline debate is considered the minimum participation level eligible for grading.
  - ○ **In-class debate:** The facilitator team assigned to that weekly discussion is responsible for moderating the discussion as well as providing a report on the overall discussion process. The facilitator team is expected to coordinate the debate and make sure that it takes no more than 40 minutes of class time. Your performance on the in-class debate should be complementary to your offline participation, and you are expected to provide at least one meaningful contribution in this phase in order to receive credit.

  Remember, you are evaluated by your overall participation. You are not supposed to answer all the posted questions or to participate in all discussion threads, but your level of commitment and quality of your input will have a considerable weight in this grade.

- **Written response:** Each student must submit a written response to the instructor by 11:59PM EST on the second day after the class in which the discussion occurs, which for this semester means Friday, 11:59PM EST. Your grade in this written response accounts for 40% of the overall Weekly Discussion grade. With possible exceptions as noted by the instructor, it *must be less than one typed page*. In some cases, a graphic may be appropriate. If so, you

can embed the graphic in your document or attach a separate image file. There should be no more than one page of graphics. Your response may draw on any points made during open discussion. It must be a self-contained response to the discussion question, written in your own words. Ideally, you should explore the group consensus (or most popular views) pointing out aspects you agree (i.e. reinforce with your own views/experience), disagree (provide reasons), would like to complement, etc.

- o ***Written response submission:*** It should be uploaded via Blackboard or, in case of unavailability of it, sent by email to the instructor. In either case, you should abide to the submission convention as follows.
  For example, if your name is John Smith and you are responding to discussion question 2, you must have:

    - ▪ Subject line: Discussion Question 2 – John Smith

    - ▪ File attachment(s): DQ2_JohnSmith (DQ2_JohnSmith2, ….)

Facilitating and reporting a weekly discussion

For each weekly discussion, a team of two or three students will be responsible for the facilitation and the reporting of that specific process. The grading is structured as follows:

- Facilitating the open discussion: 60% of the grade.
- Documenting the process: 40% of the grade.

That is, the group will receive a grade based on both their ability to facilitate the discussion and their respective report of the discussion process. The assignment for the facilitating teams will be performed during the first day of classes, and the first facilitating will start their job the next day (i.e. as soon as the discussion question is posted).

The role of the moderator is to lead the class in a productive discussion of the issue raised in the week's question. We will be collaboratively developing an operational concept for the case study DSS we have selected and laying out key elements of a preliminary design. The objective each week will be to come to consensus on some aspect of our design. For example, our objective in the first week is to agree upon the stakeholders, the decisions to be supported, how the DSS will be used, and our approach to obtaining requirements.

Typically, the discussion leader / facilitator will begin by presenting a brief summary of the main ideas raised in the initial discussion. If there are disagreements or issues that need clarification, these should be pointed out. Then the discussion leader will engage the class in debating any issues on which there is disagreement, trying to work toward consensus. An important role for the moderator is to keep the discussion from

wandering off-topic. The moderator will also try to give everyone a chance to speak. Remember: the moderator, not the professor, is leading the discussion!

At the end of the discussion, the moderator will summarize the key points covered during the discussion, summarize what has been agreed upon, and state any remaining areas of disagreement. Each facilitating team, usually a team member assigned as scribe, will have to record the main points made during the discussion, to note the key areas of agreement and disagreement, and to post the notes after the discussion in the discussion section of Blackboard. The team is supposed to post their respective notes *no latter than two hours after the class*, so that students will be able to use these notes when formulating their final responses to the discussion question.

Each facilitating team is free to define their respective modus operandi and work breakdown structure. It should be noted from previous experiences that a minimal planning and task assignment effort drastically improved the performance of the team and the quality of the discussion process as a whole. Likewise, teams that just operated as independent facilitators without a pre-defined strategy consistently led to below average discussions.

Paper Review

By the second week of class, each student will choose a DSS article from either a peer-reviewed conference or an academic journal. Students are expected to write a review of the paper and present his/her respective assessment and conclusions to the class via 20 min oral presentation followed by a 5-min questioning session. The Paper Review grading is structured as follows:

- Written review report: 60% of the grade.
- Oral presentation: 40% of the grade.

Oral presentation. The presenter must upload his slides to the Blackboard system no latter than 2 p.m. Eastern Time of the day before his/her presentation. Minor changes to the slides after submission are allowed, but the submitted version must be very close to the actual presentation. All students are expected to read the abstracts and view the slides prior to each presentation. However, those really interested in maximizing their learning experience are advised to read the actual paper before the presentation and fully use their participation rights at the questioning session.

Written review report. Ideally, it should have a length of 3 to 4 pages, while 6 pages is the actual limit. Students are expected to submit the report one week after their respective presentations, by 11:59 p.m. Eastern Time. They are strongly advised to go beyond a mere description and exercise their critical side, and special attention should be given to a proper support for each critique, being it positive or not. As an example,

"his idea of automating the data collection process is awful ... because I don't think it would work" is a common instance of an empty evaluation. In this case, the reviewer should have supported his assessment with either facts (e.g. "this has been tried in system so-and-so and achieved such-and-such results) or references (e.g. "Smart, Maxwell; *et al.*, 1965, proved this approach to be sub-optimal"). You will be evaluated on your ability to provide a thoughtful and well-supported review.

> ### BEST WISHES FOR A GREAT SEMESTER!!!

Fairfax, October 28, 2013.

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