Professors: Joe Hahn and Sam Seaman

DESC-637.02

Multi-Attribute Decision Analysis

Spring Trimester 2011 – B Session

Thursday

8:00 – 12:00 AM

Malibu Campus

SYLLABUS
DESC-637: Multi-Attribute Decision Analysis  
Spring 2010

Day and Class times: Thursday, 8:00-12:00 AM  
Location: Malibu Campus, Beckman Management Center  
Professor: Joe Hahn and Sam Seaman  
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Course Description

One of the major classes of problems in the field of decision analysis is one-time decisions where a group of alternatives must be compared on the basis of multiple (and possibly competing) goals and objectives. This type of problem, called a multi-attribute decision, is found in many resource allocation and policy-making applications. As leaders in business increasingly consider the social and environmental consequences of their firms’ actions, the ability to solve multi-attribute decision problems is becoming progressively more important. There are also many personal decision-making problems that involve multiple attributes (both quantitative and qualitative), such as choosing a job or purchasing a home. The challenge in this type of decision is to create a "value model" that allows explicit comparisons between alternatives that often differ in many ways.

The study of these types of decisions is based upon Multi-Attribute Utility Theory (MAUT), which is an extension of the fundamental axioms of decision analysis. MAUT provides a framework for quantitative models that utilize a multi-dimensional utility function to compute an alternative's overall desirability based on how it performs on a set of evaluation measures. In this approach we make a clear distinction between the choices that can be made (the alternatives), the characteristics of the alternatives (quantified by the measures) and the relative desirability of different sets of characteristics (preferences). These distinctions allow the clear separation of the objective and subjective parts of a decision. The basic methodology for multi-objective problems, which is typically supported with a spreadsheet model or software application, consists of the following steps:

1. Identify the alternatives to be ranked.  
2. Clarify the goals and objectives that should be met by choosing the top-ranking alternative.  
3. Identify measures to quantify how well the alternatives meet the goals and objectives.  
4. Quantify the level for each measure for each alternative.  
5. Quantify preferences about different levels of the measures.  
6. Rank the alternatives by combining information from steps (4) and (5).  
7. Do "sensitivity analysis" to see the effects on the results of changes in measure levels or preferences.
In this class, we will first briefly review the axioms of decision analysis and present the theory of multi-attribute utility. We will then develop a methodology for implementing this theory to solve multi-objective problems, and demonstrate the application to several real-world applications, ranging from simple personal decisions, to strategic decisions for large firms. Two of the examples we will consider are a case of resource allocation in an R&D organization where the value of individual projects is not well known, and resource allocation and portfolio management in a non-profit firm, where the decision criteria include welfare defined across a broad group of potential stakeholders, “competitive” strategy with others in the non-profit space, donor/sponsor support, charter/social agenda, and many others.

**Mission**

This course explores the role of the values-centered leader in decision-making, and includes aspects of social, ethical and environmental stewardship in establishing the optimal decision policies for a firm. In addition, this course advances the Graziadio School’s mission of including applied research topics in the education of its graduate business students.

**Textbook and Course Materials**


**Grading**

- Homework: 30%
- Case Assignments: 30%
- Final Project: 40%

**Grading Scale**

<table>
<thead>
<tr>
<th>Min</th>
<th>Max</th>
<th>Letter Grade</th>
<th>Grade Point</th>
</tr>
</thead>
<tbody>
<tr>
<td>93</td>
<td>100</td>
<td>A</td>
<td>4.0</td>
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<tr>
<td>90</td>
<td>92.99</td>
<td>A-</td>
<td>3.7</td>
</tr>
<tr>
<td>87</td>
<td>89.99</td>
<td>B+</td>
<td>3.3</td>
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<tr>
<td>83</td>
<td>86.99</td>
<td>B</td>
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<tr>
<td>80</td>
<td>82.99</td>
<td>B-</td>
<td>2.7</td>
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<tr>
<td>77</td>
<td>79.99</td>
<td>C+</td>
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<tr>
<td>70</td>
<td>72.99</td>
<td>C-</td>
<td>1.7</td>
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**Course Computing:**

The software used in this class is the academic version of Logical Decisions, which will be available for purchase through the website [www.logicaldecision.com](http://www.logicaldecision.com) at student pricing. We will be working through examples using this software during classes, so students are encouraged to bring their notebook computers to follow along.

### SCHEDULE

<table>
<thead>
<tr>
<th>Date</th>
<th>Topic</th>
<th>Reading*</th>
<th>Practice Problems</th>
<th>Assignments</th>
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<tbody>
<tr>
<td>Mar. 3</td>
<td>Introductions to Multi-Attribute Decision Theory, Structuring Decisions, Defining Objectives, Attributes and Preferences</td>
<td>C&amp;R pp. 1-12&lt;br&gt;C&amp;R pp. 43-68&lt;br&gt;C&amp;R pp. 79-83&lt;br&gt;LD Ch. 3&amp;4</td>
<td>Install Logical Decisions on your laptop, and bring it to class.</td>
<td>Review the tutorial for the software (Chapter 4 in LD)</td>
</tr>
<tr>
<td>Mar. 10</td>
<td>Analysis of Multi-Attribute Problems with Decision Trees, Probabilistic Inputs</td>
<td>C&amp;R pp. 133-145&lt;br&gt;C&amp;R pp. 154-159&lt;br&gt;LD Ch. 5</td>
<td></td>
<td>Prescribed Burn Goals Hierarchy</td>
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<td>Mar. 17</td>
<td>Expected Utility Theory, Risk Attitudes, Utility Assessment</td>
<td>C&amp;R pp. 527-546&lt;br&gt;LD Ch. 6</td>
<td></td>
<td>Mad Hatter Case</td>
</tr>
<tr>
<td>Mar. 24</td>
<td>Utility Axioms and Paradoxes, Preference Assessment</td>
<td>C&amp;R pp. 571-594&lt;br&gt;LD Ch. 7</td>
<td></td>
<td>Mad Hatter Case (using LD) Thorlar Case</td>
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<td>Mar. 31</td>
<td>Advanced Issues in Multi-Attribute Decision-Making</td>
<td>C&amp;R pp. 598-629&lt;br&gt;C&amp;R pp. 644-667&lt;br&gt;LD Ch. 9-55 to 64</td>
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<td>SouthPort Mining Case</td>
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<td>Apr. 7</td>
<td>Aggregation of Individual Preferences, Group Decisions</td>
<td>Handout</td>
<td></td>
<td>Blood Bank Case</td>
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<td>Apr. 14</td>
<td>Final Project Presentations</td>
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<td>Final Individual Project</td>
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**Conduct**

The University expects from all of its students and employees the highest standard of moral and ethical behavior in harmony with its Christian philosophy and purposes. Engaging in or promoting conduct or lifestyles inconsistent with traditional Christian values is not acceptable.

The following regulations apply to any person, graduate or undergraduate, who is enrolled as a Pepperdine University student. These rules are not to be interpreted as all-inclusive as to situations in which discipline will be invoked. They are illustrative, and the University reserves the right to take disciplinary action in appropriate circumstances not set out in this catalog. It is understood that each student who enrolls at Pepperdine University will assume the responsibilities involved by adhering to the regulations of the University. Students are expected to respect order, morality, personal honor, and the rights and property of others at all times. Examples of improper conduct for which students are subject to discipline are as follows:

- Dishonesty in any form, including plagiarism, illegal copying of software, and knowingly furnishing false information to the University.
- Forgery, alteration, or misuse of University documents, records, or identification.
- Failure to comply with written or verbal directives of duly authorized University officials who are acting in the performance of assigned duties.
- Interference with the academic or administrative process of the University or any of the approved activities.
- Otherwise unprotected behavior that disrupts the classroom environment.
- Theft or damage to property.
- Violation of civil or criminal codes of local, state, or federal governments.
- Unauthorized use of or entry into University facilities.
- Violation of any stated policies or regulations governing student relationships to the University.

Disciplinary action may involve, but is not limited to, one or a combination of the alternatives listed below:

- **Dismissal** – separation of the student from the University on a permanent basis.
- **Suspension** – separation of the student from the University for a specified length of time.
- **Probation** – status of the student indicating that the relationship with the University is tenuous and that the student’s records will be reviewed periodically to determine suitability to remain enrolled. Specific limitations to and restrictions of the student’s privileges may accompany probation.”

**Policy on Disabilities**

**Assistance for Students with Disabilities**

The Disability Services Office (DSO) offers a variety of services and accommodations to students with disabilities based on appropriate documentation, nature of disability, and academic need. In order to initiate services, students should meet with the Director of the DSO at the beginning of the semester to discuss reasonable accommodation. If a student does not request accommodation or provide documentation, the faculty member is under no obligation to provide accommodations. You may contact the Director of Disability Services at (310) 506-6500. For further information, visit the DSO Web site at: [http://www.pepperdine.edu/disabilityservices/](http://www.pepperdine.edu/disabilityservices/)