

Dynamic Decision Making Research
Nowy Sacz School of Business
June 3 - June 5, 2009

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Lecture: 12:00 to 4:00PM.

OVERVIEW

Research on behavioral decision making has been largely dominated by one-choice models, where alternatives with probable outcomes are given. Expected Utility Theory (EUT) is the most common model of decision making, predicting that the selected alternative is the one with the highest utility defined by the size of the payoff and its probability of occurrence. In contrast, the 'closed loop' view of decision making suggests that alternatives develop over time, probabilities are not known and outcomes are only observed through feedback after a decision has been made. Relevant models for this closed loop view of decision making are "Decisions from Experience" and "Learn by doing."

The closed loop view of decision making has been studied for many years in the field of Dynamic Decision Making (DDM). In contrast to the choice paradigm, DDM does not idealize the conditions under which we make decisions, but it rather embraces multistage repeated decisions, time constraints and workload, immediate and delayed feedback, and decisions from experience. DDM extends the repeated choice paradigm to more realistic conditions of choice.

This seminar-style course will take you to the fascinating and unexplored world of DDM research through the reading, discussion, and critical evaluation of research articles in the field. We will also discuss relevant concepts of DDM research through computer Decision Making Games (DMGames), developed in my laboratory.

Each day of the seminar is divided into themes. The first day of the seminar I will give the basic initial concepts and the organization of the course. I will also lecture on the first themes of DDM. Each of you will be assigned to be the leader of one theme and the discussant of another theme. The goal of the leader is to introduce the theme for discussion according to the readings and guide the discussion of the theme. The goal of the discussant is to document the major conclusions and points of discussion throughout the theme discussion. This seminar is an interactive course where every participant is expected to have vigorous exchanges of ideas with all the participants. Every participant in this seminar is expected to:

1. Read and critique each of the readings planned for the day. You can use the worksheet provided to you at the end of this document.
2. Prepare a critique in advance for each article, and bring ONE question pertinent to each theme of discussion to be addressed in the session.
3. Attend and participate actively in the session

This is the routine of a prototypical seminar session:

1. The theme leader will describe, illustrate, and motivate the theme for discussion.
2. The leader will share his or her thinking about the articles assigned to that theme and the findings to date.

3. The leader will collect the question prepared by each of the participants of the session and will guide the discussion towards answering each of those questions.
4. All seminar participants will then discuss the main theme and each of the readings actively, towards answering the questions.
5. The discussant will summarize the major points of discussion and present the conclusions at the end of the theme discussion.
6. Occasionally, I will motivate the relevant concepts of the theme through the presentation of a Decision Making Game (DMGames) relevant to the theme.

OBJECTIVES

When you complete this course, you will have a concrete understanding of the current research in the field of DDM. You will understand the history of the field, the questions that have been addressed in the field, and the many questions that are left to answer. In many ways, this course will elicit more questions than answers, reflecting how little we know about how people make decisions in dynamic and complex environments. I hope that this course can help us all clarify some of these research questions and come up with ideas on how to address and answer the relevant questions.

READINGS & REQUIREMENTS

Selected articles have been provided to you in a reading packet. When I refer to the readings below, I will write the Author(s) and Year. Please refer to the corresponding publication using the name on the file. Your goal for the end of the seminar is to write a summary research paper, due on **June 6, 2009**. One day after the course is over. The research paper is a 4-page manuscript in the format provided at the end of this document. The paper should be titled: "Dynamic Decision Making Research" intended to summarize the state of the art in this research field, the main findings, your opinions on the research done and the research questions left to answer. Please turn this in by E-mail to me: coty@cmu.edu, no later than June 6, 2009. I will review it and give you feedback, also by E-mail.

THE SCHEDULE

<u>Date</u>	<u>Topic & Readings</u>
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June 3	Introduction and History of DDM Research
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Introduction to the DDMLab. Dr. Gonzalez will present a brief introduction to the different research questions addressed in her Dynamic Decision Making Laboratory (www.cmu.edu/ddmlab). These represent some of the major topics of research in the field that will be covered in this course. This session will occur during the faculty meeting 12-1 PM.

History of DDM research. Dr. Gonzalez will lecture on the history of DDM research, the similarities, differences and connections that the field of DDM has with the more traditional Behavioral Decision Making field, and the Naturalistic Decision Making perspective. Some of the relevant research papers on this session are:

Edwards, 1962
Brehmer, 1992

Research Methods and Major Research Topics. Dr. Gonzalez will lecture on the research methods used in DDM research including: Experimental studies with Decision

Making Games and Computational Cognitive Modeling. She will also briefly summarize the major research topics in DDM research and present the logistics for the rest of the seminar. Some of the relevant research papers on this session are:

Funke, 1995

Gonzalez, Vanyukov & Martin, 2005

June 4 The Basic Building Blocks of Dynamic Systems

The Beer Game. Dr. Gonzalez will lead a group of volunteer participants to play the Beer Game, a Supply Chain Management task that has inspired a significant amount of research in DDM. Some of the relevant research papers on this session are:

Sterman, 1989

Diehl and Sterman, 1995

Stocks and Flows. The **leaders of this theme** will present a brief introduction based on their prepared critiques of the articles assigned to this theme (see below). Then the leaders will pick up the questions pertinent to the theme that each of the participants of the seminar has prepared. If these questions have not been addressed already by the discussion of the leaders, they will be discussed at this point. The **discussants** will summarize the major points of discussion during the session and present the conclusions. The relevant research papers on this session are:

Sweeney and Sterman, 2000

Cronin, Gonzalez, & Sterman, 2009

Learning in Dynamic Systems. The **leaders of this theme** will present a brief introduction based on their prepared critiques of the articles assigned to this theme (see below). Then the leaders will pick up the questions pertinent to the theme that each of the participants of the seminar has prepared. If these questions have not been addressed already by the discussion of the leaders, they will be discussed at this point. The **discussants** will summarize the major points of discussion during the session and present the conclusions. The relevant research papers on this session are:

Dienes and Fahey, 1995

Gonzalez, Lerch, Lebiere, 2003

June 5 Research Topics in Complex, DDM.

Firefighting and Dynamic Resource Allocation. Dr. Gonzalez will lead a demonstration of the relevant topics of this theme through the presentation of two DMGames used in her research: Firechief and the Water Purification Plant.

Feedback. The **leaders of this theme** will present a brief introduction based on their prepared critiques of the articles assigned to this theme (see below). Then the leaders will pick up the questions pertinent to the theme that each of the participants of the seminar has

prepared. If these questions have not been addressed already by the discussion of the leaders, they will be discussed at this point. The **discussants** will summarize the major points of discussion during the session and present the conclusions. The relevant research papers on this session are:

Brehmer, 1992
Gonzalez, 2005.

Time Pressure and Workload. The **leaders of this theme** will present a brief introduction based on their prepared critiques of the articles assigned to this theme (see below). Then the leaders will pick up the questions pertinent to the theme that each of the participants of the seminar has prepared. If these questions have not been addressed already by the discussion of the leaders, they will be discussed at this point. The **discussants** will summarize the major points of discussion during the session and present the conclusions. The relevant research papers on this session are:

Gonzalez, 2004
Gonzalez, 2005

Term paper due June 6, 2009. Please send the term paper in the format provided to you by E-mail to: coty@cmu.edu.

WORKSHEET FOR CRITIQUES OF ARTICLES

Reading original articles helps learn first-hand how research ideas are formulated, tested, analyzed, and interpreted. In analyzing each research article use the following questions:

1. What was the main research question?
 - What methods were used to study this question and why?
 - Was the study an experiment (involving manipulated variables) or a correlational study (involving only measured variables)?
 - What was the outcome of interest (dependent variable) and how was it measured?
 - What data were collected?
2. What were the primary findings?
3. What interpretations were made of the findings?
4. How did researchers deal with quality control issues (ethics, validity, reliability, and so forth)?
5. What research would usefully clarify or extend the present findings?

Title of your manuscript here

Author1 (@)

Department and Address

Abstract

The abstract should be one paragraph, indented 1/8 inch on both sides, in 9 point font with 10 point vertical spacing. The heading **Abstract** should be 10 point, bold, centered, with one line space below it. This one-paragraph abstract section is required only for standard spoken papers and standard posters (i.e., those presentations that will be represented by six page papers in the Proceedings).

Keywords: Add your choice of indexing terms or keywords; kindly use a semi-colon; between each term.

General Formatting Instructions

The text of the paper should be formatted in two columns with an overall width of 7 inches (17.8 cm) and length of 9.25 inches (23.5 cm), with 0.25 inches between the columns. Leave two line spaces between the last author listed and the text of the paper. The left margin should be 0.75 inches, and the top margin should be 1 inch. The right and bottom margins will depend on whether you use U.S. letter or A4 paper, so you must be sure to measure the width of the printed text. Use 10 point Times Roman with 12 point vertical spacing, unless otherwise specified.

The title should be 14 point, bold, and centered. The title should be formatted with initial caps (the first letter of content words capitalized and the rest lower case). Each author's name should appear on a separate line, 11 point bold and centered, with the author's email address in parentheses. Under each author's name list the author's affiliation and postal address in ordinary 10 point type.

Indent the first line of each paragraph by 1/8 inch (except for the first paragraph of a new section). Do not add extra vertical space between paragraphs.

First-Level Headings

First-level headings should be 12 point, initial caps, bold and centered. Leave one line space above the heading and 1/4 line space below the heading.

Second-Level Headings

Second-level headings should be 11 point, initial caps, bold, and flush left. Leave one line space above and 1/4 line space below the heading.

Third-Level Headings Third-level headings should be 10 point, initial caps, bold, and flush left. Leave one line space above the heading, but no space after the heading.

Table 1: Sample table title.

Error type	Example
Take smaller	63 - 44 = 21
Always borrow	96 - 42 = 34
0 - N = N	70 - 47 = 37
0 - N = 0	70 - 47 = 30

Tables

Number tables consecutively; place the table number and title (in 10 point) above the table with one line space above the caption and one line space below it, as in Table 1. You may float tables to the top or bottom of a column, and set wide tables across both columns.

Figures

All artwork must be very dark for purposes of reproduction and should not be hand drawn. Number figures sequentially, placing the figure number and caption, in 10 point, after the figure with one line space above the caption and one line space below it, as in Figure 1.

CoGNiTIVe ScIeNcE

Figure 1: This is a figure.

References

Follow the APA Publication Manual for citation format. Examples:
 Chalnicks, A., & Billman, D. (1988). Unsupervised learning of correlational structure. *Proceedings of the Tenth Annual Conference of the Cognitive Science Society* (pp. 510-516). Hillsdale, NJ: Lawrence Erlbaum Associates.
 Feigenbaum, E. A. (1963). The simulation of verbal learning behavior. In E. A. Feigenbaum & J. Feldman (Eds.), *Computers and thought*. New York: McGraw-Hill.