COMPETITIVE ADVANTAGE FROM OPERATIONS

SUMMER 2007
Tisch Hall UC 52

MEETINGS: Tuesdays and Thursdays
            3:00-5:55 p.m.

INSTRUCTOR: Sridhar Seshadri, Room 867 KMC
             sseshadr@stern.nyu.edu

OFFICE HOURS: Wednesdays
              2:00-3:00 p.m. (subject to change)

REQUIRED COURSE MATERIALS:

CUSTOM TEXT: Competitive Advantage From Operations, 5th edition; a
              customized text with separate case book created for Stern students including
              chapters from Heizer and Render, Operations Management, 8th edition, Prentice
              Hall, 2006; NYU Cases and Readings; Harvard Cases and Readings. This book was
              prepared by Pearson Custom Publishing.

THE GOAL, second revised edition (buy in bookstore), Eliyahu Goldratt,
              North River Press, Inc. 1992

COMPUTER SOFTWARE: EXCEL - For Linear Programming
                    HOM 3.0 - For other OM Topics

These programs are available on the computers in the labs.

TEACHING FELLOW: Dana Popescu <dpopescu@stern.nyu.edu>
                 Office: KMC 8-154
                 Office Hours: TBA
MATERIALS REQUIRED


And CASE BOOK (CB) (contains technical notes and cases)

TERMS USED IN OPERATIONS MANAGEMENT
ANALYSIS OF AN OPERATION
FCN SECURITIES DEMO (A), (B) AND (C)
ALLIED DISTRIBUTING EQUIPMENT, INC.
THE FORD-FIRESTONE CASE
SOUTH TREE ELECTRONICS
FIRST CITY NATIONAL BANK

BENIHANA OF TOKYO
KRISTEN'S COOKIE CO.
DONNER COMPANY
BLANCHARD IMPORTING AND DISTRIBUTING COMPANY, INC.

2. THE GOAL, Second revised edition  (Buy in Bookstore), Eliyahu Goldratt, North River Press, Inc. 1992

3. CASE TO BE PURCHASED

TOYOTA MOTOR CO. CASE

Other cases and handouts will be posted on Blackboard.
HONOR CODE

I expect every student to be familiar with the Stern School of Business Honor Code. Some of the ways in which the code applies to this course are discussed below:

- The honor code stipulates that no student will lie, cheat, copy or otherwise behave in an unfair manner to obtain academic advantage over other students.
- As per the honor code, an individual’s name on a report should be included only if they have contributed to the analysis. If an individual has not contributed to the analysis in an intellectual manner, it is a violation of the honor code to include his or her name.
- Furthermore, you may not refer to case write-ups from classes offered in earlier semesters.
- The premise of the honor code is that ideas should be attributed to their source. Therefore, please acknowledge the main source(s) of data, facts, and ideas (other than from the instructor or textbook) in all your written work and when you make a presentation. If you use material from a source other than the lecturer, the textbooks or the lecture notes, you must attribute the source. For example, say, “I discussed this with the TA.” Or “I obtained this from the following website.”
- You may discuss the homework with your classmates, TA or me. However, you must do them individually. The discussion is limited to “how to solve” type of questions. The actual solution must be done individually. Do not be worried of getting the answer incorrect in the homework. Most of the points will be given for using the correct approach.

ELECTRONIC DISCUSSION

This course will use Blackboard. You are expected to post your comments, responses to other postings, questions and response to specific questions in the outline. In addition, you can: (a) post interesting examples illustrating concepts discussed in class, (b) questions about concept or calculations that are unclear in class, and (c) links to relevant websites.

The TA and I will be reading these discussions. Please keep the discussions strictly relevant to the course and the language as professional as possible. If you are responding to a specific question in the outline, please do so by 10:00 am of that day’s class.
SYLLABUS

COMPETITIVE ADVANTAGE FROM OPERATIONS

SUMMER 2008
UC 52 Tisch Hall

MODULE 1: Introduction to Operating Systems: Process Design and Analysis

SESSION 1A: INTRODUCTION - OPERATIONS AS A SOURCE OF COMPETITIVE ADVANTAGE

Concepts: The link between business and operations strategy, operating decisions and profitability.

Class Plan:
In this session we discuss the course contents, form groups, and discuss other details. The main themes in this session are: what are business processes, how operations management involves the design, planning, and management of business processes, and how operations is a source of competitive advantage for a firm.

1. Read Chapter 1 H&R (prepare but do not submit discussion questions 8, 9, 10, 11, 12 on p. 20 H&R)
2. Begin reading “The Goal” by E.M. Goldratt (should be completed before June 1)

SESSION 1B: OPERATING SYSTEMS - TYPES OF OPERATING PROCESSES

Class Plan:
Prepare the Benihana of Tokyo case (CB) (No submission)
Use the following study questions as an aid in analyzing the case.
1. How does the cost structure of a Benihana restaurant compare with that of a typical American restaurant? How does Benihana get its competitive advantage?
2. Describe Benihana as an operating system.
3. How does the operating system support the Benihana concept?
4. Which parameters of the operating system influence the profitability of a Benihana Restaurant?
5. What is the proper relationship between the number of tables in the dining room and number of seats in the bar? Assume they want the average customer to stay 24 minutes in the bar. Explain.
SESSION 2: PROCESS ANALYSIS: PROCESS CAPACITY AND PROCESS COST, FLOW TIME, PRODUCT VARIETY

Concepts and techniques: Process charting, capacity calculations, bottleneck, throughput time calculations, work assignment, Gantt charts, product costing, and process improvement. I = RT law.

Class Plan:
In this and the next session, we learn to analyze a business process in detail. The objectives of the analysis are: identify the process capacity, process cost, and time to serve customers. Additionally, understand how to execute orders, schedule labor, and identify bottlenecks.

1. Read Chapter 7, pages 285-295 in H&R.
2. Read, analyze and be prepared to discuss the Kristen's Cookie Company case (p. 109 CB) utilizing the six key questions at the end as guides. In particular prepare question 3 below.
3. What are the cycle time, throughput time, and capacity of each operation and the whole production system?

Homework 1: Draw a Gantt chart for Kristen's operation assuming orders are for two-dozen cookies, orders come every 20 minutes AND Kristen’s roommate is absent. Submit this analysis at the beginning of next class (May 22).

SESSION 3: PROCESS CHOICE EXERCISE
in Abbe Bogen Lounge, 11th Floor of KMC
1. Please read the Toyota Motor Company Case before class (case purchased separately from main bookstore)
2. Be prepared to discuss the root cause of the seat problem.

Electronic discussion: What is the root cause of the seat problem in the Toyota Motor Co. case?

Related Links:
Process Analysis http://www.stern.nyu.edu/om/under_caf0/Seshadri/allrefs.htm#process_analysis

MODULE 2 Managing for Competitive Advantage:
Time-to-Market & Responsiveness

SESSION 4A: THE EFFECTS OF SET-UP TIME ON CAPACITY

Concepts: Set up time, external and internal set up, batch size, effect of product-mix on capacity, order size - cost - due dates. Matching process and firm strategy.

Class Plan:
In this class, we study the effect of set-up time on capacity. The Donner Company (p. 113 CB) case will also serve as another example for analyzing processes. The process in this case is quite complex, but we will see that the simple but powerful ideas of capacity management that we have learnt so far, such as, identifying and managing the bottleneck, will prove to be adequate even for managing the most complex processes. I urge you to explore the spreadsheets before class.

1. Read the Donner Company case (p. 113 CB). Use the EXCEL spreadsheets discussed in the previous class (Donner.xls and Donner1.xls) to analyze and understand the relationships between number of orders (set-ups) in a month, order size, and capacity
2. Use the following study questions as guides in analyzing the case:
   a) Describe Donner as an operating process. To simplify this task, consider only the flow of the most important output.
   b) Assume Donner has to process 60 orders in a certain month. What is the capacity (in terms of the number of boards) of each operation and of the entire system?
   c) What factors influence the capacity of the entire system? What is the current utilization of the machines?
   d) What was the efficiency of Donner?
   e) What are the causes of the major problems described at the end of the case? How would you propose to resolve them?

Electronic discussion: You could choose to post your analysis to questions (c) and (e) in the discussion board of Prometheus.

Related Links:

SESSION 4B: TIME BASED COMPETITION

Concepts: Critical time, planning and control issues for projects, work breakdown structure (WBS), drawing project networks, cost-time analysis.

Class Plan:
Competing based on time means being able to execute large projects, on time and within cost. In this session we first discuss the value of time-based competition.

Then, in this and the next session, we learn about network techniques for planning and managing large projects. Successful project management involves planning and managing the time to complete the project, monitoring the use of resources during project execution, and increasing the probability of successful completion. Network planning and control techniques provide the tools necessary for undertaking these tasks.

1. Read Chapter 3 in H&R (p. 53 H&R). Attempt the discussion questions at the end of the chapter. These do not have to be submitted.
2. Draw the networks for the projects described in the FCN/Securities Demo (A) exercise (p. 30 CB).
3. Homework 2: Submit: The network for the Allied Distributing exercise (p. 33 CB) (no need to analyze beyond drawing the network). Make suitable assumptions to draw the network.

Electronic discussion: When is a project said to be successful? What are the critical factors for successful project management? Give examples. You may like to look back on the Internet boom as well as some successful (non-military) projects in recent years (conversion from tokens to metro cards in NYC, introduction of the euro, the cooper mini).

SESSION 5A: PROJECT MANAGEMENT

Class Plan:
We will discuss the probabilistic methods for project analysis. We will also touch upon project crashing. We will learn why it is sometimes beneficial to reduce the duration of a project, even though it may increase the cost of the project. We will discuss project crashing techniques that optimally reduce the duration of a project by selectively reducing the duration of only certain activities.

1. Read, analyze and be prepared to discuss the other four project management network cases (exercises) assigned in class: FCN (B), FCN (C) (p. 31 CB), Specialty Contractors, and Aerospace Components (p. 35 CB).
2. Homework 3: Submit an analysis and solution to the FCN (B) case. HOM can be used to do the homework. HOM can be downloaded from Blackboard.

Related Links:
Please visit the website of Primavera (http://www.primavera.com/) to see examples of the state-of-art network planning tools.

SESSION 5B: THE EFFECTS OF UNCERTAINTY- WAITING LINES
Concepts: Uncertainty - time scale and planning demand and supply, service level in queues, cost-service tradeoff in queues, queueing formulae -- averages and distribution of number of customers in system and time spent in the system, revisit I = RT law. Dynamics of processes.

Class Plan:
Recall Pete’s people who were trying to beat the robot? Demand and supply often do not match. The mismatch creates special problems for managers. To understand these problems it is important to understand the time-scale at which these uncertainties happen. Very long and gradual changes in demand can be dealt with using techniques for managing seasonal demand. Medium term uncertainties, such as day-to-day fluctuations in demand levels, can be dealt with using staffing solutions and overtime. Demand uncertainties on the same time scale as operational variables such as processing time or set-up time need special techniques. These techniques are called waiting line or queueing techniques. We learn a bit about the other two and lot more about the waiting line techniques in this and the next session.

Regarding waiting lines, we learn: why uncertainties in processing times as well as arrival patterns create delays? These delays are due to queues. We learn why queues form? How to estimate the queueing delays? How to plan for extra capacity to reduce unwanted delays? And how to reduce uncertainty?

1. Read Quantitative Module D in H&R on Waiting Lines and Queuing Theory (p. 743-755 H&R).
   2. Prepare the sixteen discussion questions at the end of Module D in H&R (p. 762). Do not submit.


SESSION 6A: QUEUEING THEORY IN ACTION

Concepts: Design of queueing systems, staffing, scheduling, psychology of queues.

Class Plan:
We apply waiting line techniques to analyze the First City National Bank case (p.83 CB). In particular, we discuss whether S-lines are better than single lines, whether and when specialization using dedicated servers is preferred, as well as, several psychological factors that affect the perception of "waiting" in lines.

1. Homework 4: Submit the solutions to problems D3, D7, D9 and D11 in H&R (p. 764-765) on June 1. HOM can be used to do the homework. HOM can be downloaded from Blackboard.
2. Read, analyze, and be prepared to discuss the First City National Bank case (p. 83 CB). The following study questions will help:
   a) Considering the data supplied for arrival and service times, how would you calculate an average arrival rate and service rate?
   b) As Mr. Craig, what characteristics of this queueing system would you be most interested in observing?
   c) What is the best number of tellers to use?
   d) Calculate the waiting time for a customer (time spent in the queue before service) and determine which of the two line configurations you would recommend. Support your result with the appropriate quantitative queuing analysis.

SESSION 6B: AN INTRODUCTION TO RELATED TOPICS IN PROCESS ANALYSIS

Class Plan:
In this session we shall review process analysis concepts. We shall also learn about many applications of process analysis. We shall discuss issues of product-mix and profitability, process design for suppliers, process design and quality management, etc. This will set the stage for the rest of the course.

PICKUP MIDTERM PROBLEM SET FOR SUBMISSION. THESE MUST BE DONE ON INDIVIDUAL BASIS. DO NOT CONSULT WITH ANY ONE EXCEPT THE PROFESSOR OR THE TEACHING ASSISTANT. DUE BACK JUNE 6.

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OPTIONAL SESSION

Screening of the movie “The Goal”
Show time: 9 to 10 am (first come first seated); Place: Tisch UC 52.
The book, The Goal, has been turned into an excellent movie. The length of the film is 50 minutes. From feedback received and own experiences, seeing the movie after reading the book greatly enhances the learning experience. The viewing is completely optional. Seats will be filled on first come first seated basis. Please bring your own popcorn.

Related Links:
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MODULE 3  Managing for Competitive Advantage:
Quality as a Strategic Issue

SESSION 7A: QUALITY - ITS DEFINITION AND BASIS FOR COMPETITION
Concepts: Quality its definition, analysis, planning and control. Dynamics of processes. Type I and Type II errors, process control and process capability, six sigma quality.

Class Plan:
In this session we discuss quality management in the context of the Ford-Firestone tire recall case. The objectives of the session are to understand what is quality, what are the costs associated with it, and raise questions about managing quality in the age of super-mass production. These questions will be answered in the next two sessions.

1. Read the Ford-Firestone case (p. 39 CB) and be prepared to discuss it. In particular attempt question 4 below to determine what was the true cause of the problem?
2. Prepare a Fishbone Diagram of the problem.
3. Read Chapter 6 in H&R (p. 191 H&R).
4. Prepare discussion questions 4, 5, 7, 9, 12 and 19 H&R (p.212).

Homework 5: Submit: Prepare and submit a fishbone diagram showing the probable causes for the tire failure problem (as set out in the case). A fishbone diagram shows probable causes for a problem such as: due to manufacturing, materials, design etc.

Electronic discussion: Post your views on the recall. How does it compare with other product recalls? Are product recalls inevitable? Can the society do something about them?

SESSION 7B: QUALITY CONTROL -Introduction to Six Sigma

Class Plan:
In this session we learn about statistical process control. We discuss how statistical process control techniques are used in many different industries.

1. Read the Supplement to Chapter 6 in H&R (p. 221).
3. Revisit the Toyota case and suggest whether the use of six sigma technique and statistical process control can be used in Toyota? (Good exam question)

Electronic discussion: What service industries will most benefit from the use of statistical process control? ISO 9000? Give examples.

Related Links:
Visit the American Quality Control Society's website:
http://www.asq.org/portal/page?_pageid=33,39211,33_39236&_dad=portal&_schema=PORTAL
Total Quality Mgmt
http://www.stern.nyu.edu/om/under_cafo/Seshadri/allrefs.htm#total_quality_management
MODULE 4          Managing for Competitive Advantage:
Supply Chain Management

SESSION 8A:  INVENTORY AND LOGISTICS

Concepts: EOQ, safety stock and cycle service level, effect of scale on inventory cost,
risk pooling and safety stock. If time permits, transportation and logistics concepts.

Class Plan:
In this and the next two sessions, we discuss inventory management and more broadly supply chain management. Material, information and funds flow through supply chains. Demand is matched with supply, orders with fulfillment, and products are planned to fill customer needs and to compete against other products in the market. The integrated management of the three flows, material, information, and funds, is called supply chain management. We learn how firms compete using new principles of supply chains. We also learn how inventory, one of the fundamental levers for managing supply chains, can be analyzed and managed.


SESSION 8B: THE ROLE OF INVENTORY - THE TRADITIONAL VIEW

Class Plan:
In this session we explore the effect of centralization on inventory costs. We see how scale economies can be derived even in very ordinary situations. We then discuss alternate ways of deriving these scale advantages.

1. Read and analyze the Xenon Drives case (download from Blackboard). Be prepared to discuss questions 1, 2, 4 and 6
2. Homework 7: Answer and submit question 1 in the case.
3. Pick up problem set for inventory management. Not to be submitted.

Electronic discussion: What are the operational challenges and opportunities faced by Walmart? How do these relate to supply chain management? Are these different for a retailer such as Gap or Circuit City?

SESSION 9: INVENTORY IN ACTION:  THE BEER GAME
in Cantor Boardroom, 11th Floor of KMC

PLEASE BE A FEW MINUTES BEFORE TIME!!

Read Chapter 11 of H&R. Skim through the chapter.

Related Links:
What is systems dynamics? http://www.albany.edu/cpr/sds/

SESSION 10A: JUST-IN TIME and LEAN PRODUCTION
Concepts: Just-in-time, continuous improvement, firm strategy based on continuous improvement.

Class Plan:
We debrief the beer game and discuss how firms manage to smooth product flows in supply chains. We conclude Module 4 with a discussion of Just-in-Time production systems. We learn the key operating principles behind such systems. We also learn about the firms that have adopted such production systems. Revisit the Toyota case!
1. Debrief of the Beer Game
2. Read Chapter 16 in H&R on Just-in-Time systems (p. 625).
3. Discussion questions 1, 3, 4, 6, 7, 9, 10, 11, and 12 H&R (p.646).

MODULE 5 Allocating Resources for Strategic Capacity Planning

SESSION 10B: THE BASIC LP PROBLEM

Concept: Modeling operations problems for optimization of processes, product-mix, diet and transportation problems, solution techniques.

Class Plan:
We begin the last module, which is integrative in nature. It deals with the use of linear programming for planning and optimizing systems. We shall discuss several applications of LP to Operations Management problems.

1. Read Quantitative Module B: Linear Programming in H&R (pages 692-707). You may do the first reading for a quick overview.
2. Read (more carefully) pages 692-707, again.
3. Prepare to discuss questions 1,2,3,7, 8, 9, 10, and 13 H&R (p.712).
4. Homework 8: Attempt Problem B.1 on page 713 and submit on June 20.

Related Links:
Linear Programming and other Operations Research Topics http://www.informs.org/Resources
SESSION 11A: SOLUTION TECHNIQUES: GRAPHICAL METHOD AND ENUMERATING THE CORNER POINTS

Concepts: Sensitivity (what-if) analysis, shadow price, formulating for solution using Excel’s solver, interpreting Excel solver output

Class Plan:
We learn how to solve LP problems by hand using a graphical technique. We also learn to carry out sensitivity analysis.


SESSION 11B: LP SOLUTION (LINDO OR EXCEL INTERPRETATION)

Class Plan:
We learn how to formulate and solve LP problems using Excel. How to interpret Excel outputs for LP problems.

1. Homework 9: Solve problems B.2 and B.3 on page 713-714 using (a) graphical method, (b) "enumerating the corner points" method and (c) Excel. Submit on June 22.
2. Interpret the results
3. Review of course and sample examination will be handed out.

Related Links:
Linear Programming and other Operations Research Topics http://www.informs.org/Resources
Visit the website of Ilog and look under OPL Studio. http://www.ilog.com/

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Optional review session on June ____. Time will be announced in class.

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SESSION 12: FINAL EXAMINATION: Last day of class. In-class, open book and open notes. No laptops allowed. The examination will be comprehensive. Sample exam and solution will be provided.
GRADING

Class Participation, Attendance 15%
Electronic Participation 5%
Mid-Term Take-Home Problems (Open book) 10%
Final Examination (Open book) 35%
Short Reports (Group work) 20%
Homework, Quizzes 15%

HOMEWORK
There are nine homework assignments. The homeworks are due on the dates (sessions) where the assignments appear in the syllabus. Only homeworks that are specifically designated as **SUBMIT**, are to be handed-in at the beginning of class. Keep a copy of all homework submitted for reference during class. When discussion questions are involved, please answer briefly (two or three sentences).

Homework will be graded, and will not be accepted late. It must be prepared individually in order to receive credit.

QUIZZES
Quizzes might be given in any class in which a case is to be discussed. The quiz will relate to facts given in the case and study questions asked in the syllabus.

HOW TO PREPARE FOR CLASS DISCUSSIONS

Please read the cases carefully. Use the study questions supplied in the syllabus as a guide. Be prepared to be called-upon to present the facts of the case, or to carryout the analysis indicated by the study questions.

OVERVIEW OF ASSIGNMENTS WITH DUE DATES

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<td>Kristen's case question <em>Homework 1</em></td>
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<td>Allied Distributing <em>Homework 2</em></td>
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