FACULTAD ECONOMÍA Y NEGOCIOS UNIVERSIDAD DE CHILE

Operations Management

Spring Semester 2024

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Course Activity Summary

Bold activities are those requiring personal work

Week	Monday	Wednesday
29-Jul	1. Introduction	2. Case: Beleza Natural
05-Aug	2. Case: National Cranberry	4. Variability and wait times
12-Aug	5. Case: Saintmarie Hospital	6. Newsvendor (capsule)
19-Aug	7. Case: Club de Vin	8. Start Littlefield Game
26-Aug	9. Simulation and uncertainty	10. Debrief Littlefield
02-Sep	11. Demand prediction	12. Quality management
09-Sep	13. Case: Estee Lauder	14. Lean Operations (NUMMI)
16-Sep	UNIVERSITY BREAK	
23-Sep	MIDTERM WEEK	
30-Sep	15. Inventory (EOQ)	16. Inventory (Order up-to)
07-Oct	17. Beer Game	18. Debrief Beer Game
14-Oct	19. Supply chain design	20. Case: Deskjet HP
21-Oct	21. Case: Timbuk2	22. Production planning
28-Oct	23. Transportation planning	24. Case: FlexiWeight
04-Nov	25. Cruise Game	26. Revenue Management
11-Nov	27. Markdown pricing	28. Conclusion
18-Nov	EXAMS	

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Course Description

Operations Management is the design and management of processes that transform inputs into final goods and services. Operations are one of the main functions of a company, and recent innovations in data analytics and digitalization have been transforming how they are managed. While marketing focuses on product demand and finance provides the capital, the operations function focuses on producing and delivering the product.

This course provides a foundation for understanding a company's operations. Our goal by the end of the course is to provide the basic skills needed to critically analyze operational efficiency and its practical implementation in companies and organizations. Unlike other courses that tend to treat the company as a "black box," we will be primarily concerned with "opening" the black box to discover what makes a company "work"—or, conversely, "stop working."

Because a company's operations vary widely from one industry to another, a course like this cannot cover all topics relevant to specific industries. Thus, we have selected a set of topics fundamental to understanding operations across a wide range of industries. These concepts are illustrated using cases from a diverse set of businesses.

Grading

- Solemn Exam and Final Exam (60%) – Individual Assessment
- Assignments (30%) – Group
  - 4 assignments
  - Groups of 3-4 people
  - Exercises + computational problems
- Participation and Cases (10%) – Individual
  - Mandatory readings + Quiz
  - Some activities with mandatory attendance
  - Cases and activities may also be included in controls and exams

Final Grade - 30% * solemn_exam + 30% * final_exam + 30% * assignment_average + 10% cases_grade

Passing Criteria - Final grade >= 4.0 - Average of Solemn and Final Exam >= 4.0

References

The following textbook will be used throughout the course:

- Gerard Cachon, Christian Terwiesch. Matching Supply with Demand. 4th Edition.

A digital copy of this book is available at the FEN library.

Other recommended references (not required).

- Steven Nahmias, Tava Lennon Olsen. Production & Operations Analytics. 8th Edition, 202.
  - Note: Editions 5th-7th also cover the course material.
- Stephen G. Powell, Kenneth R. Baker. Management Science: The Art of Modeling with Spreadsheets. 3rd Edition.

Class Details

Session 1: Introduction

Introduction. The operations function and decisions at the strategic, tactical, and operational levels. Administrative details of the course.

Session 2: Case - Process Selection

Process types and process-product matrix. Application of process analysis concepts in a service company context.

In-class activities: Case Beleza Natural.

Prepare: - Watch video capsules explaining process analysis concepts.

- Process Flow Diagrams: Video Link

- Capacity Analysis: Video Link

- Read the Beleza Natural case and prepare answers to the following questions for the class:
  - What are the key elements of Beleza Natural's business strategy? How is the organization of the institutes aligned with this strategy?
  - Think about process efficiency. What improvements do you suggest? How would you prioritize these improvements?
- Respond to the case-associated test on Canvas

Recommended readings: Nahmias & Olsen Cap 1.4 and 1.5. Cachon & Terwiesch Cap 2 and 3.

Session 3: Case - Bottleneck Analysis

In-class activities: Case National Cranberry Cooperative

Prepare: - Read the National Cranberry Cooperative case and prepare for the discussion by considering the following questions:

- Draw a process flow diagram showing the main process steps, inventories, and flows from Reception to the Separators. Indicate the capacity at each process step in barrels per hour. Assume:

  - 16,000 barrels per day is the average delivery over the 20 days from 20/9 to 9/10.
  - Each truck carries 75 barrels on average.
  - Trucks arrive uniformly over a 12-hour period.
  - 70% of the trucks carry only wet cranberries, and 30% carry only dry cranberries. Note that the flow of wet and dry cranberries within the process differs (they use different resources).
  - During peak volume periods, the destoning/desgraning/drying operation starts at 7 AM (instead of 11 AM as shown in Figure E).
- What operation(s) is the bottleneck?
- Until what time does the plant need to be open? When does the plant close during this peak season?
- What are the basic options for improving the operation? What options would you recommend and why? Be sure to include a simple quantitative analysis (i.e., include a back-of-the-envelope calculation).

Prepare to discuss and defend your recommendations in class.

Respond to the case-associated test on Canvas

Session 4: Variability and Response Times

Impact of variability on process performance and response times. Models to analyze wait times. Trade-off between utilization and response time.

Recommended reading: Cachon and Terwiesch Cap 9; Nahmias & Olsen Cap 8.1-8.5.

Session 5: Case - Wait Times in Healthcare Services

Read the "Emergency Department Congestion at Saintemarie University Hospital" case and prepare to answer the following questions.

- What operational problems does the Saintmarie Hospital emergency unit face? What potential causes of these problems can you identify?
- What alternatives can Saintmarie adopt to improve its performance?
- Calculate (approximately) the average wait time patients face from when they complete triage until they are admitted to the emergency box. How does your calculation compare to the wait time indicated in the case (1:10 hours)?

Respond to the case-associated test on Canvas

Session 6: Supply Policies with Demand Uncertainty – The Newsvendor Model

Impact of demand uncertainty on supply decisions. We will review methods to quantify demand uncertainty. We will discuss the "Newsvendor" model and its application in supply decisions.

Prepare: - Develop a forecast for iPhone sales (in units) in the last quarter of this year (October-December). Complete the online survey by entering your forecast: Forecast Survey Link

(0ptional material in Spanish) Watch online classes on the Newsvendor model

- Part 1: Introduction: Video Link
- Part 2: Forecasts: Video Link
- Part 3: Overage/Underage Costs: Video Link
- Part 4: Optimal Quantity: Video Link

Recommended reading: Cachon & Terwiesch Cap 14; Nahmias & Olsen Cap 5.1-5.3.

Session 7: Case - Forecasts and Production Decisions for Seasonal Products

Read the "Le Club Francaise de Vin" case and think about the following questions:

- What are the costs of having a stockout? Overstock? List these costs and try to assign an economic value, for example, for a bottle of white wine worth 10 euros.

- How would you use the data in Exhibit 1 to estimate the expected demand for a bottle of wine that was forecasted to have a demand of 2000 units? How many units would you order for this wine?

- How much would you order for each of the wines listed in Exhibit 2? Be prepared to justify and defend your decision.

Respond to the case-associated test on Canvas

Session 8: Littlefield Preparation

Read the Littlefield game instructions (Littlefield Instructions.pdf). Bring at least one computer per group.

This activity

is in-person and mandatory.

Session 9: Simulation and Decisions under Uncertainty

We study simulation techniques for evaluating uncertain scenarios and making decisions based on the developed models.

Recommended reading: Powel & Baker Cap 16 and 17.

Session 10: Littlefield Game Debrief

Prepare to discuss your experience playing the Littlefield game and the written responses in the report.

Prepare: Littlefield game report. The report should be at most one page and answer the following questions:

- Describe the initial strategy your group decided to follow.

- How does your strategy address the various uncertainties of the game's first stage?

- Describe the analysis (qualitative or quantitative) used to support your strategy.

- How did your strategy evolve during the game? What type of data did you use to adapt your strategy?

- Describe the strategy you decided to use for the last 100 days of the game and the logic behind it.

This activity is in-person and mandatory.

Session 11: Demand Prediction Models

We study various types of models to predict demand and measure the associated uncertainty.

Recommended reading: Nahmias & Olsen Cap 2.

Session 12: Introduction to Quality Management and Six Sigma

Process capability indices and the Six Sigma quality concept. Statistical Process Control, continuous improvement, and their applications in manufacturing and service industries.

In-class activities: We will conduct various experiential and discussion activities during the sessions to demonstrate the application of Quality Management concepts and tools.

Recommended reading: Nahmias & Olsen Cap 10; Cachon & Terwiesch Cap 7.

Session 13: Case - Quality Management in the Cosmetics Industry

Prepare: Read the Estee-Lauder case. The case describes various data sources Estee Lauder collects and uses to monitor the quality of its processes. What performance indicators can be constructed with these data sources to identify the cause of problems occurring in the Asian market?

Respond to the case-associated test on Canvas.

Session 14: Lean Operations and Applications in the Automotive Industry

In-class activities: We discuss the general principles of lean operations (also known as the Toyota production system) and Just-in-Time production.

Prepare:

- Listen to the first 30 minutes of the NUMMI plant documentary (produced by National Public Radio on the "American Life" program): NUMMI Episode (You can also download the episode from other podcast platforms)

- Be prepared to answer the following questions:

    - What are the main differences between General Motors and Toyota in how they evaluate plant efficiency?

    - Why did Toyota choose to hire the same employees who worked at GM's Fremont plant?

    - What is the "andon cord"? What are the costs and benefits of "pulling the cord" in terms of the operation and efficiency of a production line?

Recommended reading: Cachon & Terwiesch Cap 8.

Respond to the case-associated test on Canvas.

Session 15: Inventory Management Models for Non-Perishable Products

The role of inventory in the operations function. Inventory decisions with a fixed order cost with deterministic or uncertain demand.

Recommended readings: Nahmias & Olsen Cap 4 and 5. Cachon & Terwiesch Cap 5.

Session 16: Introduction to Supply Chain Management. The Order-up-to Model

Service levels and lead times in the supply chain. Unlike the Newsvendor model, we now consider that the supply chain has demand over a long time horizon, so constant replenishment is possible.

Recommended reading: Cachon & Terwiesch Cap 16.

Sessions 17 and 18: In-Person Group Activity – The Beer Game

In this in-person activity, teams work to manage the supply chain in the beer industry. Each group should bring a computer to class. More details on how to use the game and submit results will be provided.

This activity is in-person and mandatory.

Session 19: Supply Chain Management

We will discuss the Beer Game, the learnings from the activity, and its application to supply chains in various industries.

Prepare: Based on the Beer Game group activity, be prepared to answer the following questions:

- What happened when you played the beer game? Was your supply chain prepared to adequately follow the demand?

- What factors influenced the performance of the inventory management in the supply chain? What suggestions do you have to address these challenges?

Recommended reading: Cachon & Terwiesch Cap 19.

Session 20: In-Class Activities: Case Deskjet HP

Prepare:

Read the "HP Deskjet" case and prepare for the class discussion by considering the following questions:

- Compare the air transportation option with the sea transportation option (base case) by examining the cost of all models in Europe (ignore Asia and North America). Use a fill rate of 98% and the data provided in Table 1.
- Assume:
    - - Lead time is 5 weeks by sea and 1 week by air.
    - - Orders are issued weekly by the production cycles of the Vancouver plant. - The product's selling price is $667 (from page 1 of the case), and the production cost is $400.
    - - Air transportation adds an additional $10 per unit, and the annual storage cost rate is 12% of the unit cost (you can assume that this 12% reflects the capital cost).
    - - The generic printer option involves redesigning the product so that the power supply is external. Under this option, partially assembled printers could be sent to the European distribution center and stored generically. Thus, as orders arrive, printers can be packaged with the appropriate power supply and manual to meet each country's demand. Evaluate the inventory savings using this strategy.

Respond to the case-associated test on Canvas.

Session 21: Case – Make-to-Stock vs. Make-to-Order Operations

We will analyze the factors to consider in global sourcing decisions by discussing the Timbuk2 case. We will discuss how Timbuk2 should decide production modalities based on orders and forecasts while managing inventory.

Prepare: Read the Timbuk2 case. Think about the following questions and be prepared to discuss them in class:

- What sales channels does Timbuk2 use, and which are the most profitable?

- - How should Timbuk2 decide on the options to offer customers for customizing bags sold online? In other words, what general principles should be used to understand the options to offer? (e.g., adding a handle to the bag, different logo colors, different sizes of bag panels, etc.)
- - What are the costs and benefits of moving production to China? If production is moved to China, what changes need to be made?
- In particular, consider the utilization of the San Francisco plant before and after outsourcing the manufacturing and also the need to maintain inventory.

Respond to the case-associated test on Canvas.

Session 22: Introduction to Linear Programming: Production Planning

Topics in linear programming using Excel Solver. Models for making production and planning decisions.

Recommended reading: Powel & Baker Cap 10, 11, 12, and 13.

Session 23: Applications of Linear Programming: Location and Transportation

Examples of linear programming models for optimal production planning.

Recommended reading: Powel & Baker Cap 10, 11, 12, and 13.

Session 24: In-Class Activity: Case FlexiWeight

Read the "FlexiWeight" case and prepare for the class discussion by considering the following questions:

- Do you agree with FlexiWeight's decision to change the fulfillment system from a single channel to a more complex micro-fulfillment strategy? What are the pros and cons of their decision?
- - Suppose a new order arrives, and you need to decide where to fulfill the order. How would you make this decision? What considerations should you take into account to design a strategy? What difficulties might arise?
- - How could you evaluate your strategy before implementing it?

Respond to the case-associated test on Canvas.

Session 25: Group Experiential Activity – The Valuation Game

We will conduct an experiential activity in the classroom in groups of 3 people where each group will make pricing decisions for a tourist package. Each group should bring a computer.

This activity is in-person and mandatory.

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Sessions 26 and 27: Revenue Management and Markdown Pricing: Pricing Decisions with Fixed Capacity and Demand Uncertainty

Models, tools, and pricing management practices to maximize revenue subject to fixed capacity, known in the industry as Revenue Management.

Recommended reading: Cachon & Terwiesch Cap 18.

Session 28: Conclusions

Summary of the material covered in class. The relationship between operations strategy and business strategy of a company/organization, with a special emphasis on developing innovative business models based on technology.