Operations Management

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Course Manual

The following course manual specifies the content, required preparation and tasks for each class. Please consult the manual carefully before each class in order to be well prepared for the class.

Course pack (code **C-4146-326841-STU**) available at
https://www.thecasecentre.org/course/registerForCourse?ucc=C%2D4146%2D326841%2DSTU

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Lecture 1: *Introduction to Operations Management*

1.1 Content

I will provide a conceptual understanding of what operations management is, what different views are, and what the challenges and key issues in operations management are. We will then play MIT's venerable Beer Game, an experiential learning business simulation game, to experience the difficulties of running a business. The object of the game is to meet customer demand for cases of beer through the distribution side of a multi-stage supply chain with minimal expenditure on back orders and inventory. There are four stages, manufacturer, distributor, supplier, and retailer. At least one player managers each stage. Verbal communication between players is against the rules. After the Beer game, we will discuss the course structure, go through the syllabus, and point out the expectations from this course.

1.2 Preparation before the class

Read the rules of the Beer Game: https://www.masystem.se/MA-system-Consulting/Play-The-Beer-Game/Rules

Read the syllabus and course manual carefully.

Supplementary readings:

H. Lee, P. Venkata, and W. Seungjin. 1997. The Bullwhip Effect in Supply Chains. *MIT Sloan management review*.

The Bullwhip Effect 101: https://www.youtube.com/watch?v=2nlmkTYZG5s

KFC's Big Screw-Up Left Restaurants Without Chicken: https://www.bloomberg.com/news/articles/2018-03-01/kfc-s-big-screw-up-left-restaurants-without-chicken

1.3 Tasks after the class

1) Individual assignment_1
2) Starting group assignment (see description at the end of the manual)

Lecture 2: *Customer Value & Matching Products, Channels, and Strategies*

2.1 Content

During the first part of the lecture, I will introduce what is customer value and how to identify the dimensions that define customer value. During the second part of the lecture, I will describe how each dimension of customer value drives operations strategies. In addition, we will discuss the *Made-to-Measure* case and the *Dell* case extensively. You are required to prepare these two cases thoroughly.

Supplementary readings:

M.L. Fisher. March-April 1997. What is the Right Supply Chain for Your Product? Harvard Business Review. 105-116.

C. Meyer and A. Schwager. February 2007. Understanding Customer Experience. *Harvard Business Review*.

D. Simchi-Levi, A. Clayton and B. Raven. Winter 2013. When One Size Does Not Fit All. *MIT Sloan Management Review*.

A. Dukes and Y. Zhu. February, 2019. Why Is Customer Service So Bad? Because It's Profitable. *Harvard Business Review*.

2.2 Preparation before the class

Read the following cases:

1) *Dell INC.: Improving the Flexibility of the Desktop PC Supply Chain*   By Johnson Wu, Donald B. Rosenfield, Charles H. Fine, David Simchi Levi. *MIT Sloan Management*, 2010

   Source 1: On the blackboard

   Source 2: Chapter 6, Designing and Managing the Supply Chain, 3rd edition, Simchi-Levi et al.

   Prepare the following questions:

   1. Why do you think L5 incurs higher manufacturing and logistics costs than L6? What are some of the costs that incur in L5 but not in L6? Are there any costs that apply to only L6 but not L5?

   2. If you were part of the BPI team, which of the six proposed manufacturing solutions would you recommend, based on the survey result (Exhibit 8)? Why? What are the pros and cons of your recommendation?

3. How easily sustainable is your recommendation if the chipset supply shortage further deteriorates?

4. What is your evaluation of the BPI team's methodology of determining the optimal manufacturing option for Dell?

5. What is your recommendation on how Dell can effectively address the root causes contributing to the increase of L5 manufacturing?

2) *Made to Measure: Invisible Supplier Has Penney's Shirts All Buttoned Up*   By Gabriel Kahn. *The Wall Street Journal*, 2003.

Source 1: https://www.wsj.com/articles/SB106323446110491600

Source 2: Chapter 12, Designing and Managing the Supply Chain, 3rd edition, Simchi-Levi et al.

Prepare the following questions

1. What are the components of the supply chain for apparel? What types of firms are involved in the supply chain and the objectives of these firms?

2. What is a buyer-driven industry? What is a producer-driven industry?

3. What do J.C. Penny's customers value? What does J.C. Penny value?

4. How does Tal add value to its offering in order to compete? What are the benefits for both J.C. Penny and Tal? What are the potential risks?

2.3 Tasks after the class

1) Individual assignment_2

Lecture 3: *Demand Forecasting & Inventory Management*

3.1 Content

During the first part of the lecture, I will talk about the role of forecasting in operations management and the rules in foresting. Then I will elaborate on forecasting methods, particularly time-series forecasting methods. During the second part of the lecture, I will talk about inventory management and introduce two inventory models, i.e., the EOQ model and the Newsvendor model.

3.2 Preparation before the class

Watch the online lecture on the blackboard.

3.3 Tasks after the class

1) Prepare for the mid-term exam

Lecture 4: *Network Planning & Decision Making under Competition*

4.1 Content

During the first part of the lecture, I will talk about a framework of network planning and four phases of decisions within the framework. I will introduce some network optimization models for these planning decisions. During the second part of the lecture, I will talk about how decision should be made under competition. I will introduce game theory (*a beautiful mind*) and explain how it is used for business decision making. Game theory is the study of mathematical models of conflict and cooperation between intelligent rational decision-makers. It is an important tool in many fields, including economics, political science, psychology, logic, computer science, and biology. As of 2014, eleven game-theorists have won the economics Nobel Prize.

4.2 Preparation before the class

Watch the online lecture on the blackboard.

Supplementary readings:

Chapter 27 & 28, Intermediate Microeconomics: A Modern Approach, 6th Edition, Hal R. Varian, 2003.

4.3 Tasks after the class

1) Prepare for the mid-term exam

Lecture 5: Mid-term exam & feedback session

You will have a closed-book mid-term exam. The duration is 90 minutes. After that, TA will give answers.

Lecture 6: *Procurement & Risk Mitigation Strategies*

6.1 Content

During the first part of the lecture, we will discuss the *Zara* case and compare the *Zara* model with the *Sport Obermeyer* model. Next, I will talk about the outsourcing trend in many industries and a framework for making buy/make decisions. Procurement strategy is not only about whether to outsource a component. I will then introduce the Kraljic's supply matrix for determine the appropriate procurement strategy. During the second part of the lecture, I will talk about the sources of risk in operations and how to manage them.

Supplementary readings:

A Fire in Albuquerque Sparks Crisis For European Cell-Phone Giants: https://www.wsj.com/articles/SB980720939804883010

When the Chain Breaks: http://www.economist.com/node/7032258

T. Nishiguchi and A. Beaudet. 1998. The Toyota Group and the Aisin Fire. *MIT Sloan Management Review*.

6.2 Preparation before the class

Read the following cases:

1) *Sport Obermeyer*   By Janice H. Hammond and Ananth Ramon. *Harvard Business School*, 1994.

    Source 1: View the course pack

    Source 2: Chapter 2, Designing and Managing the Supply Chain, 3rd edition, Simchi-Levi et al.

    Prepare the following questions

    1. Using the sample data given in Table 2-20, make a recommendation for how many units of each style Wally should make during the initial phase of production. Assume that all of the 10 styles in the sample problem are made in Hong Kong and that Wally's initial production commitment must be at least 10,000 units. Ignore price differences among styles in your initial analysis.

    2. Can you come up with a measure of risk associated with your ordering policy? This measure should be quantifiable.

    3. Repeat your methodology and assume now that all 10 styles are made in China. What is the difference (if any) between the two initial production commitments?

4. What operational changes would you recommend to Wally to improve performance?

5. How should Wally think (both short-term and long-term) about sourcing in Hong Kong versus China? What kind of sourcing policy do you recommend?

2) *Zara*   By Nelson Fraiman and Medini Singh. *Columbia Business School*, 2002.

Source 1: View the course pack

Source 2: Chapter 9, Designing and Managing the Supply Chain, 3rd edition, Simchi-Levi et al.

Supplementary materials:

1. Zara distribution center: https://www.youtube.com/watch?v=iKUmOsmh-Gs

2. Zara Builds Its Business Around RFID: https://www.wsj.com/articles/at-zara-fast-fashion-meets-smarter-inventory-1410884519

3. What is RFID: https://www.youtube.com/watch?v=gEQJxNDSKAE

4. How RFID benefits retail fashion: https://www.youtube.com/watch?v=4eOr0PfwFgs

Prepare the following questions

1. What is Zara's value proposition?

2. What is the issue here? What is the context of the problem?

3. What are the decision targets? What are the concerns?

4. Which characteristics of the textile and apparel industry that may influence Zara's decision? What are the impacts?

5. Zara only commits around 50%-60% of its inventory by the beginning of the season and only make 25% of the season's collection available in store at the start of the season. How does Zara manage when the season starts? Why does Zara choose this plan?

6. Zara's in-house production can take as little as 10 days. How does Zara achieve it?

7. What are the key factors to Zara's success?

8. What do you think can Zara do in order to further improve?

6.3 Tasks after the class

1)   Prepare group assignment (see description at the end of the manual)

Lecture 7: *Pricing Strategies*

7.1 Content

First, we will discuss the *Starbuck* case. Next, I will explain the relation between price and demand. I will then introduce different pricing strategies and talk about how firms use then to improve the bottom line.

Supplementary readings:

D. Williams and M. Scott. 2012. Four Secrets to Selling More. *Harvard Business Review*.

R. Mohammed. 2012. Use Pricing Strategy to Boost Sales. *Harvard Business Review*.

R. Mohammed. 2017. How Retailers Should Think About Online Versus In-Store Pricing. *Harvard Business Review*.

S. Heda, S. Mewborn and S. Caine. 2017. How Customers Perceive a Price is as Important as the Price Itself. *Harvard Business Review.*

7.2 Preparation before the class

Read the following case:

Starbucks Economics: Solving the Mystery of the Elusive "Short" Cappuccino By Tim Harford. *Slate Magazine*, January 6, 2006.

Source 1: http://www.slate.com/articles/arts/everyday_economics/2006/01/starbucks_economics.html

Source 2: Chapter 13, Designing and Managing the Supply Chain, 3rd edition, Simchi-Levi et al.

Prepare the following questions

1. What is the pricing strategy that Starbucks uses for its Cappuccino products?

2. What is a downward-sloping demand curve? Can you give some examples of products which have a downward-sloping demand curve? Can you give some example of exceptions?

3. Which factors do you think will influence the pricing strategy?

4. What types of pricing strategies have you heard of/experienced before?

7.3 Tasks after the class

1) Individual assignment_3
2) Prepare group assignment (see description at the end of the manual)

Lecture 8: *Flexibility, Technology & Emerging Trends*

8.1 Content

During this lecture, each group will present their pitch on the group assignment. Maximal time for each pitch is 3 mins. I suggest only one group member do the pitch. After the presentations, I will talk about emerging trends in operations management. If we have time left, I will wrap up the whole course and outline the important issues in each lecture.

8.2 Preparation before the class

If you have any questions regarding the course or the exam, prepare them and ask me during this lecture.

8.3 Tasks after the class

1) Prepare for the exam

Group assignment

This assignment is designed to encourage students to discover the emerging trends in operations management and how they change the way business operates nowadays. There are the following three topics from which you could choose one to write the group assignment.

1) **Online (Interactive) Product Assortment**

Online sales are now prevalent in the retail industry. During an online sale, a seller offers a handpicked assortment, i.e., a subset of products, to an arriving customer. The customer's purchase decision crucially depends on his offered assortment. He first scrutinizes all the products in the assortment, then decides which product he likes the most. After that, he either purchases his favorite, or purchase nothing if his willingness-to-pay is below the price for his favorite. The assortment problem is then a problem of deciding which subset of products to offer to customer in order to maximize the total revenue over the entire selling season. To do so, the seller needs to know a customer's preferences for products, e.g., the choice model according to which a customer makes his purchase. However, this information (the choice model) is often not known in practice. This motivates the seller to maximize the revenue and learn the underlying choice model simultaneously. This resembles an exploration-exploitation problem, which has been studied extensively by researchers in computer science. Recently development on online product assortment problems utilize machine learning algorithms to find the optimal balance between exploration and exploitation.

Product assortment can (should!) also be customized in a real-time manner. Online interactive recommender systems strive to promptly suggest to customers appropriate items according to the current context including both the consumer and item content information. These systems try to continuously maximize the customers' satisfaction over the long run. Application of such systems at Netflix, YouTube, Sportify, etc., show great success.

Product assortment problem is just one example of dynamic resource allocation problems. These problems are not just concerned with giving humans what they want, when they want it. They will also be essential for tackling some of the world's most fundamental and complex issues, including climate change, as they help us allocate our planet's often scarce and depleted resources in the most efficient ways possible.

If you choose this topic, your first challenge is to identify which company has such a problem and thus needs to use an algorithm to learn what customers may like. Think about which companies are currently using learning algorithms and what are the common features of their offerings. Intuitively speaking, you only need to "learn" about something when you do not know about it. If you already know, you do not need to learn. Learning is costly. There are two criteria for deciding whether a firm needs to "learn": 1) it offers too many choices (e.g., >=40K product varieties) therefore it is difficult to guess what customers

like; 2) its offerings are mostly innovative product, i.e., short lifecycle, always new products, thus not enough historical sales data for the firm to know what customers like. Based on these two criteria, I suggest you **not** choose (online) supermarket or IKEA as your client. The second challenge is to decide how to learn. Asking customers to fill in a survey on what they like and then offer products based on the survey results is **not** learning. It is an exploitation, i.e., exploiting what you know about customers. Learning is an exploration, e.g., you try something that you do not know the outcome yet. There is nothing wrong with only exploiting. In fact, if you have enough information about customers, why waste time learning more, you should just utilize your information to get the best assortment. But in situations where you do not know much about customers (sometimes the market changes so fast that you just cannot have a good forecast), you need to explore. All companies which need a learning algorithm are in such situations.

2) Sharing Economy

The sharing economy involves buying and selling temporary access to goods or services, usually arranged through an online platform. It is one of the fastest growing business trends in history, with investors dumping more than $23 billion in venture capital funding since 2010 into startups operating with a share-based model. By using new digital platforms, the sharing economy has created an effective business model for the utilization of goods and availability of services. The lack of overhead and inventory help share-based businesses run lean. The increased efficiencies allow these brands to pass-through value to their customers and supply chain partners.

The sharing economy has a history of disrupting traditional business sectors. In the transportation industry, Uber's ascension is one of the best examples to illustrate the effect of the sharing economy in a traditional sector. Uber and other ride-sharing services offer an affordable, safe, and convenient alternative to traditional transportation options such as public transit or taxi cabs. By utilizing an efficient mobile application and network of vetted drivers, Uber satisfies consumers' transportation demands while providing an arguably better user experience than traditional means. In just New York City alone, there are roughly 4.5 times more Uber drivers than yellow cabs. This has caused the price of owning a taxi cab in New York City to drop from $1 million in 2015 to less than $200,000 today.

In the professional and personal services space, services are defined by work that requires special knowledge, skills, experience, certifications, or training like copywriters, accountants, or plumbers. In relation to the sharing economy, this is also referred to as freelancing, gigs, and other trendy terms equating to short-term labor. Powerhouses like Fiverr, Upwork, and TaskRabbit create value by providing a fast, friendly, and secure platform on which people or businesses can find contractors for hire. Freelancers can earn extra money sharing their trade skills and expertise—not unlike owners renting access to their home or car owners sharing rides.

Technology has helped the sharing economy advance to where it is today—and, the trend should only continue as we become more connected digitally. While we've seen how dominant collaborative consumption can be in industries like transportation, consumer goods, and services, many other traditional sectors will soon experience changes because of the sharing economy.

If you choose this topic, you first need to realize that it is about buying and selling **temporary access** to goods or services. Second-hand markets are not sharing economy. Rental cars/bikes are not sharing economy as long as the company owns those cars. Uber owns no car, and Airbnb owns no properties. Second, think about what is exactly the secret to the success of the sharing economy. When Airbnb started its business in 2008, it is proclaimed that its true innovation was not its digital platform or its distributed business model: **it is trust**. The sharing economy has us engaging in behavior that would have seemed unthinkably foolhardy as recently as 10 years ago. We are hopping into strangers' cars (Lyft, Uber), welcoming them into our spare rooms (Airbnb), dropping our dogs off at their houses (DogVacay, Rover), and eating food in their dining rooms (Feastly). We are entrusting complete strangers with our most valuable possessions, our personal experiences — and our very lives. This is not only an economic breakthrough, but also a cultural one. What has helped create this breakthrough is technology. Interpersonal trust in the sharing economy is reliant upon digital platforms' capacity to foster trust. You need to address how to build trust. Different from conventional businesses where trust is required in a fixed direction along the value chain, e.g., in order to pass value from suppliers to buyers, buyers needs to trust suppliers, whereas whether suppliers trust buyers is less important, the sharing economy rides on a two-sided market with two distinct user groups. In order for trust to be relevant to share-based business, both user groups need to trust each other. A bilateral trust resembles a chicken and egg situation: who should trust first? If there are no passengers, there will be no drivers; if no drivers, there will be no passengers. You need to make a choice based on the business context.

3) Blockchain Application in Supply Chain Management

In today's business world, a company is likely to work with about 30 partners and many more suppliers across multiple industries to product products and services. Blockchain technology, which offers a more decentralized approach to data management and sharing, can improve the transparency, speed and responsiveness of these complex ecosystems. Blockchain's immutable ledger makes it well suited to tasks such as tracking goods as they move and change hands in the supply chain. Using a blockchain opens up several options for companies transporting these goods. Entries on a blockchain can be used to queue up events with a supply chain (allocating goods newly arrived at a port to different shipping containers, for example). Blockchain provides a new and dynamic means of organizing tracking data and putting it to use. Companies like Skuchain and Factom offer solutions that utilize blockchain in supply chain management solutions.

Blockchain can improve the pharmaceutical supply chain in a variety of ways. Pharmaceuticals often need to be kept in a particular temperature zone. Many medications—especially biologics—being shipped from manufacturer to warehouse to another warehouse need to stay within a certain

temperature range. With blockchain technology, this can be programmed in, triggering an alert when the temperature gets too high — or falls too low. Blockchain's transparency may also help reduce fraud for pharmaceuticals, according to a report from Deloitte. The global counterfeit drug market size is around $75-200 billion. The status quo—a complicated and opaque supply chain—exacerbates the problem. Blockchain's immutability provides a basis for traceability of drugs from manufacturer to end consumer, identifying where the supply chain breaks down. In addition to cutting losses, there's the potential to improve consumer safety and prevent some of the estimated 1 million deaths annually from counterfeit medicine, according to Deloitte.

From an operational standpoint, blockchains are not more efficient than centralized data systems. After all, they require additional computation power. But the technology is uniquely able to resolve important issues of trust and visibility in far-flung, increasingly fluid manufacturing and supply networks. It promises to be a game-changer for companies that need more agile supply chains to keep up with changing customer demands, or that are making the transition from market player to platform provider. The key is knowing whether and how to capitalize on a blockchain, when to combine it with other digital technologies for even greater synergies, and how to weigh its cost/value tradeoffs relative to those of other advanced supply chain management approaches.

If you choose this topic, I want to remind you of the cost and the nature of blockchains: you are looking at a 2-3 million investment per year and it is just an information system, it won't save your cost elsewhere (e.g., manufacturing or transportation costs) in 99.8% of the business examples. The key challenge is to identify which company should and is able to use a blockchain. There are two criteria: 1) The supply chain should be "long" (not necessarily "wide"), involving at least 200 players. Information sharing generates value only when there is a lot of information and the current system fails short at disseminating information; 2) The firm should be the dominant player in the supply chain so that the investment in a blockchain can be pooled among all its customers. Whether a player is dominant depends on the industry, but usually the ones that are closer to the customers, e.g., retailers, are **not** dominant players.

Assignment requirement

Imagine you own a cloud analytics company, specialized in offering solutions to operations problems. Your client (not you!) is considering about adopting new business concepts such as personalized product recommendation. To expand your business, you need to offer tailored plans regarding these concepts. For this assignment, write a business plan on the topic you chose, based on the following questions (please do not write your business plan like a Q&A):

What is your plan regarding this business concept? **Describe it from an operations perspective.**

      1. How does your plan exactly work? (60%)

      1. How does it, e.g., sharing economy, exactly work? Please illustrate it in detail. (10%)

      2. What are the recent developments in this area, e.g., online product assortment? (10%)

      3. Can you add something new to the existing development in this area? (10%)

      4. What do you think are the major benefits of using your method for your client's problems, e.g., online product assortment? What are the challenges? (10%)

Tips: you first need to answer who are your clients, i.e., who can benefit from this concept. For example, grocery stores do not need blockchain or online product assortment. To answer this question, you need to know the condition under which a technology brings more benefits than costs. You need to give a concrete example of a potential client and give details on how he can apply your business plan. Do not just throw out trendy words such as big data, machine learning, etc., without telling your client how exactly these technologies work in practice (in steps).