OIDD 6110: Operations Management: Quality and Productivity

Course Outline - Fall 2024

Faculty Contact Information

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Course Description

For most students, OIDD6110 will be the first course related to Operations Management. This course will teach students the principles about how organizations can provide the goods and services that their customers demand.

Consider the following examples:

- When in the Spring of 2020 hospitals experienced a rapid increase for patient care as a result of the Covid-19 pandemic, they were not only struggling to find enough doctors, nurses, and hospital beds. They also experienced a dramatic shortage in the supply of personal protective equipment (PPE) including gowns, masks, and gloves. Much of this supply was no longer available in Europe or the US as most of its production had been moved to Asia. Supply shortages were even more visible when the first Covid vaccines were launched. Millions and millions around the world were eagerly awaiting a vaccine appointment. However, the sophisticated and complex production processes that companies like Moderna and Pfizer/Biontech had designed took several months to ramp up to the large scale production required to meet demand.
- In addition to the videoconferencing platform Zoom, some of the big winners of the Covid-19 pandemic have been food delivery services such as DoorDash, UberEats, and DeliveryHero. These companies have been able to respond to customer orders (demand) by quickly and inexpensively delivering food from many sources of supply. Similarly, 20 years after the bankruptcy of grocery delivery retailer Webvan, ordering our groceries has become a part of daily routine during the pandemic.
- On April 20 in 2020, the price for oil for the May 2020 contract futures price for West Texas Intermediate (WTI) turned negative. Oil producers were struggling to find storage space for incoming tankers. A little over a year later, oil prices reached new highpoints in many areas of the world and energy supply shortages are seen as one of the major inflation drivers at the beginning of 2022.
- Sony launched its Playstation PS5 in November 2020. However, shortages in semiconductor supply severely limited sales and the demand for the PS5 still exceeds supply at the beginning of 2022. Shortages for semiconductors have also forced manufacturers of phones, computers, and automotive vehicles to reduce the utilization of

their production lines, leading to stranded assets for the manufacturers and frustrated customers waiting to see their orders filled.

As these examples illustrate, matching supply with demand is an enormous challenge for firms: excess supply is too costly, inadequate supply irritates customers. In the course, we will explore how firms can better organize their operations so that they more effectively align their supply with the demand for their products and services. Throughout the course, we illustrate mathematical analysis applied to real operational challenges – we seek rigor and relevance. Our aim is to provide both tactical knowledge and high-level insights needed by general managers and management consultants. We will demonstrate that companies can use (and have used) the principles from this course to significantly enhance their competitiveness.

In this course, the emphasis is on the design of business processes to maximize productivity and to achieve world-class quality. The course details different kinds of business processes and explains how to measure key process parameters like capacity and lead time. The course also covers process improvement and examines classic ideas in quality management and the Toyota Production System.

Course Timing for Q1-2024

The two sections of the course will meet at 8:30am and10:15 am in JMHH-xxx . The course will begin Tuesday, August 27 and will consist of 10 class sessions covering new content. The last week of class that will introduce new content will thus be on Thursday, September 26. On Tuesday, October 1 there will be a session on AI and the future of work, which will not be tested on the final exam. Then, there will be an optional review session on October 3.

The attendance of all other classes is mandatory (including the first class) except for absences excused by the MBA Program Office.

The final exam for this course will take place on October 10 at 9am.

Course Format

Students are expected to attend all sessions in person. This includes:

- Being on time for each session. Note: we will NOT use the attendance app but rather rely on the seating chart and your physical arrival in class.
- Preparing an average of one case a week. There is no need to submit a formal case write-up, but students are expected to spend about 1h on case preparation for each case. Detailed instructions on how to prepare each case will be sent out in advance / provided in the prior session.
- Time for reading, reviewing, and preparing for homework assignments and the course exam (about two hours per week, on average, though this is not evenly distributed).
- Watch a set of asynchronous (pre-recorded) videos as assigned in Canvas and in class. These videos allow us to avoid spending too much class time in lecture mode. These videos also help students who have missed classes or whose class attendance might be constrained by Covid restrictions to make up for lost class time.

Canvas will be used to keep track of readings, assignments, and videos.

Asynchronous videos

All course content is available in a library of asynchronous videos that are posted on Canvas. Students don't have to watch these videos. They are meant as a resource for students who could not attend class or are struggling for other reasons. All the action will be in the class room.

Grading

Each student's final numerical score for the course is based on the following items and weights:

Homework assignments (24% of final grade). Each student must turn in his or her own assignment through Canvas. We encourage students to attempt to complete the assignments on their own. However, to promote learning, students are allowed to discuss each assignment with other students taking OIDD611 in the same quarter. There will be three homework assignments. HW1 and HW2 are worth 6% each. HW3 is worth 12%.

Class participation (26% of final grade). The class participation score is based on class contributions throughout the entire course. To contribute during case discussions, students must prepare cases carefully before coming to class and be ready to discuss and defend recommended actions. Answers to cases do not have to be submitted. Repeated unexcused absence or late arrival will influence the class participation grade.

Final Exam (50% of final grade). There is 2h exam based on the contents of the course: analytical tools, case discussions, lectures, etc. The format of this exam is open book and open notes.

Course Text, Readings and Handouts

All lectures will follow the textbook by Cachon and Terwiesch very closely:

Cachon, Gerard, Christian Terwiesch, *Matching Supply with Demand: An Introduction to Operations Management*, 5th edition, McGraw Hill (older editions and the international editions are cheaper to purchase and cover all relevant material)

Though the book is a recommended reading, it is not required. All definitions and formula will be provided in the slide decks. Cases will be made available via Canvas.

OIDD6150: Operations Strategy is a related to this course. OIDD6110 (this course) is about process analysis as a tool to match supply with demand. It uses the first half of the Cachon and Terwiesch book. OIDD6150 is focusing on supply chains and covers the second half of the book.

Course Ethics and Electronic Devices

The following summarizes the ethics guidelines for the course:

(1) Homework: Students are encouraged to test their understanding of the material by working on the homework individually. Once the student has diagnosed his/her skill level, communication with other students in the same course offering is allowed and encouraged. No AI tools are allowed to help in the homework. No materials from past offerings of this course may be consulted.

(2) Case preparation: Students are encouraged to collaborate when preparing for cases or working on the end-of-chapter problems. Students are also encouraged to use AI tools to help prepare with cases or the end-of-chapter problems.

(3) Final Exam: The final exam is open book, open notes. Students can use a tablet or a laptop (please have the screen positioned so that it cannot be viewed by others), though a calculator works just fine. Students are not allowed to pre-program any macros or spreadsheets. To state the obvious, students are not allowed to interact with fellow students or anyone else during the time of the assessment. No AI tools are allowed during the exam. No materials from past offerings of this course may be consulted before or during the exam unless released by the faculty.

During class, students are allowed to use laptops and tablets only for work directly related to the class (no email, no other work).

Session overview

There are 10 sessions covering new content in this course and three homework assignments. Cases and exercises are taken from a broad range of industries, including financial services, hospitality, retailing, manufacturing, and healthcare. Some of the detailed session planning might change. Please check the Canvas for the final assignments.

The course consists of 10 modules.
INTRO: Cost-quality trade-off, the efficiency frontier, three system inhibitors
PROCESS: Process flow, capacity, bottleneck, inventory, flow rate, flow time
FLOW: Labor productivity, cycle time, idle time, takt and line balance
LITTLE: basic flow law, inventory turns, employee turnover
MULTI: more advanced process flows, variety, set-ups, attrition losses
KPI: performance measurement, value drivers, ops-finance link
LEAN: sources of waste, Toyota production system, push-pull, just in time
WAIT: customer waiting and congestion, priority rules, customer experience
LOSS: lost demand, service levels, pooling capacity, new business models
QUALITY: six sigma models, Jidoka, fool-proofing, quality improvement

Detailed Outline
The course consists of 10 modules. Here is a mapping from the 12 sessions to the as well as the due dates of the assignments. Canvas has more information.

Class	Date	Module	Key content	Prework
1	27-Aug	INTRO	WTP, Efficiency Frontier, System Inhibitors; Mortgage game	Loan Underwriting
2	29-Aug	PROC, LITTLE	Process Analysis, Bottleneck, Little's Law	Retail data
3	3-Sep	FLOW	Subway analysis, Labor productivity	
4	5-Sep	MULTI	Cranberry case analysis, problem definition	Cranberry case
5	10-Sep	KPI	Performance analysis, ROIC tree, value drivers	HW1
6	12-Sep	LEAN	Capital One case analysis, lean operations	Capital One case
7	17-Sep	WAIT	Waiting time analysis, types of queues	
8	19-Sep		Call center case analysis, transformation	Call center case
9	24-Sep	LOSS	Loss models, blocking and starving	
10	26-Sep		Quality, TPS, Six Sigma; Mortage game (Round 2)	
11	1-Oct	QUALITY	AI and operations: Chat GPT, Process Analytics	Mortgage analysis
12	3-Oct		Review session	HW2
13	10-Oct		Final exam (9-11am in JMHH)	HW3

TA Office Hours
Over the course of the quarter and especially close to Homework due dates and the exam, we will offer an assortment of TA office hours that are staffed by second year students. You can approach the TAs with specific questions and/or for general review. More details to come…

Faculty Office Hours

Office hours with me can be scheduled as needed. My default time for meeting with students is from 12 to 1.30 in my office on Thursday. However, we can schedule phone calls or zoom meetings pretty much any time over the quarter. Either way, please make an appointment with me via email to make sure that our schedules align.

In addition to office hours, I plan to schedule a handful of social gatherings over zoom and / or in person.