Course Description

OPIM 224: Analytics for Service Operations
(Fall 2018)
(Revised May 16, 2018)

Instructor:
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Office Hours: Monday 3:00 – 6:00 pm or by appt.

Teaching Assistant:
TBD

Class Room and Schedule
JMHH 260   Thursday 3pm – 6:00pm[1]

Course Overview
The service sector represents the largest segment of most industrial economies. In the U.S., for example, it accounts for approximately 70% of GDP and over 80% of employment. In addition to this "pure" service sector, the competitiveness of many manufacturing firms increasingly is based on their service processes and capabilities. Indeed consumers today care little about the distinction between manufacturing and service. Rather, they simply want their specific needs to be fulfilled through a combination of physical goods, intangible services and information, provided not only at the moment of placing a demand, but also throughout the life-cycle of product acquisition, use and disposal. This has blurred the traditional distinction between 'manufacturing' and 'service' firms. Today's firms must provide what the customer needs, and frequently that is a bundle of services and physical goods that generate value.

While operational excellence is critical for success in most industries today, this is particularly true for the production and delivery of services. For example, industries such as banking, transportation, health care, and communications all face intensified competition and rising customer expectations based on the performance of their operations. At the same time, the rapid evolution of information technology and the internet has enabled firms to operate in a fashion – and to offer a level of service – that has not been previously possible.

Elements common to most services make the management of their operations complex, however. In particular, services are intangible, not storable or transportable, and often highly variable. Frequently their delivery involves distributed operations with a significant amount of customer contact. All of these factors make service operations end up looking quite a bit different than manufacturing operations, and thus the task of achieving excellence in them requires particular strategies and analysis methods.

Therefore, the understanding and effective management of service operations requires specialized analytical tools and a customer-centric focus. This course covers a mix of topics with an emphasis on

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[1] Except for x/xx where we meet in VANC 112.

quantitative methods, application of analytics and strategic frameworks. The class will introduce simple models and basic concepts that support analysis of tradeoffs in a variety of common service processes.

Students also will have the opportunity to apply the ideas and analytical models developed in the course to a particular service industry. They will do so by conducting a guided, application group project which includes opportunities for in-depth analysis of a particular service process and field work.

The course will cover the following service operations topics:

- The design of a service strategy
- Capacity management for services
- Service quality management
- Service delivery processes
- Revenue management
- Lean for services
- After-sales service product support
- Servicization of products and product-service systems

In class, we will apply analytic tools and methods developed for each of these topics to cases and problems derived from service industries such as:

- Financial Services and Banking
- Health Care
- Transportation and Logistics
- Entertainment
- Restaurants

- Consulting
- Hospitality/Hotel
- Gaming
- Sports
- Education

We will also discuss how the material covered in the course is relevant to customer focused, service delivery aspects pervasive in product related industries such as:

- Telecommunications
- Manufacturing Equipment
- Internet Retailing
- Semiconductor
- Auto

- Aerospace and Defense
- Consumer Electronics
- High Technology/IT
- Power Systems
- Energy/ Oil & Gas

Prerequisites and Related Courses
To take this course, you should have a good understanding of elementary probability and statistics as well as some exposure to linear programming and computer simulation, (all at the level of OIDD 101 or an equivalent course).

- Your background in probability and statistics should include an understanding of random variables, measures of central tendency and variation and the use of sample data to estimate distribution parameters.
- Your background in linear programming should include an understanding of the algebraic formulation and spreadsheet implementation of linear programs (LPs as well as shadow (dual) prices). We will review the use of the Solver in Excel that solves such problems.
- Your understanding of simulation should include an understanding of the basic principles of Monte Carlo Simulation. We will introduce some basic simulation modeling concepts and using several prepared simulation models to support analysis of specific cases.

- We will introduce several basic Queueing models and use quantitative tools to analyze performance tradeoffs and decisions for these models.
- A heuristic solution algorithm applied to a complex optimization problem will be introduced and applied to a problem of after-sales service support.

Students without these specific prerequisites, but with a good quantitative or systems background can take the course, but may have to do some extra reading to cover these topics. You will learn to apply these tools in several Structured, Active Learning class sessions.

We will be using several tools and models that you may have seen in other courses, i.e. in OIDD 220 or OIDD 321. Our focus in this course is on the application of such tools to realistic service related business cases.

Course Requirements and Grading
Your final numerical score for the course is based on the following components (with % weights): individual class participation (15%), 2 group assignments (10%), the in-class midterm test (20%), 3 individual case reports based on active learning sessions (5%), and the group project (50%). Your grade is based on the ranking of your overall numerical score in the course. The grades are in general relative, although there are minimal absolute standards for passing the course. Therefore, minimal performance requirements apply. Please refer to the Wharton undergraduate handbook for code of conduct and guidelines.

Group Project
At the start of the course, you should form teams of 3-4 people. The group will be responsible for developing a suitable project with the participation of a service organization, conduct the project and submit a final report due at the end of the semester. Each group also will be responsible for several assignments as well as reports on project progress. Groups are encouraged to share their results with the sponsoring organization.

Assignment Reports
Reports for the 2 group assignments and the 3 individual assignments will be due after the active learning session (on a specified date), where we discuss the case and demonstrate use of any relevant tools. There are additional sessions where we will discuss cases in class, and which do not require a written report. Your participation in the discussion in these sessions, however, will count towards your participation grade. There also will be an in-class midterm test that will focus on the some of the analytic tools covered in the first half of the course. You are encouraged to discuss all of the cases and assignments in your groups. Assignments and case discussion questions will be posted on the canvas website; for a schedule of due dates, please see the deliverables schedule and the course outline below.

The cases, assignments and readings are based a variety of different industry settings that include airlines, restaurants, hospitals, call centers, banks, casinos, high tech service support providers and off the grid energy distributors. Cases are considered an integral part of the course. You are expected to *prepare for each class* by reading the case and assigned articles carefully and by answering the guiding questions posted on the course Canvas web site. If a particular group member has not been able to participate in the write-up of a group assignment, please do not include him/her on the cover page of the report. The report should clearly state the key problems, provide your analysis, and summarize any takeaways. Case reports (4 pages, double spaced) and active learning session reports (2 pages, double spaced) are due *at the beginning of the class* in which the case is discussed. Please, submit your case write-ups electronically via Canvas.

In-Class Midterm

Course Description

There will be 1 in-class, open book test during the semester; please mark the dates in your calendar October 30 (class #8A). This test will be based on concepts covered in class and in the homework assignments during the first half of the course. If you cannot attend class on the scheduled test date do not sign up for this course. Some guidelines and sample questions will be offered during the course.

Honor Code
As noted above some of the cases and the project are partner and group efforts. You can discuss cases, class materials and all of the assignments with your group and other members of the class. Any case write-ups answers from prior/other related classes cannot be used in the course. You will also be asked to rate all members of your group with respect to their contribution effort to the final project.

Learning Environment – Concert Rules
In addition to regular class presence, attentive participation and informed discussions are critical to the learning process; they make classes more interesting and enjoyable for all of us and the quality of your comments is an important factor in enhancing the classroom experience. You are encouraged to volunteer substantive comments and questions freely.

Several of the class sessions will be based on Active Learning, where you will have the opportunity to work, in class, on exercises and mini-assignments that are associated with the analytical tools introduced in the course. In some instances you will be required to submit a brief report based on your continued analysis of a case, that will be based on application of the tool introduced in the class session.

Classes will start and end on time.   Sit according to the seating chart and please display your name tents. Late entry or reentry to a class session is allowed only under exceptional circumstances.   All phones, laptops and other electronic devices should be turned off except for those active learning sessions where you are required to bring your laptop and use it in class. If you must keep a phone on by reason of a personal emergency, you must inform the instructor before class begins.

I encourage you to take advantage of the regular office hours listed above. If they don't fit your schedule, please make an appointment. E-mail is another good way to have your questions answered. It is vital that you communicate with me early on about any difficulties or concerns. In addition to regular office hours, we may also offer some review sessions if there is sufficient student interest. Logistics for these will be discussed in class.

Project Progress and Reporting
There are a number of milestones associated with the group project report. These include topic idea generation and topic selection, a progress report presentation, a final presentation and the final report.

Course Materials
All required course materials are available at the Study.Net link in the course Canvas site. Additional materials and all handouts will be posted on the course Canvas site at:
https://canvas.upenn.edu/courses/xxxx
For those who would like to have a text, I recommend the following book for reference:
> J. A. Fitzsimmons and M. J. Fitzsimmons, *Service Management: Operations, Strategy, and Information Technology*, New York: Irwin-McGraw Hill, 8th ed., 2014 (or earlier editions).

Deliverables Schedule

Class #	Assignment	Deliverable	Due Date
1-B	The Indigo Story/ Southwest Airlines	Case Discussion	8/30
2-B	Benihana Simulation	Introduction to Case - Discussion	9/06
3-A	Benihana Simulation	Individual Report - 1	9/13
4-A	Project Topic List	Group Report	9/20
4-B	Shouldice Case Debrief	Individual Report - 2	9/20
5-B	Potelco (B)	Introduction to Case - Discussion	9/27
6-A	Potelco (B)	Group Case Report -1	10/11
7-B	Discrete Event Simulation	Individual Report -3	10/18
8-B	Harrah's Case	Case Discussion	10/25
9-A	In-Class Midterm Test	Individual Test	11/01
10-A	Project Plan Presentation	Group Report	11/08
11-B	Schindler Elevator	Group Case Report -2	11/15
12	Project Progress Update	Group Report	11/20
14	Project Presentation	Group Report	12/06
--	Project Report	Group Report	12/14

Case write-ups and assignments must be submitted in to Canvas before the start of class in which it is due.

Term Project
The lecture and active learning portion of the course introduces several analytical models and strategy frameworks that are useful for the management of service operations. The in-class examples, cases and problems allow you to see how these tools can be applied in various service settings.

By design, all of the classroom material is somewhat sanitized, however. That is, the hard work of acquiring data, cleaning it, and massaging it into a form that is useful for analysis has already been done for you. The use of such "clean" data allows you to focus on internalizing the key concepts without becoming unnecessarily distracted by data anomalies.

The final project provides an important complement to the classroom experience, allowing you to apply course concepts and tools on a problem of special interest to you. The project is a guided application, in which I assist your group through a significant course of self-study. Specific benefits of the guided study include a chance to think through how best to collect and clean the data, as well as how to apply the models used in class, especially if none of them exactly fits the project situation.

Since we all are actively involved as consumers of services, it should be straightforward to select a particular service provider or a service industry that your group is interested in and is familiar with. There is a wide variety of topics that each group can choose from to pursue for the final project. Some important considerations when selecting a project topic is that you gain access to the site, have cooperation and involvement of management and have access to data. The following types of project work out best.

Service Improvement – a mini-consulting project. It involves use of the methodologies introduced in class to analyze a real life service operations system, diagnose its problems, identify opportunities for improvement and quantify potential costs, benefits, risks and service impacts.

New Service Business Plan. This is an opportunity for entrepreneurs to identify a service need that can be met through enhanced service operations processes. Your group will be required to develop a mini-business plan and support the analysis through use of the tools introduced in the course. You are

encouraged to consider opportunities that are based on emerging technologies and strategies related to services (internet, mobile communication, social networking, 3-D printing, internet of things, servicization etc.).

To the extent that the above types of projects do not work out for your group – or to the extent that you have a burning passion to study a particular industry, you also might consider the following option:

Industry / Company Service Profile. You will be required to complete a report that describes the key operational and strategic challenges in the selected service industry, and how various firms are managing these challenges. Alternatively the report could focus on a single firm, describing its service concept, competitive position, underlying service strategy, the main characteristics of its operations, key operational choices it has made, operational policies, etc.

Class	Date	Topic	To Read Before Class / Agenda	Due
1-A	Thurs 8/30	Introduction: course overview & introduction to service ops strategy	J. A. Fitzsimmons and M. J. Fitzsimmons, "The Nature of Services," *Service Management,* 4thed. New York: Irwin-McGraw-Hill, 2004, pp 17-30. F. Frei and A. Morriss, "Truth Number 1:You Can't Be Good at Everything--How to Make the Right Trade-Offs to Deliver Exceptional Customer Service", HBS Chapter # 8922BC-PDF-ENG	
1-B	Thurs 8/30	Service Delivery Strategy: Airlines	G. Yemen and E. Weiss, "The Indigo Story: On Time, Hassle Free", Darden Case, # UVA-OM-1505, 2013. Southwest Airlines: Where's the Luv?", Darden Case, # UVA-OM—1571, 2017.	**CD**
2-A	Thurs 9/06	Monte Carlo simulation	• Overview of Simulation modeling • Airplane boarding simulation • Introduction to Benihana case "How to Register for Benihana Simulation as a Student" Link to simulation: http://cb.hbsp.harvard.edu/cbmp/access/65900218	
2-B	Thurs 9/06	Service Delivery Strategy: Restaurants	W. E. Sasser and J. Klug, "Benihana of Tokyo" *HBS Case* #9-673-057, 2004, 17pp • Simulation analysis of Benihana case – Analysis of options	**CD**
3-A	Thurs 9/13	Quantitative Methods Review - Linear Programming	• De-brief Benihana strategy case results • Review of Linear Program modeling • Modeling exercise D. Iancu, "Constructing a Linear Model" (video) D. Iancu, "Introduction to Linear Optimization with Microsoft Excel" (We meet in Computer Lab TBD)	**R1**
3-B	Thurs 9/13	Capacity Management: Service Delivery Strategy: Hospitals	• Shouldice Case - – initial discussion J. L. Heskett , "Shouldice Hospital Ltd (Abridged)," *HBS Case* #9-805-002, 2005, 14 pp P. Mango and L. Shapiro, "Hospitals Get Serious About Operations" *The McKinsey Quarterly*, 2001, No. 2, pp. 74-85.	
4-A	Thurs 9/20	Capacity Management: Queuing models - Introduction	• D-brief Shouldice case results	**R2**
4-B	Thurs 9/20	Capacity Management	• Introduction to Queuing M. Rieders, "Basic Queuing Models" K. L. Katz, B. M. Larson, and R. C. Larson, "Prescription for the Waiting-in-Line Blues," *Sloan Management Review*, Winter 1991, pp. 44-53. • **Project Topic List Due**	**P1**
5-A	Thurs 9/27	Capacity Management: Queuing models - Loss systems	• Loss system model Peter Kolesar, "Stalking the Endangered CAT," *Interfaces*, 14.6, Nov-Dec 1984, pp. 16-26.	
5-B	Thurs 9/27	Capacity Management: call center case	• Potelco case - initial discussion N. Agrawal, Thank You For Calling Potelco – May I Help You, Santa Clara University (B) Case 2012	
	Thurs 10/04	Fall Break	Class Cancelled	
6-A	Thurs 10/11	Capacity Management: call center case	• De-brief Potelco (B) case results	**GR1**
6-B	Thurs 10/11	Simulation Software	• Discrete Event Simulation – Introduction to JaamSim software (We meet in Computer Lab TBD)	
7-A	Thurs 10/18	Revenue Management : - Introduction	• Revenue Management Game	
7-B	Thurs 10/18	Revenue Management: uncertainty & Simulation	• Introduction to Revenue Management • Model with uncertain demand R. G. Cross , "The Core Concepts of Revenue Management," *Revenue Management*, New York: Broadway Books, 1998, pp. 49-98.	**R3**

			R.L. Phillips, <u>Pricing and Revenue Optimization</u>, "Capacity Allocation, Chapter 7 • Simulation Exercise (We meet in Computer Lab TBD)	
8-A	Thurs 10/25	Revenue Management: bid price LPs & expected marginal revenue	• LP model of revenue management R..L. Phillips, <u>Pricing & Revenue Optimization</u>, "Network Management", Chapter 8	**CD**
8-B	Thurs 10/25	Harrah's case discussion	• Harrach's case analysis M. A. Cohen, N. Gans and N. Agrawal, "Revenue Management at Harrah's Entertainment, Inc.", Wharton Case, INFORMS Transactions on Education, May, 2009, pp.160-168. Metters et al, "The "Killer Application" of Revenue Management: Harrah's Cherokee Casino & Hotel"	
9-A	Thurs 11/01		In-Class Midterm Test	
9-B	Thurs 11/01		Class Cancelled	
10-A	Thurs 11/08		**Project Plan Presentations**	**P2**
10-B	Thurs 11/08	Toyota Guest Speaker	Guest speaker: Jamie Bonini,Vice President TSSC at Toyota Engineering and Manufacturing North America "Application of the Toyota Production System to Services"	
11-A	Thurs 11/15	After-Sales Service Support - Performance Based Logistics	• Service Life Cycle Management Strategy M. A. Cohen, N. Agrawal and V. Agrawal, "Winning in the Aftermarket", *Harvard Business Review*, June 2006, pp. 129-138. • Performance Based Logistics J. Guajardo et al, "Impact of Performance Based Contracting on Product Reliability: An Empirical Analysis", Management Science, 2012, 32pp	
11-B	Thurs 11/15	Service Support Case	Schindler Elevator Corporation", Darden Case, # UVA-OM-1593, 2018	**GR2**
12	Tues 11/20	Project Progress Report	**Project Progress Report Presentations**	**P3**
13-A	Thurs 11/29	Service Quality Management - TQM, Lean	• Service Quality Management and Measurement J. A. Fitzsimmons and M. J. Fitzsimmons, "Service Quality", 2004 F. Lai, J. Hutchinson, D Li and C. Bai, "An empirical assessment and application of SERVQUAL in mainland China's mobile communications industry", *International Journal of Quality and Reliability Management*, Vol. 24, No. 3, 2007, pp. 244-282	
13-B	Thurs 11/29	Servicization & Product-Service Systems	J. Guajardo and M. Cohen, "Service Differentiation and Operating Segments: A Framework and an Application to After-Sales Services", MSOM, 2018.	
14	Mon 12/06	Project Presentations	**Project Presentations**	**P4**
---	12/14	Final Report	**Report Due on (12/14)**	**P5**

Assignments / Deliverables:

Individual Report (based on Active Learning Session) = Rn
Group Case Report = GRn
Case discussion (no hand-in required) = CD
Project Topic List = P1 (2-3 choices with brief description of each)
Project plan proposals progress report = P2 (2 page description of your project)
Project progress update = P3 (1 page report describing progress, changes in direction)
Project presentations (power point) = P4
Project final report = P5