



**OIDD-680**

## **Operations Strategy Practicum**

**Spring 2017**

(Revised January 12, 2017)

**Locations:** Scheduled sessions at Wharton will meet in JMHH – G92 at 6:00 pm – 7:30 pm, on scheduled dates. Spring Break in Germany and various company visits reachable from the Philadelphia Campus during the semester. On schedule Fridays.

**Dates:** Spring Semester 2017

- Lectures, Case Discussions
- Visits to German, Dutch and US manufacturing plants, logistics centers and service provider facilities
- Presentations by senior managers

**Credit:** 1.0 Credit Unit

### **Course Instructor**

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### **Participating Faculty**

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### **Course TA**

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### **Course Overview and Learning Goals**

This course will focus on the management of operations at manufacturing and service facilities located within the US, Germany, and the Netherlands that are used either by domestic corporations or by foreign multinational companies. Our emphasis will be on the evolving patterns of operations strategies adopted by firms for producing products, sourcing manufacturing, distributing products, delivering services and managing product design as well as on programs for enhancing quality, productivity and flexibility and managing technology. We will focus on the formulation and execution of such strategies for a collection of firms in the context of the current dynamics of global

competition. The course will consist of a set of site visits and in-class sessions which include lectures, case discussions and management speakers who will describe their company's current strategy.

Our course is motivated by the fact that many manufacturing and service producing firms are re-examining the structure of their global supply chains, internal processes and sourcing strategy in response to the uncertainties and risks they face in these turbulent times. These adjustments are occurring against a backdrop of fundamental change to the environment in which companies operate. For decades a dominant strategy in manufacturing has been to outsource to low cost global suppliers. This has led to the transfer of millions of manufacturing jobs and development activities out of the US, Japan and Europe and into low labor cost countries such as China, India and Vietnam. Today this trend is being challenged by a movement by some companies to "re-shore" their manufacturing by bringing it back or at least moving it closer to their developed country market, i.e. by "near-shoring" to locations such as Mexico or Eastern Europe. At the same time many firms continue to select offshore locations for outsourcing of material inputs and services. Similar arguments for global sourcing and re-shoring can also be made for firms that act as suppliers of services such as Business Process Outsourcing, Customer Service Support, Product Design and Software Development. Moreover there have been major technology developments affecting production automation, logistics and smart, connected product designs which are contributing to this re-structuring. Against this backdrop of change, we are currently in an era where government policies concerning globalization and its impact on domestic employment have been questioned and challenged.

This course will consider the current status of operations strategy and process management primarily from the perspective of major multi-national firms, although we will also interact with startup companies. The goal is to provide the class with the opportunity to interact with senior executives from these companies, which are headquartered and/or operating in the US, Germany, and the Netherlands, to explore current thinking and state-of-the-art practices concerning their global operations. Experiential learning will be facilitated by providing students with the opportunity to observe company operations in action under the guidance of company management. These interactions will facilitate an exchange of ideas that will identify managerial challenges and concerns. It will also highlight current practices and intentions of participating companies. Moreover, the course will consider various models and frameworks that have been developed in the economics, public policy, operations and management literatures for dealing with strategies for global supply chain sourcing, technology management and process improvement. We will also consider how technology developments are impacting current operations strategy (e.g. automation, E-commerce, Internet of Things). Our objective is to develop an understanding of the drivers of operations strategy decisions, at present and in the future, in order to identify opportunities for improvement and barriers to implementation.

We will explore these issues through the lens of visits to a specific group of multinational and emerging companies located in Germany, the Netherlands and in the mid-Atlantic region of the US. The companies will be chosen to cover a range of manufacturing and service industries where global sourcing, productivity and coordination are key issues e.g. aerospace and defense, automotive, consumer electronics and computers, consumer products, entertainment, health care products, medical equipment, pharmaceuticals, logistics, and semiconductor. This course will build off of the learning based on a Global Modular Course on this topic that has been offered in Japan and from versions of the course that has been offered to students participating in the Wharton SiSF (Semester in San Francisco) program and to students in the regular full time program in Philadelphia.

## **Course Organization and Requirements**

The course will include an intense week of company visits in Germany and the Netherlands during the spring break (March 5 – March 11, 2017), several US company visits on Fridays, and several class sessions at Wharton. The class sessions to be held at Wharton will include lectures, case discussions and guest speakers. Students will be responsible for travel expenses (flight to Germany and for the land arrangements in Germany,, the Netherlands and the US). We estimate that these expenses will be about \$2,400 for the course (for the full semester, shared occupancy, excluding the cost of the flight to Germany). ***It will be necessary to register for the course (as a 1 CU course), and pay a deposit fee for the expenses in order to reserve your place in the course.*** Enrollment will be limited due to capacity restrictions imposed by the companies that we will be visiting.

## **Pre-requisites**

Students taking this course should have completed at least one of the OIDD core courses, i.e. OIDD 611, “Managing the Productive Core of the Firm: Quality and Productivity” or OIDD 615, “Managing the Productive Core of the Firm: Operations Strategy”, or an equivalent course, or have had work experience that focuses on operations and supply chain management.

## **Grading and assignments**

Grades are based on (1) class participation which includes class discussions, contribution to the group reports and attendance to the company visits (25%); (2) analysis of 2 assigned cases, each requires an individual, written report (25%); (3) A background report concerning one of the companies and their industry, that we will visit, and an after-site visit report for that company based on observations from the visit. (25%); This will be a group report; and (4) a final, individual paper offering reflections on what you observed and learned during the site visits (25%). If you miss any of the company visits your participation grade will be reduced.

All of the Wharton class sessions will be recorded so if you miss a class you will be able to review the discussion. An adjustment to your participation grade can occur if you miss any of the Wharton sessions. Attendance at all of the company site visits is mandatory.

The schedule for the course includes a series of company visits in Germany and the Netherlands during the week of Spring break (March 5 to March 11). The tour will begin the German segment in Frankfurt and we will visit ten companies as we work our way to Eindhoven and then to Hamburg during the week of March 5. There will also be visits to Janssen Pharmaceuticals, Inc. of Johnson & Johnson and AmerisourceBergen (on Fridays), at sites that are accessible from the Philadelphia campus that have been scheduled in the Spring semester, (see below).


The schedule is subject to change but has been fully confirmed.

The following is the full schedule for the course, including the domestic and European segments.

Session	Dates	Session	Location	
1	1/17/2017 - 6 pm - 7:30 pm JMHH G92	Opening class -Operations Strategy lecture - Plant Tours Analysis	Wharton	
2	1/31/2017 - 6 pm - 7:30 pm JMHH G92	Case Cisco SCRM Discussion	Wharton	
3	2/14/2017 -6 pm - 7:30 pm JMHH G92	Global Supply Chain Strategy – Sourcing and Location	Wharton	
V-1	Friday - TBD	Corporate Visit to Janssen/Johnson & Johnson - large molecule facility	Malvern PA	
4	2/28/2017 -6 pm - 7:30 pm JMHH G92	Industry Reports and Trip Preparation	Wharton	
E-0 – E-7	3/05 - 3/11, 2017	Trip to Germany & Netherlands	Germany Netherlands	
5	3/21/2017 - 6 pm - 7:30 pm JMHH G92	Boeing Fasteners case Discussion	Wharton	
6	3/28/2017 -6 pm - 7:30 pm JMHH G92	Logistics and Distribution Strategy	Wharton	AmerisourceBergen Speakers: <ul style="list-style-type: none"> <li>• Joe Short, Senior VP Corporate Operations</li> <li>• Bruce Bennet, Senior VP Distribution Services</li> </ul>
V-2	Friday 4/7/2017 – 8:30 am – 4:30 pm	Corporate Visit to AmerisourceBergen distribution center	Bethlehem PA	
7	4/13/2017 - 6 pm - 7:30 pm JMHH G92	Post-Visit Group Presentations	Wharton	
8	4/25/2017 - 6 pm - 7:30 pm JMHH G92	Final Debrief Class	Wharton	


**Schedule: Wharton study tour, Germany and the Netherlands  
March 5 to 11, 2017**

The following schedule is subject to change.

<b>Session</b>	<b>Date</b>	<b>Topic and Readings</b>
<b>1-A</b>	<b>January 17</b>  <b>6:00 pm -7:30 pm</b>	<p><b>Course Introduction - Operations Strategy</b></p> <p>This session will present the goals and requirements for the course. We will then review the course schedule. Finally, we will introduce a framework for operations strategy that highlights the following concepts that will be covered in the course either in class sessions or through company visits:</p> <ul style="list-style-type: none"> <li>○ Global Manufacturing Sourcing</li> <li>○ Supplier Relationships and Coordination</li> <li>○ Logistics and Distribution</li> <li>○ Technology and Capacity Planning</li> <li>○ Supply Chain Risk Management</li> <li>○ Agility, Flexibility Strategies</li> <li>○ Environment and Sustainability</li> <li>○ Lean operations and continuous improvement</li> </ul> <p>• <b>Readings</b></p> <ul style="list-style-type: none"> <li>○ M. Fisher, “What is the Right Supply Chain for Your Products”, Harvard Business Review, 1997.</li> <li>○ H. Lee, “Triple A Supply Chain”, Harvard Business Review, 2004.</li> </ul>
<b>1-B</b>	<b>January 17</b>  <b>6:00 pm -7:30 pm</b>	<p><b>Plant Tours and Industry Background</b></p> <p>This session will introduce the Plant Tour Analysis tool that will be applied in our site visits by the student teams. We will also discuss the industry background reports that each team will prepare. Each team will be required to distribute their background report prior to the site visit and a summary of the site report after each visit.</p> <p>• <b>Reading</b></p> <ul style="list-style-type: none"> <li>○ R. E. Goodson, “Read a Plant – Fast”, HBR, May 2002.</li> </ul>
<b>V-1</b>	<b>January 27</b>  <b>February 10</b>  <b>February 17</b>  <b>February 24</b>  <b>Malvern PA</b>	<p><b>Corporate Visit to Janssen/Johnson &amp; Johnson - large molecule facility</b></p> <div align="center">  <p>The logo for Janssen Pharmaceutical Companies, a division of Johnson &amp; Johnson. It features the word 'janssen' in a blue, lowercase, sans-serif font. Below it, in smaller text, are 'PHARMACEUTICAL COMPANIES' and 'OF Johnson &amp; Johnson'. To the right of the text is a stylized blue graphic element resembling a checkmark or a wing.</p> </div>
<b>2</b>	<b>January 31</b>  <b>6:00 pm -7:30 pm</b>	<p><b>Supply Chain Risk Management - Cisco Case Discussion</b></p> <p>This session will introduce the concept of supply chain risk management. We will do so by discussing the case which describes the Cisco process and how it reacted to the Tohoku earthquake in Japan. We will review the presentation of James Steele, who was director of Cisco’s Supply Chain Risk Management</p>

		<p>program at the time of the quake, who has provided an update on Cisco's response.</p> <ul style="list-style-type: none"> <li>• <b>Readings</b> <ul style="list-style-type: none"> <li>○ R. Anupindi, "Cisco Supply Chain Risk Management (SCRM) in Action: 2011 Tohoku Earthquake", (U. Michigan Case 1-429-284, 2013)</li> <li>○ R. Anupindi, "Supply Chain Risk Management at Cisco: Response to H1N1 (U. of Michigan case 1-428-881), – <u>read pages 2 through top of page 9.</u></li> <li>○ D. Simchi-Levi , W. Schmidt and Y. Wei, "From Super Storms to Factory Fires: Unpredictable Supply-Chain Disruptions", HBR Jan-Feb, 2014.</li> <li>○ D. Reynolds, "Lessons From Tohoku", Wharton Magazine, Winter 2012.</li> <li>○ A. Pollack and S. Lohr, "A Japanese Plant Struggles to Produce a Critical Auto Part", New York Times, April 27, 2011.</li> </ul> </li> </ul>
3	<p><b>February 14</b></p> <p><b>6:00 pm -7:30 pm</b></p>	<p><b>Global Supply Chain Strategy – Sourcing and Location Decisions</b></p> <p>We will review the current situation concerning global manufacturing sourcing, including the results of a recent Benchmark study.</p> <p><b>Readings</b></p> <ul style="list-style-type: none"> <li>○ W. C. Shih "What It Takes to Re-Shore Manufacturing Successfully", , Sloan Management Review, Fall, 2014.</li> <li>○ "Shifts in Cost Competitiveness Reshape Global Manufacturing", Sourcing Journal, September 05, 2014.</li> <li>○ "Yen's Shifting Value Helps Japanese Carmakers Meet New Challenges", Knowledge@Wharton, April 01, 2014.</li> <li>○ J. Endo, "Discussion paper of Nissan's Global Supply Chain Management Roles of Mother Plants and the Global Production Engineering Center in Japan, Revised February 16, 2015 (M. Cohen)</li> <li>○ M. A. Cohen, S. Cui, R. Ernst, A. Huchzermeier, P. Kouvelis, H. L. Lee, H. Matsuo, Marc Steuber, A. Tsay "Benchmarking Global Production Sourcing Decisions: Where and Why Firms Offshore and Re-shore", , OID Working Paper, 2016.</li> </ul>
4	<p><b>February 28</b></p> <p><b>6:00 pm -7:30 pm</b></p>	<p><b>Industry/Company Reports and Trip Preparation</b></p> <p>Each group will present a brief report that provides background information concerning their assigned industry and company that we will be visiting. Topics that could be included in this report include: current competitive trends, technology developments affecting both the product and processes, the regulatory environment, etc.</p>

<b>E-0</b>	<b>Sunday</b> <b>March 5, 2017</b>	Arrival in Germany 07.00 pm.: Opening Orientation Session
<b>E-1</b>	<b>Monday</b> <b>March 6, 2017</b>	09.00 a.m.: Wirtgen GmbH – Windhagen 2.00 p.m.: Zalando Logistics - Moenchengladbach
<b>E-2</b>	<b>Tuesday</b> <b>March 7, 2017</b>	09.00 a.m.: ASML HQ - Eindhoven 2.00 p.m.: Smart Robotics - Eindhoven
<b>E-3</b>	<b>Wednesday</b> <b>March 8, 2017</b>	09.00 a.m.: Schmitz Cargobull - Vreden 2.00 p.m.: Meyer Shipyard - Papenburg
<b>E-4</b>	<b>Thursday</b> <b>March 9, 2017</b>	09.00 a.m.: Daimler - Bremen (Car Assembly) 2.00 p.m.: Airbus HQ - Hamburg (Air Plane Assembly)
<b>E-6</b>	<b>Friday</b> <b>March 10, 2017</b>	09.00 a.m.: Lufthansa Technology HQ - Hamburg 2.00 p.m.: Kühne & Nagel - Hamburg
<b>E-7</b>	<b>Saturday</b> <b>March 11, 2017</b>	(optional) - Harbor Tour
<b>5</b>	<b>March 21</b> <b>6:00 pm -7:30 pm</b>	<b>Case Discussion - Boeing: The Fight for Fasteners</b>  We will discuss challenges associated with sourcing and supplier coordination encountered by Boeing in its 787 supply chain. Our focus will be on the procurement process and their interaction with suppliers of fasteners used in the assembly of the airplane.

		<p><b>Readings</b></p> <ul style="list-style-type: none"> <li>○ M. Lee and R. Anupindi, “Boeing: The Fight for Fasteners”, by (U. of Michigan case 1-428-787, 2009)</li> <li>○ C. S. Tang, and J. Zimmerman, “Mitigating New Product Development Risks – The Case of the Boeing 787 Dreamliner”, Chapter 11 in M.S. Sodhi and C.S. Tang. <i>Managing Supply Chain Risk</i>. Springer. 2012</li> </ul>
6	<p><b>March 28</b></p> <p><b>6:00 pm -7:30 pm</b></p>	<p><b>Logistics Systems and Distribution Strategy + Guest Speakers - Joe Short, Senior VP Corporate Operations, Bruce Bennet, Senior VP Distribution Services, Amerisource Bergen</b></p> <p>In the first half of this session we will discuss the management of distribution and logistics within a global supply chain. We will focus on issues associated with risk pooling, coordination and technology. We also will present insights derived from analytical models and current practices for materials management, cross-docking, and warehouse automation.</p> <p>In the second half of the session our guest speakers will provide us with an overview of the distribution strategy at Amerisource Bergen</p> <p><b>Readings</b> G. Cachon and C. Terwiesch, “Risk-Pooling Strategies to Reduce and Hedge Uncertainty”, Chapter 15 “Matching Supply with Demand: An Introduction to Operations Management”, 3<sup>rd</sup> edition, McGraw Hill</p>
V-2	<p><b>April 7</b></p> <p><b>Malvern PA</b></p>	<p><b>Corporate Visit to Amerisource Bergen distribution center</b></p> 
7	<p><b>April 13</b></p> <p><b>6:00 pm -7:30 pm</b></p>	<p><b>Post visit- Group Presentations</b></p> <p>Each group will have 15 minutes to present a report of our visit to their assigned company. The report will include application the plant tour assessment tool (i.e. “Read a Plant Fast” by Goodson) based on the visit. The reports will be shared with the full class.</p>
8	<p><b>April 25</b></p> <p><b>6:00 pm -7:30 pm</b></p>	<p><b>Debrief session</b></p> <p>Each student will have the opportunity to comment on lessons learned from the course. We will review highlights of our company visits and discuss key lessons learned.</p>



## Case Assignments (Individual assignments - 25% of your overall grade)

### **First Case Assignment - Cisco**

On March 11, 2011 a major earthquake struck Tohoku Japan. It had a devastating impact on global supply chains. Read the case, **Cisco SCRM in Action: 2011 Tohoku Earthquake**, by Ravi Anupindi (Tauber Institute, U. of Michigan case 1-429-284, 2013) and also read **Supply Chain Risk Management at Cisco: Response to H1N1** (U. of Michigan case 1-428-881), – read pages 2 through top of page 9 for a description of Cisco’s approach to risk management. Prepare a 750 word paper (*plus or minus 5%; double-spaced; put word count and your name at the top*) that addresses the following questions:

1. *What are the major challenges facing Cisco as result of supply chain disruptions caused by the earthquake?*
2. *How should Cisco manage the crisis?*
3. *What metrics should be used by Cisco to support Supply Chain Risk Management? What data would you need to estimate these metrics? At what organizational level (plant, product, supply chain, business unit) would it be appropriate to apply these metrics? What may be typical uses of these metrics?*
4. *How should Cisco mitigate the impact of the disruption to their supply chain? What tradeoffs and risks should they consider and how are these related to the metrics? In particular, how can the TTR metric be used to develop a mitigation strategy?*
5. *Comment on Cisco’s SCRM process and how they dealt with the Tohoku crisis. What are its major strengths? Do you see any weaknesses?*

You should also read the following articles (posted on Canvas) as you prepare your answers to the case:

1. D. Reynolds, “Lessons From Tohoku”, Wharton Magazine, January 26<sup>th</sup>, 2012,
2. D. Simchi Levi, “From Super Storms to Factory Fires: Managing Unpredictable Supply-Chain Disruptions”, Harvard Business Review, Jan-Feb 2014.
3. A. Pollack and S. Lohr, "A Japanese Plant Struggles to Produce a Critical Auto Part", New York Times, April 27, 2011.

Read the case and think about the assignment questions. We will discuss this case in class on **January 31, 2017**. James Steele, who was director of Cisco’s SCRM program at the time of the quake, has provided us with a report on how Cisco’s SCRM system actually operated during the crisis. We will review his comments in our discussion of the case. Your paper is due on **February 6, 2017**, posted on Canvas.

### **Second Case Assignment - Boeing**

Boeing encountered an unusual supply chain problem during its 787 Dreamliner product development and manufacturing process, related to a small and unlikely source of difficulty, namely shortages and delays in the supply of fasteners needed to hold the airframe together. Read the case, **Boeing: The Fight for Fasteners**, by Moses Lee and Ravi Anupindi (Tauber Institute, U. of Michigan case 1-428-787, 2009) and prepare a 750 word paper (*plus or minus 5%; double-spaced; put word count and your name at the top*) that addresses the following questions:

1. *What were the causes of the fastener crisis at Boeing? How was the problem ignored for so long? What effect did the 787 Dreamliner project have on fastener supply?*
2. *What are the key elements of the Fastener Procurement Model (FPM)?*

3. Describe the material, information, and financial flows between Boeing, fastener manufacturers (suppliers) and Tier-1 partners under FPM.
4. Evaluate FPM from the perspective of Boeing, fastener manufacturers, Tier-1 partners, and other stakeholders.
5. Critique the approach taken by Boeing in implementing FPM. What problems has Boeing encountered in rolling out the FPM?
6. What are some of the costs, benefits and risks associated with a “customer managed inventory” strategy such as FPM.

You should also read the article by Chris Tang, and Josh Zimmerman, **Mitigating New Product Development Risks – The Case of the Boeing 787 Dreamliner**, Chapter 11 in M.S. Sodhi and C.S. Tang. *Managing Supply Chain Risk*. Springer. 2012, as you prepare your answers to the case.

Read the case and think about the assignment questions. We will discuss this case in class on **March 21, 2017**. Your paper, which includes answers to all 6 questions, is due on **March 24, 2017**, posted on Canvas.

### **Industry Background and Site Visit Report (Team assignment - 25% of your overall grade)**

Each team will be assigned to a company that we will be visiting during the semester. Prior to the visit, the team will prepare and present or distribute a report that provides background information concerning their assigned industry and the company that we will be visiting. Topics that could be included in this report include: current competitive trends, technology developments affecting both the product and processes, the regulatory environment, etc. The team will then use the plant tour assessment tool (i.e. “Read a Plant Fast” by Goodson) to prepare a report based on the visit. The reports will be shared with the full class after the visits. Group formations and preferences are due on **January 31, 2017**. Please submit your group membership (3-4 members) and your first two choices for the background and post-visit reports. Each group will present their industry /company background report to the class in our pre-tour session on **February 28, 2017**. A session devoted to group reports based on observations from the the visits will be held on **April 13, 2017**.

Groups will be assigned for the company visits from the following list:

- Airbus
- AmerisourceBergen
- ASML
- Janssen/Johnson-Johnson
- Kuhne Nagel
- Lufthansa Technik
- Mercedes Benz
- Meyer Werft
- Schmitz Cargobull
- Smart Robotics
- Wirtgen
- Zalando

### **Final reflection paper (Individual assignment - 25% of your overall grade)**

This individual assignment is an opportunity to reflect on what you have learned in the course and through the site visits. It is worth 25% of your grade and is due on **TBD**, posted on Canvas. You

should give your thoughts on 1) the current status, 2) future trends and 3) key drivers of operations strategy and sourcing decisions in the industries we visited. Our guideline for length is 750 words, roughly three pages, although this is a recommended, but not required, length; your paper can be either shorter or longer, as long as it captures your thoughtful reflections on your experience in the course.

## Company Profiles (Germany and the Netherlands)



### [WIRTGEN GmbH](#)

WIRTGEN supplies a complete range of mobile machines and high-quality services for all areas of road construction and open-cast mining.

With its innovative, high-performance and cost-efficient products and technologies for cold milling, soil stabilization, hot and cold recycling, concrete paving and surface mining, WIRTGEN leads the world market in road construction and repair, as well as in mining natural rock and pay minerals. WIRTGEN develops both the machines and the technologies.

Today, market-leading and cutting-edge products for the Road and Mineral Technologies business sectors are constructed at the WIRTGEN brand headquarters in Windhagen, Rhineland-Palatinate. Over 60 different types of machines from the company's extensive product divisions are produced at the brand headquarters using state-of-the-art techniques.



### [Zalando Logistics Mönchengladbach SE & Co. KG](#)

Zalando SE is a multinational e-commerce company that specializes in selling shoes, clothing and other fashion and lifestyle products online. The company was founded in Germany in 2008 by Robert Gentz and David Schneider, initially under the name Ifansho and since then has expanded to offer its retail services in a total of fourteen European countries. Currently, Zalando is operationally active in Germany, Austria, Switzerland, France, Belgium, the Netherlands, Italy, Spain, Poland, Sweden, Denmark, Finland, Norway and the UK.

Zalando initially specialized in the sale of footwear but has since grown to encompass other areas of fashion, lifestyle and sports.

### [ASML](#)



In 1984, Philips and Advanced Semiconductor Materials International (ASMI) created a new company to develop lithography systems, called ASML. Today, ASML is the world biggest supplier of lithography systems for Semiconductor industry.



The products focus on making transistors on a chip smaller, a key step in making them both faster and cheaper. The machines that ASML makes are essentially projection systems, not unlike a slide projector. Laser light is projected through a so-called mask (also called a reticle), which contains the blueprint of the pattern that will be printed. A lens focuses the pattern onto the wafer, which has earlier been coated with a light-sensitive chemical. When the unexposed parts are etched away, the pattern is revealed.

Because lithography patterns the structures on a chip, it is lithography that determines how small the features on the chip can be, and how densely chip makers can pack transistors together. In other words, lithography is crucial to follow the path described by Moore's Law.

### Smart Robotics

Smart Robotics, the employment agency for robots, develops and modular robots that can be configured for specific tasks. The company is specialized in flexible automation for manufacturing and intralogistics. In the manufacturing industry we help our clients by deploying our robots for assembly line work, product sorting, machine loading and unloading, but also for quality control, packaging and palletizing.



The intralogistics market is often strongly linked to the production and packaging of manufactured products. However the quickly increasing number of enterprises with warehousing for online shopping also contribute to our clientele. Extremely flexible automation is essential to realizing the high online demand for 24/7 order fulfilment. Their solutions are therefore found in processes such as order picking, loading and unloading of vehicles, sorting, packaging and palletizing.

### Schmitz Cargobull

With an annual production of some 45,000\* vehicles and around 4,900\* employees, Schmitz Cargobull AG is Europe's leading manufacturer of semi-trailers and trailers for temperature-controlled freight, general cargo and bulk goods.



The Trailer Company. 4,900\*



The company achieved sales of approximately €1.6\* billion in the 2014/2015 business year. As a pioneer in the industry, the German company developed a comprehensive brand strategy early on and consistently established quality standards spanning every level: from research and development, to production and specialist services such as trailer telematics, financing, used vehicles, spare parts and Full Service.

\*Figures based on the 2014/2015 business year

### MEYER WERFT

MEYER WERFT, based in Papenburg, was founded in 1795 and is in its sixth generation of family ownership.



its sixth

It has achieved an excellent worldwide reputation over the last decades. The company is especially known due to the construction of huge, modern and sophisticated cruise ships. MEYER WERFT was the first compact shipyard in Europe and is one of the most modern shipyards in the world. The two covered docks as well as the modern manufacturing plants and the concept of short distances ensure the shipyard's success. Innovations and the newest technologies characterize the shipyard's daily routine.



Modern computer technology is used everywhere, be that the first layout or the design of the ship or the production process. Construction drawings are hardly found. They are replaced by simulations by which the shell plating of a ship is designed, to name but one example. Almost the whole production process has been digitized, which saves time and money. A lot of projects can be planned and saved in the virtual world, and assembly processes can be tested. 3-D simulations allow planning with a high degree of anticipation. Production and production process

can be developed at the same time: This saves time and effort and leads to a better efficiency.

The "Digital Factory" is extremely helpful in planning and designs because the engineers can estimate at very early stages what can be implemented and what can't. This avoids "surprises" in the production process, and accelerates construction. Mistakes can be avoided well before they cost a lot of money when the ship is already at the production stage. The computer-aided logistics system minimizes storage space and thus operating costs. The material-flow control system TESS controls the whole material flow on the shipyard via data radio. Each structural component is with the right person at the right place at the right time. Shortest transport routes, minimal empty runs and precise just-in-time-supply are ensured.

MEYER WERFT is Papenburg's attraction, due to the construction of luxury cruise ships. Every year, about tourists come to MEYER WERFT to see on site how state-shipbuilding works.

The shipyard's visitor center provides you with a comprehensive introduction about MEYER WERFT's and of the previous years. Furthermore there are unique informative films, a fully equipped mock-up cabin and highlights.



300,000  
of-the-art

work today  
exhibits,  
other



### Mercedes-Benz Plant, Bremen

The Mercedes-Benz Plant in Bremen is worldwide one of the biggest car Mercedes-Benz. More than 12,500 employees are working in Bremen so that Daimler is also the biggest private employer in that region. Until today, more than 7 million cars have left the plant. In 2014, more than 338,000 vehicles were produced. Presently, 8 models are produced at the site: C -Class Saloon, Estates, Coupé, E - Class Coupé and Cabriolet, the new GLC as well as both SLK and SL roadsters.



Furthermore, the Mercedes-Benz plant in Bremen is responsible as lead factory for the C-Class partner factories in the US, in South Africa and in China.

In the "future vision", which was determined by the plant management and the work council in June 2015 the future course was set. The plant receives two new models and will be equipped with the latest technologies. Especially the aspects of "Industry 4.0" will be realized by the digital interconnection of production processes and man-machine relationship in the factory. In 2017, the number of apprenticeship positions will be increased as well as 500 new staff members employed. The Daimler group will invest 750 million euro in total in the site.

## [Airbus Hamburg](#)



Hamburg is the headquarters of Airbus in Germany and the largest Airbus site in Germany employs around 12,500 people and plays a key role in the development and manufacturing of all Airbus aircraft. The company is also one of the biggest employers in the region. Over 500 apprentices start their careers each year at Airbus in Hamburg.

Hamburg is the home of the A320 Family program management. For the A320 Family's four members, the A319, A320 and A321, structural assembly and equipping of sections as well as final assembly take place here. Around Airbus' annual production of A320 family aircraft are painted, and delivered to customers from all around the Hamburg (262 in 2015).



A318, fuselage half of assembled, world in

The plant in Hamburg-Finkenwerder is also home to Airbus' component assembly hall, which houses the structural assembly and the equipping of the forward and complete rear fuselage sections for this new-generation very large aircraft. These fully assembled and equipped fuselage sections are produced here and then shipped to the A380 Final Assembly Line in Toulouse, France on a specially-built roll-on, roll-off sea ship.

A380 major



Following final assembly in Toulouse, the empty and unpainted A380s are flown to Hamburg. They are fitted with their customers' exclusive cabin interiors and painted in one of the two high-tech A380 paint shops before final delivery. Final acceptance and delivery of A380s for customers in Europe and the Middle East take place from the "Jürgen Thomas Delivery Centre" in Hamburg.

Hamburg also plays a key role in the A330 and A350 XWB programs. As for the A380, the forward and the rear fuselage sections are manufactured and equipped in Hamburg. In the production domain, Hamburg's many years of manufacturing experience in fuselage structural assembly and systems installation make this site a center of competence for fuselage and cabin.

In the engineering domain, key competences in Hamburg revolve mainly around the development of fuselage structure and the design, innovation and systems of the cabin. The Finkenwerder site also houses A320 Family maintenance training facilities that receive hundreds of airline trainees every year.

Close to the commercial airport of Hamburg-Fuhlsbüttel, Airbus operates a large spares center - which holds some 120,000 proprietary parts, as well as a 24/7 spares call center for its customers from around the world.

As the world's biggest provider of technical support services for aircraft, Lufthansa Technik is more than just a maintenance and repair organization. The company is also an aviation authority-approved development and production organization. This multiple competence contributes significantly to the company's leading position and makes it possible to fulfill even the most complex customer requirements.

More than 500 engineers work in the various business units in Hamburg, a team of over 120 people is



responsible solely for the development of new technologies, equipment and systems. Lufthansa Technik's technical expertise in the conversion of aircraft for private customers is particularly striking. The problems that the team is regularly asked to solve call for an unusually wide range of development competencies, as customers' requirements vary widely, for example, from the design of a water supply system with extra-large tank volume to a very large-format plasma screen for the on-board audio and video system or custom-built furniture for the cabin.

Although some in-house developments were designed primarily to meet the needs of private customers, others have also found their way into commercial airliners. One example here is GuideU ColourCurve, a floor path marking system for passenger aircraft which has become the standard on the international market. The light strips work without electrical power and hence can be relied on to indicate the route to the emergency exits in a darkened cabin, even after an electrical failure. Skypower®, a system for supplying power to individual passenger seats to enable the use of laptops, was also developed by Lufthansa Technik.

Another example of a customer-oriented product developed by Lufthansa Technik is the Cyclean® engine cleaning system. Cyclean® Engine Wash is a new method for washing engine interiors quickly and effectively using water delivered under high pressure. Removing deposits in this way enables the high-pressure compressor of an engine to work more cleanly and efficiently, resulting in a better flow of air and a reduction in exhaust gas temperature. Improving engine performance in this way not only cuts fuel consumption and emissions of pollutants, but also brings savings in maintenance costs throughout the service life of an engine.

A further example of the competence of Lufthansa Technik is the development of a system for high-speed Internet access on board commercial aircraft. Originally developed for VIP customers, today these products are also available to passengers of commercial airlines. Between 2004 and 2006 Lufthansa equipped its entire long-haul fleet with fast internet access based on this system. To connect passengers to the Internet even at cruise altitude, Lufthansa Technik fitted a special antenna to the upper side of the aircraft fuselage which ensured connection to the worldwide net by satellite. Even at a cruise speed of 900 km/h, the antenna maintains steady contact with the satellites, thus permitting transmission speeds similar to those that passengers are used to for convenient online applications at home or in the office. When the then partner, Connexion by Boeing, discontinued the Internet access service Lufthansa stopped the product and looked for an alternative partner, which has been found now. The new cooperation with Panasonic allowed Lufthansa to re-launch the service in the end of 2010. Lufthansa Technik is currently fitting the complete long-haul fleet of Lufthansa with the new system.



## Kuehne + Nagel



Over our 125 year history, Kuehne + Nagel has evolved from a traditional international freight forwarder to a leading global provider of innovative and fully integrated supply chain solutions. Since 1890, when the business was founded in Bremen, Germany, by August Kuehne and Friedrich Nagel, Kuehne + Nagel has grown into one of the world's leading logistics providers. Today, the Kuehne + Nagel Group has more than 1000 offices in over 100 countries, with over 66,000 employees. Our key business activities and market position are built on the company's truly world class capabilities:

### **Seafreight:**

- Number 1 global seafreight forwarder
- Sustained year-on-year double digit growth in managed freight
- Solid partnerships with an extensive range of preferred ocean carriers

### **Airfreight:**

- Number 2 global air cargo forwarder
- Leader in innovative cargo management concepts
- Global Cargo 2000 Phase 2 certification

### **Contract Logistics & Integrated Logistics:**

- Number 2 global contract logistics provider
- Worldwide network of warehouse and distribution facilities
- Number 1 global lead logistics provider

### **Overland:**

- European Top 3 provider
- Pan-European overland transportation capabilities, including dedicated and individual delivery services
- Close partnerships with best-in-class carriers

Kuehne + Nagel is financially strong, stable and independent. Its global logistics network, cutting-edge IT systems, in-house expertise and excellent customer service is proof of our dedication to be the market leader. These attributes have placed them at the forefront of our industry, and positioned us to continue increasing the scope of our customer solutions and services.

## Company Profiles (USA)



### [AmerisourceBergen](#)

AmerisourceBergen is driving innovative partnerships with global manufacturers, providers and pharmacies to improve product access and efficiency throughout the healthcare supply chain. As part of the largest global generics purchasing organization, the leading specialty pharmaceutical services provider and the partner with more community and health system pharmacy relationships than any other—we're well positioned to help you capitalize on the dynamic changes in healthcare. From product commercialization and distribution to pharmacy, provider and manufacturer solutions, we're working with you every day to enhance patient care.



### [Janssen Pharmaceuticals](#)

Who is Janssen? We're more than 30,000 people working hard to prevent, treat, cure and stop some of the most devastating and complex diseases of our time. From heart disease to HIV, Alzheimer's disease to cancer, we are committed to issues that touch everyone's lives.

Our mission is to transform individual lives and fundamentally change the way diseases are managed, interpreted, and prevented. We believe that challenging something is the best way to change it. So every day, in more than 150 countries, we bring cutting-edge science and the most creative minds in the industry together to think differently about diseases. We aim not only to innovate but also to empower people with the tools they need to make informed decisions and achieve the best possible results for their health.

We are looking at a future where the world of healthcare will be challenged by informed and empowered patients. We work for change that will improve access to medicines: the best available treatment at an affordable price. That's why we at Janssen strive to provide access to effective and affordable medicines and related healthcare services to the people who need.

Our focus areas are: Cardiovascular & Metabolism, Immunology, Infectious Diseases & Vaccines, Neuroscience and Oncology.

## Optional Reading List

Note: Required readings are assigned for the lecture classes and the written assignments. All required readings will be posted on the course Canvas site. A subset of the optional readings will also be posted on the Canvas site and will be updated throughout the semester. Students are encouraged to suggest current readings to be shared with the class.

Optional readings provide: 1) recent examples of reshoring /nearshoring and insourcing, as counter-trends to offshoring and outsourcing, in a variety of firms, industries, and countries, from the business press; 2) comprehensive reports by think-tanks, consulting firms, and government agencies on the economic and policy issues surrounding manufacturing in advanced economy countries such as the U.S. and Japan; 3) examples of research articles by faculty that convey their interests and provide context for this course. Suggested books are listed as well.

- 1) Recent examples of reshoring/nearshoring and insourcing from the business press
  - a) "San Diego", Destination San Diego June 21, 2016.
  - b) "Mexico's maquiladoras: Big maq attack", The Economist, Oct 26<sup>th</sup>, 2013.
  - c) "Yen's Shifting Value Helps Japanese Carmakers Meet New Challenges", Knowledge@Wharton, April 01, 2014.
  - d) "Reshoring Could Create 200,000 jobs over next decade", Financial Times, March 11, 2014.
  - e) "UK Reshoring Faces Battle Industrialists War", Financial Times, January 24, 2014.
  - f) "Few US Reshorings Go Ahead, Study Finds", Financial Times, September 7, 2014.
  - g) "Reshoring Driven by Quality, Not Costs, Say UK Manufacturers", Financial Times, March 3, 2014.
  - h) "The Top Supply Chain Disasters of All Time", Supply Chain Digest, D. Gilmore, May 7, 2009
  - i) "Rebalancing Your Sourcing Strategy", McKinsey & Co., July 2014.
  - j) A. Pollack and S. Lohr, "A Japanese Plant Struggles to Produce a Critical Auto Part", New York Times, April 27, 2011.
  - k) "Japan Re-Emerges in the Aerospace Arena With a New Jet", H. Tabuchi, New York Times, April 9, 2013.
  - l) "Requiem for a Dreamliner," James Surowiecki, *The New Yorker*, Feb. 4, 2013.
  - m) "New Problems with Boeing 787," C. Drew and J. Mouawad, *NY Times*, Dec. 10, 2012.
  - n) "Does America Really Need Manufacturing?" Gary P. Pisano and Willy C. Shih. *Harvard Business Review*, March 2012.

- o) "Making It in America." Adam Davidson. *The Atlantic*, Jan-Feb. 2012.
- p) "Winning the Race with Ever-Smarter Machines." Eric Brynjolfsson and Andrew McAfee. *Sloan Management Review*, Winter 2012.
- q) "Offshoring, Onshoring, and the Rebirth of American Manufacturing." Michael Dolega. TD Economics, October 2012.
- r) "In Shift of Jobs, Apple Will Make Some Macs in U.S.," C. Rampall and N. Wingfield, *NY Times*, Dec. 6, 2012.
- s) "Flextronics CEO Sees Hope for U.S. Tech Production," J. Hagerty, *Wall Street Journal*, January 4, 2013.
- t) "Honda Bolsters Its Production in North America," M. Ramsey, *Wall Street Journal*, Aug. 12, 2012.
- u) "Toyota Says No Full Production Until Year's End," H. Tabuchi, *NY Times*, April 22, 2011.
- v) "Japanese Manufacturers Help Save Chip Maker Renesas," H. Tabuchi, *NY Times*, December 10, 2012.
- w) "Nissan to Invest \$358 million in Thai Plant," *Yahoo News*, Nov. 9, 2012.
- x) "Toshiba Turns Overseas to Reduce Procurement Costs," J. Osawa, *Wall Street Journal*, Aug. 16, 2010.
- y) "Hitachi's Revival Isn't So Good for the City of Hitachi," *NY Times*, Dec. 28, 2012.
- z) "China Loses Edge As World's Factory Floor," *Wall Street Journal*, Jan. 17, 2013.
- aa) "Hedging China Risks, Japan Firms Turn to Booming Southeast Asia," S. Grudgings, *Reuters*, Nov. 5, 2012.
- bb) "The Insourcing Boom," Charles Fishman, *The Atlantic*, Dec. 2012.
- cc) "Mr. China Comes to America," James Fallows, *The Atlantic*, Dec. 2012.
- dd) "Should Manufacturing Jobs Be 'Reshored' to the U.S.?" *Knowledge@Wharton*, Sept. 26, 2012.
- ee) "American Industry Is On the Move," S. Mallaby, *Financial Times*, Jan. 8, 2013.

2) In-depth reports from think-tanks, consulting firms, governments

- a) "Manufacturing Footprints: Getting to Plant X", K. O'Marah and H. Lee, SCM World, 2013.
- b) "U.S. Manufacturing in International Perspective." Marc Levinson. Congressional Research Service, Feb. 2013.
- c) "U.S. Manufacturing Nears a Tipping Point," Boston Consulting Group, 2012.
- d) "Locating American Manufacturing: Trends in the Geography of Production," Brookings Institute, April 2012.
- e) "Trading myths: Addressing Misconceptions about Trade, Jobs, and Competitiveness," McKinsey Global Institute, May 2012.
- f) "Manufacturing the Future: The Next Era of Global Growth and Innovation," McKinsey Global Institute, November 2012.

- g) "Manufacturing's New Era: A Conversation with Timken CEO James Griffith," McKinsey and Company, December 2012.
- h) "Offshoring (Offshore Outsourcing) and Job Loss among U.S. Workers," Congressional Research Service, December 2012.
- i) "Rebalancing your sourcing strategy Offshoring is alive and well, but it's no longer the only answer," by Conradin Merk, Jonathan Silver, and Fabio D. Torrissi, McKinsey and Company, July 2014.

### 3) Faculty-authored articles

- a) "Winning in the Aftermarket," Morris A. Cohen, Narendra Agrawal, and Vipul Agrawal, *Harvard Business Review*, May 2006.
- b) "Valuing Operational Flexibility under Exchange Rate Risk," Arnd Huchzermeier and Morris A. Cohen, *Operations Research*, Vol. 44, No. 1, Jan.-Feb. 1996.
- c) "Lessons from Product Architecture Initiatives in the Global Automotive Industry," John Paul MacDuffie, *Global Strategy Journal*, Vol. 3, No. 1, 2013.
- d) "Get Ready for the Complexity Revolution," John Paul MacDuffie and Takahiro Fujimoto, *Harvard Business Review*, June 2010.
- e) "Collaboration in Supply Chains: With and Without Trust," John Paul MacDuffie and Susan Helper, chapter 10 in *The Corporation as a Collaborative Community*, Paul Adler and Charles Heckscher (editors), Oxford University Press, 2007.
- f) "Supply Chain Competitiveness and Robustness: A Lesson from the 2011 Tohoku Earthquake," Takahiro Fujimoto, Discussion Paper #362, Manufacturing Management Research Center, University of Tokyo, September 2011.
- g) H. Matsuo, "Implications of the Tohoku Earthquake for Toyota's Coordination Mechanism: Supply Chain disruption of Automotive Semiconductors", 2014.
- h) "Creating the New Global Enterprise: Transportation Panel", summary from Wharton conference on US-Japanese Manufacturing Alliances, April 7-8, 1993.

### 4) Suggested Books

- a) *Producing Prosperity: Why America Needs a Manufacturing Renaissance*. Gary P. Pisano and Willy C. Shih. Boston, MA: Harvard Business School Press.
  - b) *Race Against the Machine: How the Digital Revolution is Accelerating Innovation, Driving Productivity, and Irreversibly Transforming Employment and the Economy*. Eric Brynjolfsson and Andrew McAfee. Lexington: Digital Frontier Press, 2011.
  - c) *The New Industrial Revolution: Consumers, Globalization and the End of Mass Production*. Peter March. New Haven: Yale University Press, 2012.
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