THE UNIVERSITY OF SOUTHERN CALIFORNIA

Marshall School of Business

DSO 581 – Supply Chain Management– Fall 2016

Time: Thursdays, 6:30-9:30 pm
Room: JKP 212
Instructor: Dr. Greys SOŠIĆ
Office: Bridge Hall 401E
E-mail: sosic@marshall.usc.edu
Telephone: (213) 821-3632
Office hours: Wednesday, 2:00-3:00 pm
Thursday, 2:00-3:00 pm

COURSE SCOPE AND OBJECTIVES

This course will be valuable for someone pursuing a career in consulting or a position in the operations, marketing or finance function in a manufacturing or a distribution firm. The course focuses on the management and improvement of supply chain processes and performance. We explore important supply chain metrics, the primary tradeoffs in making supply chain decisions, and the basic tools for effective and efficient supply chain management, production planning and inventory control, order fulfillment and supply chain coordination. Several recent and influential innovations such as revenue management, supply chain analytics, RFID, SaaS, and Internet of Things will be discussed. We also investigate topics such as global supply chain design, sustainable supply chains, e-commerce and outsourcing.
The class format includes lectures, case discussions, movie clips, simulation games, and guest speakers. The content covers both quantitative and qualitative materials. The cases will feature high-tech companies as well as firms in more traditional industries such as apparel and manufacturing.

COURSE MATERIALS

Required: *Course Reader* (CR) – Package of cases and readings available at USC bookstore. In the syllabus, a number such as CR#5 refers to 5th article in sequence in the course reader.

Handouts (HO): Handouts posted on the Blackboard.

Recommended: *Supply Chain Management* by S. Chopra and P. Meindl, Prentice Hall, 2012.
Managing Supply Chains by A.V. Iyer, Hercher, 2013.
The Supply Chain Professional: Concepts and Analytics by F.R. Jacobs and R.R. Lumus, Hercher, 2015.

COURSE POLICIES

This course covers both quantitative and qualitative materials, and uses cases for discussion of issues and illustration of approaches. We will use Excel as a modeling/solution finding tool when addressing several topics. Active participation in class is important throughout the course. To ensure everyone's participation, I may at times resort to cold calling.
You should arrive to classroom on time. If you have conflicting schedules that prevent you from that, please let me know at the beginning of the semester.

GRADING

Group case reports (4)	28%
Individual submissions (10 out of 14)	20%
Tests (2)	40%
Retail game	4%
Class participation	8%

GROUP CASE REPORTS

Please form teams of up to four persons within the first two weeks; you will be working in these teams for the group assignments. Use the "Group" option on the Blackboard to join one of the teams.

The cases are to be discussed within your team and you will submit (as a team) a written report. This Syllabus provides some suggested questions that you should address in your analysis. Each team is required to submit a written report on four case studies (Genentech on 9/15, Three Jays on 10/20, Plaza on 11/10, and Han Solar on 12/1). Case write-ups should be at most 4 pages and single-spaced (11 or 12 point font), with appendices attached (not included in the number of pages). They should be submitted on-line through the Blackboard, along with the Excel files used in your analysis. You will also need to enter some of the main results of your analysis separately, following the link on the Blackboard.

When preparing your report, imagine that you, as a consultant, have to study an organization, to identify the main issues it faces, and to propose a set of recommendations. Your written report should begin with an executive summary, about half page long, summarizing the most important problems and your recommendations (something a busy executive would read and understand what the report is about). The rest of the report should be organized as follows:

1. Brief description of the company and its environment
2. Brief description of the problems and issues to be addressed (the questions in the syllabus related to the specific case should guide you in identifying those issues).
3. Recommendations and implementation plan.
4. Analysis that discusses why the recommendations will solve the problems identified.

You may choose to organize the report differently; however, please ensure that the above aspects are covered and the report is well organized with clear section and sub-section headers. Please avoid repetition of case facts and long expositions (remember the page limit)! Consider what you believe are the most important factors (and why). General solutions to specific problems will get you little credit. Both quantitative and qualitative analysis is important. Creativity in analysis and suggestions that are grounded in case facts will be given high credit. Please state any assumptions made clearly. Remember that your models are usually based on the forecasted demand and that different parameters and costs in the models are estimated (forecasted), so it is useful to provide some what-if analysis that considers, e.g., different possible demand scenarios, changes in cost estimates, etc.

GROUP ASSIGNMENT EVALUATION

Team assignments provide a valuable learning experience – how to work effectively and efficiently in groups, learning from others, and honing your ability to communicate to others. Although your team's grade depends on each member's efforts, some students can be tempted to let others carry their load. In order to provide an incentive for all students to make maximum contributions to the study group, you will be asked to grade each team member's contributions. Your group grades will be adjusted to obtain an individual grade based on performance feedback provided by other members of the group (the group assessment forms are posted on the Blackboard). If you do not submit your group assessment form, I will assume that you gave a rating of 100% to all your group members. The forms can be submitted in person or via e-mail, but no later than the exam date.

INDIVIDUAL (SHORT) SUBMISSIONS

In addition to the cases for which you are required to submit group reports, we will be discussing other cases and articles. You should be prepared for class discussion, and this Syllabus provides some suggested questions that you should address. For the individual submissions, follow the link on the Blackboard and enter the required information before the class. The objective of this short submission is to ensure that you prepare the case. For that reason, no late submissions will be accepted.

To answer short submissions #7 and #8, you can use Excel and submit the files along with your answers. The credit will depend on correctness of your solution. For the remaining submissions, as long as your

answer shows that you have given sufficient thought to the analysis, you will get full credit. Note that this in general requires answers that are longer than one sentence.

Each submission is worth up to 2 points, and the maximum number of points you can obtain for individual submissions is 20. If your total exceeds 20 points, it can improve your participation grade (note that in this case, each additional submission does not increase your participation by 2 points).

We will do a simulation game during week 13. As a preparation for this exercise, you need to read the relevant material posted on the Blackboard (Retail game case and instructions), analyze the spreadsheet with historical data, and use them to determine your order quantity for the two products. These quantities should be entered following the link provided on the Blackboard, along with a brief explanation of how these numbers were selected. You can obtain up to 4 points for a thoughtful analysis and quantity choice.

TEST

There will be two exams, and they will contain both qualitative and quantitative questions. The questions will have several formats: multiple choice/single answer, multiple choice/multiple answers, short answers, and problems. The exams will be closed book; however, you can prepare a "cheat-sheet" for both exams: for each exam, you can prepare one letter-sized sheet of paper hand-written on both sides (for a total of 2 hand-written pages). I will remove all printed or photocopied material!

According to the USC Final Exam Schedule, the final exam is scheduled for **December 8, at 7 pm**. If there are extenuating circumstances that prevent you from taking an exam, you must discuss the reason with me before the time of the exam. You will not be given a make-up exam unless you obtain a permission from me in advance. In addition, you must be able to document the extenuating circumstance. If you miss the exam due to a medical emergency that can be documented and verified, then a make-up exam will be given. Otherwise, a grade of zero will be given for the missed exam. Note that a make-up exam cannot be taken before the actual exam date!

CLASS PARTICIPATION

Class participation requires that you do the assigned readings, analyze the cases based on the questions given and participate actively in class. I prefer substantive comments based on good analysis rather than brief, general comments that add little to the discussion and learning. Be prepared to defend your suggestions or solutions!

If you are reluctant to talk in class or if you are not physically attending, but would like to show your preparation, please provide me with your analysis/comments through email. This may include material related to the topics covered in class from your work experience, from additional articles/videos that you have found, etc. I also encourage you to participate in the Discussion board on the Blackboard; it will be considered as a part of your participation.

As a part of the participation I will also track your attendance through Arkaive app. Please download the App to your smartphone and enable location, enter enrolment code 5MKR and check into class each week.

GETTING HELP

If you have questions about any aspect of the course, you can always talk to me. If it is a quick question, you can contact me before or after the class, or during the break. If you need more time or privacy, you can come to my office hours. If you cannot make my office hours, you can contact me and we can arrange for an alternative time. The best way to reach me is by e-mail.

GRADING

Graded work will be posted on the Blackboard. Disputes over graded material should be brought to my attention as soon as possible.

NOTICE ON ACADEMIC INTEGRITY

The use of unauthorized material, communication with fellow students during an examination, attempting to benefit from the work of another student, and similar behavior that defeats the intent of an examination or other class work is unacceptable to the University. It is often difficult to distinguish between a culpable act and inadvertent behavior resulting from the nervous tensions accompanying examinations. Where a clear violation has occurred, however, the instructor may disqualify the student's work as unacceptable and assign a failing mark on the paper.

Academic dishonesty includes: (*Faculty Handbook*, 1994: 21-22):

- Examination behavior - any use of external assistance during an examination shall be considered academically dishonest unless expressly permitted by the teacher.
- Plagiarism - the appropriation and subsequent passing off of another's ideas or words as one's own. If the words or ideas of another are used, acknowledgment of the original source must be made through recognized referencing practices.
- Other types of academic dishonesty - submitting a paper written by or obtained from another, using a paper in more than one class without the teacher's express permission, obtaining a copy of an examination in advance without the knowledge and consent of the teacher, changing academic records outside of normal procedures and/or petitions, using another person to complete homework assignments without the knowledge or consent of the teacher.

FOR STUDENTS WITH DISABILILITIES

Any student requesting academic accommodations based on a disability is required to register with Disability Services and Programs (DSP) each semester. A letter of verification for approved accommodations can be obtained from DSP. Please be sure the letter is delivered to me as early in the semester as possible. DSP is located in STU 301 and is open 8:30 a.m. - 5:00 p.m., Monday through Friday. The phone number for DSP is (213) 740-0776.

STATEMENT ON TECHNOLOGY USE

Please note that communication devices such as cell phones, smart phones, tablets, etc. capable of sending and/or receiving electronic communication and all entertainment devices are to be turned off and kept off throughout the class session. Receiving or sending communication or entertainment during class disrupts the learning environment and is rude to those around you.

	Date	Topic	Readings	Submission
1	8/25	Introduction to Supply Chain Management	The Seven Principles of Supply Chain Management (CR#1)	
2	9/1	Supply chain strategy Design for supply chain management	Apple (CR#2)	short #1 – Apple (q.#1) short #2 –Mass customization (p.6, under Week 2, q.#2)
3	9/8	Design for supply chain management Demand forecasting	World Co. (CR #3)	short #3– World Co (q.#3)
4	9/15	Demand forecasting Capacity planning	Note on forecasting (CR#4) Genentech (CR #5)	Group #1 - Genentech
5	9/22	Aggregate planning Sourcing decisions	Aggregate planning (CR #6) Cisco (CR #7)	short #4 – Cisco (q.#4)
6	9/29	Sourcing decisions Inventory management – Economies of scale	Supply chain disruptions (CR #8)	short #5 – Disruptions (q.#1)
7	10/6	Inventory management – Uncertainty	Note on Inventory Models (CR#9) Inventory-driven costs (CR#10)	short #6 – Inventory-driven cost (q.#1) short #7 – Cycle inventory (p.8, under Week 7, q.#1-2)
8	10/13	**MIDTERM (Weeks 1-6)**		
9	10/20	Inventory management – Product availability	Three Jays (CR#11)	Group #2 –Three Jays
10	10/27	Supply chain alignment and coordination Logistics	Staple yourself to an order (CR #12)	short #8 – Inventory centralization (p.8, under Week 10, q.#1,2) short #9 – Staple yourself… (q.#2)
11	11/3	Guest speaker from Saybrook Logistics	Yummy77 (CR #13) Reverse Logistic Program Design (CR#14)	short #10 – Reverse logistics (q.#2) short #11 – Yummy77 (q.#3)
12	11/10	Network design in supply chains Facility location	Plaza (CR#15) Intel (CR#16)	Group #3 – Plaza short #12 –Intel (q.#2)
13	11/17	Revenue management IT in supply chains	Note on the "Retail inventory and pricing game" (HO) SAP (CR#17)	Retail game analysis short #13–SAP (q.#3)
14	11/24	***Thanksgiving Day – no classes***		
15	12/1	IT in supply chains Sustainability in supply chains	Supply chain analytics (CR #19) Han Solar (CR#18)	Short #14-SC analytics (q.#2) Group #4-Han Solar
	12/10	**FINAL EXAM**		

Detailed course plan

Week 1 Introduction to Supply Chain Management and Key Supply Chain Concepts

Readings:

- *The Seven Principles of Supply Chain Management*, D.L. Anderson, F.F. Britt, D.J. Favre, *Supply chain management review*, 1997

Week 2 Supply chain strategy; Design for supply chain management

***Case study**: (*Ivey case #W14161*): Apple Inc.: Managing a Global Supply Chain*

Discussion Questions:

1. Review Apple's supply chain for its iPhone. What differences set it apart from competitors?
2. What are Apple's key advantages in how it manages its supply chain operations? Support your analysis with the data from the case.
3. What are the challenges that Apple faces in the future, and what are the implications for its supply chain?
4. As Jessica Grant, what recommendations would you make to the company's vice-president, Phillip Duchene, and why?

❖ ***Mass customization assignment**:* Visit and explore three different mass customization websites for customized products—shoes at Nike iD (nikeid.nike.com), jeans at Make Your Own Jeans (http://www.makeyourownjeans.com--make sure to go and check "My Measurement" option under "My Account"), and perfume at MeFragrance (http://www.mefragrance.com/).
1. Are there any differences between their approaches to mass customization?
2. Which model is most difficult to implement and why?
3. What are the main difficulties/issues that mass customization imposes on supply chains designed for mass production?

Week 3 Design for supply chain management; Demand forecasting

***Case study**: (*HBS #9-601-072*): Supply Chain Management at World Co., Ltd.*

Discussion Questions:

1. Examine the features of fashion retailing in Japan. How can a company use its supply chain to compete in this environment?
2. Identify important aspects of World's supply chain focusing on the processes for manufacturing, demand forecasting and inventory planning.
3. How do the features of the supply chain explain the company's remarkably short lead times (relative to U.S. apparel supply chains)? Examine the features of the supply chain and identify why the company is able to respond so effectively.
4. Can the World's supply chain processes be replicated at other companies? Identify potential barriers.

Week 4 Demand forecasting; Capacity planning

Readings:

- *Note on forecasting*

Discussion Questions:

1. What are key variables that need to be forecasted from an operations perspective and why?
2. What forecasting methods are used in operations?
3. When would time-series models versus other models (e.g. causal models) be used?
4. What are the operational implications of fluctuations in demand and forecast errors?
5. How should demand for C-items be forecasted?

***Case study**: (*HBS #9-606-052*): Genentech-Capacity Planning*
For the assignment questions, assume the following:

a) Each of the two contract manufacturers can devote two 10,000 liter tank lines to Genentech production, and Genentech hopes they will achieve yields similar to those at Genentech's own plants. These tanks will be fully utilized in the production of Rituxan and Herceptin.
b) Industry experts make demand forecasts for drugs like Avastin, but a number of sources of uncertainty—yet to be determined dosage amounts and treatment regiments, unexpected problems in the FDA's approval process, unexpected success of failure of a competitor's product, and unexpectedly large or small consumer uptake—means that real demand will depart from the experts' forecasts. For purposes of our case discussion, assume that future demand is distributed normally, centered on the experts' forecasts, and with variation such that one standard deviation is about 25% of the expected demand. For example, if expected demand is 100 kg/year, then 85th percentile demand (about one standard deviation) would be 125 kg per year.

Discussion Questions:

1. What is your evaluation of Genentech's production capacity requirements given expected demand in 2010 and 2015 for Avastin and Genentech's other products as per Exhibit 3? Does your evaluation change if Genentech wants to cover the 85th percentile level of demand? (see spreadsheet on the BB)
2. Assuming Genentech decides to proceed with CCP3, what size production lines (tank sizes) would you recommend? Why? What criteria should Ebersman use in selecting a location? Why? Should Ebersman move forward with CCP3 now? If not, when?
3. What recommendations would you make to Ebersman regarding the process he and his team should use in deciding how best to meet the demands for Avastin?
4. A contract manufacturing firm has had an unexpected reduction in demand for a drug it produces. It is now offering to devote four 10,000 liter lines to the production of Avastin at a price similar to Genentech's existing contract manufacturing agreements. How should Ebersman respond?

➢ **Case study report on Genentech due at the beginning of the class**

Week 5 Aggregate planning; Sourcing decisions

(Bring your laptops to class. Please download the required files for aggregate planning from the Blackboard before the class)

Readings:

- Chapter 8 *Aggregate Planning* (pp. 203-227) in *Supply Chain Management: Strategy, Planning, and Operation* by S. Chopra and P. Meindl, Prentice Hall, Second Edition, 2004

  Discussion Questions:

  1. What is the main purpose of aggregate planning?
  2. What are the main strategies used for aggregate planning? What are their main differences?
  3. How do you choose aggregate planning objective? Variables? Constraints?
  4. How can you solve aggregate planning problems?

Case study: (*Stanford case GS-66): Cisco Systems, Inc.: Collaborating on New Product Introduction*

Discussion Questions:

1. What are the challenges and risks faced by technology companies in new product introduction?
2. What were the risks and benefits of using Chinese contract manufacturing from the start?
3. In selecting Foxconn and expanding its role in the supply chain, what were the potential risks and values to Cisco?
4. What should Cisco do to mitigate these risks and ensure successful development and launch of the Viking router?

Week 6 Sourcing decisions; Inventory management-Economies of scale

Readings:

- *Reducing the Risk of Supply Chain Disruptions,* S. Chopra, M.S. Sodhi, (SMR #484)

  Discussion Questions:

  1. How can companies protect their supply chains from major disruptions? Think of the following:
     a. Supply chain efficiency vs. risk reduction
     b. Performance improvement vs. risk reduction
     c. Cost efficiency vs. risk reduction

Week 7 Inventory management- Uncertainty

Readings:

- *Note on Inventory Models §1*
- *Inventory-driven costs* (HBR #R0503J)

  Discussion Questions:

  1. What are the hidden costs of inventory? What impact can neglect of those costs have on supply chain performance?

❖ ***Cycle inventory assignment:*** In solving the problems below it may be best to set up spreadsheets to compute the answers (please submit it through the Blackboard). In all problems assume that the annual holding cost is 15% of product cost h=0.15.

1. Motor Company purchases components from three suppliers: Components from supplier Alpha cost $20 and are used at the rate 300 units/month; components from supplier Beta cost $12 and are used at the rate 1,000 units/month; components from supplier Gamma cost $30 and are used at the rate 700 units/month. The trucking company is charging a fixed cost of $1,000/truck (for the purpose of this exercise assume that you do not need to worry about the truck capacity). Currently they purchase separate truckloads from each supplier. What is the corresponding minimal annual cost? What is the cycle inventory of each component?
2. Motor Company is considering aggregating orders from all three suppliers. In addition to $1,000 fixed truck cost for deliveries with one pickup the trucking company is charging $100 for each additional pickup. What is the corresponding minimal annual cost? What is the cycle inventory of each component?

Week 8 MIDTERM (Weeks 1-6)

Week 9 Inventory management- Product availability

Readings:

- *Note on Inventory Models §2;3*

Case study*: (*HBS #9-915-531*): Three Jays Corporation*

Discussion Questions:

1. Using the data in case Exhibit 4 and the 2012 annual demand, calculate the EOQ and ROP quantities for the five SKUs scheduled to be produced in the last week of June. How do these amounts compare with those calculated in 2011? Compare the increases in EOQs with the increases in annual demand.
2. Brodie is uncertain if the costs presented in case Exhibit 2 are appropriate for determining the EOQs. What changes would you recommend, and why? Should the cost of the three idle part- time workers be included when the production line is down? Using the 2012 annual demand, and your recommendations, recalculate the EOQs for the five SKUs.
3. Compare your results with those obtained using the data in case Exhibit 2. What do you attribute the differences to? After speaking to Jake and Josh, Brodie is now not sure if the EOQ model is the most

appropriate for the current production process. Evaluate the scheduling method that Jake and Josh are using. Why are they not following the established system?

4. Compare the established EOQ/ROP procedure (described in case Exhibit 2) with the one that Jake and Josh are using. Which system do you prefer? What improvements do you recommend?
5. What recommendations should Brodie present to Jana Fremont at his next meeting with her?

➢ **Case study report on Three Jays due at the beginning of class**

Week 10 Supply chain alignment; Logistics

Readings:

- *Staple yourself to an order*

Discussion Questions:

1. What are the main obstacles that companies encounter when trying to quickly and accurately process their customers' orders?
2. What are the main components of an order management cycle (OMC)? How can problems in your OMC impact customers' satisfaction? How can you improve your OMC?

❖ ***Inventory centralization assignment*:** In solving the problems below, it may be best to set up spreadsheets to compute the answers.

1. Epson produces printers for sale in Europe in its Taiwan factory. Printers sold in different countries differ in terms of the power outlet as well as the language manuals. Currently Epson assembles and packs printers for sale in individual countries. Weekly demand in different countries is normally distributed with mean and standard deviation as shown in table:

Country	Mean weekly demand	Standard deviation of weekly demand
France	30,000	3,200
Germany	23,000	2,700
Spain	14,000	1,500
Italy	34,000	6,800
Portugal	21,000	4,200
UK	45,000	5,400

Assume demand in different countries to be independent. Given that the lead time from the Taiwan factory is seven weeks, how much safety inventory does Epson require in Europe if it targets 85 % probability of no stock out (CSL)?

2. Epson decides to build a central DC in Europe. It will ship base printers (without power supply) to the DC. When an order is received, the DC will assemble power supplies, add manuals, and ship the printers to the appropriate country. The base printers are still to be manufactured in Taiwan with a lead-time of seven weeks. How much savings of safety inventory can Epson expect as a result if it still targets 85 % CSL?

Week 11 Guest speaker: Jonathan Rosenthal (Saybrook); Logistics

Readings:

- *Reverse logistics program design: A company study*

Discussion Questions:

1. What is reverse logistics? What are some of the examples of its use?

2. What are the main differences between forward logistics and reverse logistics? What are the potential dangers if reverse channels are established by mimicking forward flows?
3. What operational considerations must be taken into account when designing the reverse flows?

***Case study**: (HBS* #9-916-025*): Mission Impossible? Yummy77 Delivers Groceries within the Hour*

Discussion Questions:

1. Many companies have tried and failed at online grocery ordering and delivery. Is there grounds to think Yummy77 will fare more favorably? Why?
2. Yummy77's approach is more aggressive than prior delivery efforts by others. Consider rapid deliveries, short delivery windows, and perishable merchandise. Do these features increase or decrease Yummy77's chances of success?
3. The case offers two operational models for Yummy77: the original delivery stations, and the subsequent neighborhood stores. What are the pros and cons of each? Is there room for further improvement in the company's approach? How? You may consider different approaches described in the case when discussing other grocery delivery companies.

Week 12 Network design in supply chains; Facility location

***Case study**: (HBS* #9-609-113*): Plaza, the Logistics Park of Zaragoza*

Discussion Questions:

1. Calculate total relevant cost of each option for a park customer.
2. How would the customer's conclusions change if the following assumption changed:
    a. Demand was more/less uncertain
    b. The number of units per container changed
    c. The service level increased
    d. The product cost increased/decreased
3. What other issues (besides the one listed above) should the customers take into account?
4. What opinion would you have about setting up more than one DC to cover Europe (i.e., one in Plaza and one in Rotterdam)?

***Case study**: (*HBS #9-713-406*): Intel: Strategic Decisions in Locating a New Assembly and Test Plant (A)*

Discussion Questions:

1. What criteria would you use to select the site for Intel's AT plant in 2005? Why?
2. Where would you build the new plant? Why?
3. If you were Intel, what package of incentives would you seek from the government of your chosen location? Why?

- **Case study report on Plaza due at the beginning of class**

Week 13 Revenue management; IT in supply chains

(Bring your laptops to class. Please download the required files for the retail game from the Blackboard before the class)

***Case study**: (*Stanford case #SM-214*): SAP* and Cloud Computing in 2012 and Beyond

Discussion Questions:

1. How is ERP different from SCM software?
2. How is SAP different from Oracle?
3. What is the role of cloud computing in ERP adoption and implementation? What is the difference between IaaS, PaaS, and SaaS? What are the drawbacks of cloud computing?

Retail inventory and pricing game.

Week 14 No classes – Thanksgiving Day

Week 15 IT in supply chains; Sustainability in supply chains

Readings:

- *Supply chain analytics*

  Discussion Questions:

  1. What are the three main types of analytics techniques? How are they used in supply chains in domains of source, make and deliver?
  2. What cases covered in this course are applications of analytics in supply chain management? Explain.
  3. What new developments and/or concepts represent recent or potential future applications of analytics in supply chain management?

***Case study**: (*Berkeley case #B5723*): Han Solar and the Green Supply Chain*

Discussion Questions:

1. Do you think Han Solar's green strategy will increase shareholder returns? What are some other possible impacts of sustainability efforts?
2. What is the corporate carbon footprint of their manufacturing and distribution processes? Assume one shipment of 1,000 PV panels produced in China and delivered to California (manufacturing and distribution). Explain how you identified the different elements that make up the total footprint.
3. Considering your results from the previous question, why do international companies favor air freight over shipping, when delivering final goods from China?
4. Decide which transportation network should be implemented in order to supply panels to California. The following questions should be considered:
   a) Between cost, distance, and lead time, which is the most important criteria in deciding which transportation network to take and why?
   b) Design the locations of the various plants for the entire manufacturing process. Then describe why you chose the locations in a few sentences or less.
5. Overall, what should Han Solar do in order to become a leading company in the PV space again?
6. Which process can be improved and how? Based on your own further research, what changes can be made in some of these processes so that there are fewer emissions to the environment? How can emissions and production cost both be reduced in tandem?

- **Case study report on Han Solar due at the beginning of the class**