"Nothing is less productive than to make more efficient what should not be done at all."
— Peter Drucker, 20th century management guru

"As the economy changes, as competition becomes more global, it’s no longer company vs. company but supply chain vs. supply chain."
— Harold Sirkin, author and consultant

"The Industrial Revolution did not end agriculture because we still have to eat and the Information Revolution will not end industry because we still need a can to hold beer."
— Industry pundit

INSTRUCTOR
Tim Zak
Associate Teaching Professor, Heinz College
Director—Institute for Social Innovation
HBH 2112B
TJZAK@ANDREW.CMU.EDU or TJZAK@HOTMAIL.COM (alternate)

Office: (412) 268-5945
Cell: (412) 735-4077
Home: (412) 422-8333

CLASS HOURS
Tuesdays and Thursdays—HBH 1004, 3:00-4:20 p.m.
Course site accessed through Blackboard (www.cmu.edu/blackboard)

OFFICE HOURS
Tuesday—HBH 2112B, 2:00-3:00 p.m. or by appointment
I’ve established these formal office hours to help reduce uncertainty—now that it’s in my calendar, you can expect me to be in my office at this time unless I announce otherwise in advance. That said, I realize that everyone’s schedule is different and I’ll make every effort to accommodate your needs. The best bet is to call or send me an e-mail to make an appointment or, if you’re feeling lucky, just stop by my office.

Also, I’ll be happy to take questions or comments after class on a first-come, first-served basis. Finally, I welcome conversations not necessarily related to SCM (e.g., career path,
course selection) if you think that my time in the “real world” can provide another dimension to your experience at the Heinz College.

**Teaching Assistant**

Mallory Nobles (**mnobles@andrew.cmu.edu**); TA hours—Fridays, time and location TBD

You should make good use of the Teaching Assistant’s office hours, particularly for questions about course content, case preparation, and grading.

**About This Course**

In the simplest sense, supply chains are “process umbrellas” under which products are designed, produced, and delivered to customers. A supply chain incorporates procurement, production, storage, distribution, selling, and disposal/recycling activities that are connected by material, information, and financial flows. Despite its name, a supply chain is in fact a network of activities and flows that often involves the extensive participation and integration of external trading partners. Therefore, Supply Chain Management (SCM) includes:

- The strategic design of the network and its operational capacities
- The tactical utilization of these capacities (e.g., by managing production, inventory, and logistics activities), and
- The simultaneous control of material, information, and financial flows to achieve an optimal mix of responsiveness and efficiency in the face of changing market conditions and customer demands.

Building on lean/just-in-time (JIT) manufacturing concepts and quality methodologies (e.g., Six Sigma) that were all the rage in the 1980’s and early 1990’s, SCM has gotten significant attention in recent years. What were “theoretical” capabilities ten years ago are now hot competitive weapons. Although recent developments in large-scale optimization software applications have provided industry players with the information visibility needed to synchronize the entire channel, SCM isn’t just about technology. It’s fundamental to business strategy and can be leveraged to create new opportunities to succeed and achieve long-term competitive advantage.

The central objective of this course is to introduce future senior decision makers to the concepts, skills, and perspectives necessary to make good SCM choices. Analytical foundations of SCM related to key concepts such as inventory, capacity, and quality will be introduced. A variety of SCM examples from the private, public, and social sectors, from the simplest to the most complex, will be explored and compared. The emerging challenge of incorporating recycle and reuse strategies into SCM objectives will be investigated. Particular emphasis will be placed on evaluating the appropriateness of mainstream SCM technologies such as enterprise resource planning (ERP) systems as well as emerging enablers like radio-frequency identification devices, 3D printers, and do-it-yourself, open-source manufacturing.

With this emphasis on “currency”, the course is primarily readings-based with numerous examples cited to further illustrate key concepts, and it relies significantly on active student participation. The materials are primarily from “hardcore” management publications like *Harvard Management Review* and *McKinsey Quarterly* as well as more "mainstream"
sources such as *NY Times* and *Bloomberg Business Week*, and selections from “academic” texts and journals. Although no textbook is assigned for the course, I will attempt to draw from among the best SCM books that I’ve come across such as *Supply Chain Management* by Chopra and Meindl and *Designing and Managing the Supply Chain* by Simchi-Levi, Kaminsky, and Simchi-Levi, particularly to highlight some of the theoretical underpinnings of SCM in areas such as forecasting and inventory management.

Here’s our challenge for the mini semester: The range of potential SCM-related topics is vast and a rigorous review of just the analytical underpinnings of SCM could extend beyond the scope of a full semester course. Therefore, this course will act as an overview to the key concepts, contemporary issues, and future direction of supply chain management directed at future executives (as opposed to dedicated SCM practitioners) in the private, public, and nonprofit sectors. In short, I hope that this course will arm you with a set of topics, tools, and techniques related to Supply Chain Management that are both relevant and impactful to your future career plans.

<table>
<thead>
<tr>
<th>Course Objectives</th>
<th>How Assessed</th>
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<td>Introduce future senior decision makers to the concepts, skills, and perspectives necessary to make good SCM choices in a variety of contexts. Provide more in-depth overviews in areas such as operations, inventory management, and SCM systems strategy to highlight “real world” situations and considerations.</td>
<td>Class participation; group case study papers, comprehensive final exam</td>
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<tr>
<td>Identify and clearly define a problem/issue</td>
<td>Class participation; group case study papers</td>
</tr>
<tr>
<td>Analyze and question data and information in a rigorous manner</td>
<td>Class participation; group case study papers, comprehensive final exam</td>
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<tr>
<td>Generate and organize qualitative and quantitative evidence to support arguments and recommendations</td>
<td>Class participation; group case study papers</td>
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<tr>
<td>Listen to, respect and heed the advice and ideas of others</td>
<td>Class participation; group case study papers</td>
</tr>
<tr>
<td>Present data and recommendations in a group setting and effectively defend your positions</td>
<td>Class participation; group case study papers</td>
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**COURSE CONTENT**

The course is organized into 7 modules:

- **Foundations of SCM** provides an introduction to key concepts to be covered throughout the course including a strategic framework to configure supply chains

- **Forecasting and Fulfilling Demand** provides basic tools used in demand forecasting, aggregate planning decisions, and responding to predictable variability, as well as an introduction to the basics of running a production process
• **Operational Improvement, Lean Manufacturing, and Quality** introduces more “advanced” tools and concepts critical for operational success and examines a typical operational improvement challenge in the *Bayonne Packaging* case.

• **Planning and Managing Inventories in a Supply Chain** provides an understanding of why supply chain inventory builds up and identifies managerial levers that improve SCM performance and profitability while lowering inventories.

• **Supply Chain Networks** continues to examine inventory while considering related issues such as logistics, outsourcing, and recycle/reuse strategies, and examines a variety of supply chain management challenges in the *Scientific Glass* case.

• **The Role of Technology and the Web on Global Supply Chains** examines how the access and use of information is increasingly separating SCM “winners” from “losers”, and how the Web is radically changing SCM strategy and operations.

• **21st Century Supply Chains** examines a specific application of SCM tech-related management considerations in the *KL Enterprises* case and concludes by reviewing some innovations with the potential to accelerate the pace of change in global SCM.

**Pre-Requisites**

None.

**Required Readings**

Available in *Course Packet* and links to articles provided in the syllabus with some supplementary readings (as applicable) made available in advance of the appropriate class session. All readings, particularly cases, must be done in advance of the class session when they will be covered (see *Tentative Course Schedule*) and key concepts will be integrated into lectures and discussions. Expect “cold calling” to open class and to provide additional thoroughness and rigor to our review of the materials throughout each class session.

Relevant lecture materials/notes will be made available on Blackboard prior to the lecture for that week. In general, Blackboard will act as the course repository for submitted and corrected assignments, grade postings, class communications, and other related “assets” from our time together.

**Course Requirements**

Since there are likely a large number of students in the class there will be a mix of assignments to provide some flexibility as well as an opportunity to stand out individually:

• Four **Group Case Write-ups** (35%—5 points for the first submission and 10 points for the following 3 submissions)

• **Class / Course Participation** (25%—determined by the rubric included below)

• **Comprehensive Final Exam** (40%)

Group size for team-based activities will be 3-5 students (pending final determination of class size and approval of professor, as required). All team members will complete a peer review assessment at the conclusion of the course to determine relative contributions to group case efforts. All assignments should be submitted to the appropriate section of Blackboard by the start of class on the day they are due.
The grading policy for this course is based on the premise that expectations regarding student performance at the graduate level are high. The mean grade in the class will likely be around 3.5 (between A- and B+) although I am more than willing to depart from those guidelines based on extraordinary performance (in either direction) from the class. Grades in the “A-to-A+” range will be reserved for students who perform exceptionally well in all aspects of the course.

Students occasionally request an extension at the end of the semester if they cannot complete their assignments due to unforeseen work commitments, family problems, illness, and so on. An “incomplete” grade will be given only under exceptional circumstances (poor time management is not considered an “exceptional circumstance”!), at my discretion, and should be discussed with me before the end of the mini-semester so that appropriate paperwork can be completed. Any assignments during the mini-semester that are submitted after the deadline will be assessed a “late penalty” at my discretion.

Finally, you should note that the assigned readings for the course provide only a broad framework for the topics we will discuss. Therefore, in your assignments, you are encouraged to use other research materials, resources, data, and readings.

A BRIEF WORD ON PLAGIARISM AND CHEATING…

Don’t!—no grade is worth sacrificing your personal integrity, particularly at the grad level! You are responsible to know and adhere to all university policies on academic integrity. The Heinz College provides a booklet on plagiarism and cheating, and the university lists all policies on the web at (www.cmu.edu/policies/documents/Cheating.html). Please acquaint yourself with the contents.

*Any plagiarism or cheating will result in failure in the course and your case will be reported to the Associate Dean who may decide to take further action.*

GROUP CASE WRITE-UPS

There are four case write-ups, done in groups, assigned in Weeks #2, #4, #6, and #7 (not the Dabbawalla case in Week #1). They are due by the start of the first (or only) class for that week; late papers receive 0 points. It is my expectation that a concise 3-5 page (double-spaced)\(^1\) write-up\(^2\) plus appendices and/or exhibits is probably sufficient. A variety of discussion questions have been included below; these questions will shape our in-class discussion and all of them (and others issues as you see fit) should be addressed in your group write-up.

CRITERIA FOR GRADING (10 points maximum)—each bullet below can reduce the grade for submissions by .5-1.5 points:

- Response refutes case facts and/or is not supported by information in the case

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\(^1\) Note: The write-up does not need to be double-spaced. Use this statement merely as a guideline for length.

\(^2\) Exceed these guidelines only if you really need the extra space to say something worthwhile or to graphically illustrate your point; go for quality, not quantity!
• Write-up does not stay focused on its core points and/or lacks any particular point of focus
• Too much case fact restatement and not enough analysis
• Response length is insufficiently short or exceedingly long
• An assertion is made but not defended, elaborated on, or clearly articulated; if you make an assertion/decision, you must defend it
• Writing is unclear, incomplete, and/or poorly written (e.g., excessive poor grammar or spelling, run on sentences)
• Paper turned in late (0 points)

*Pointer:* It is important that you support your analysis with case facts. It is equally important that you draw conclusions based on those case facts – i.e., don’t just restate case facts; also consider what those facts mean and how they impact your decisions/arguments.

For the write-ups, you’re not required to footnote if you quote an article in the course pack or the case. However, if you quote/reference another document, you must cite that via footnotes.

At the end of the mini-semester, each team member in the group is required to complete a “Team Evaluation Form” in order to rate their work/effort as well as that of the other team members. Most of the time, the evaluation forms will not result in grade changes. However, if there appears to be consensus that one group member did not pull his or her weight (or, alternatively, that one member was crucial to the team’s success) I will adjust an individual’s project grade up or down. So please be fair in rating your team members.

**Class / Course Participation**

Participation does not entail simply answering when spoken to. Informed discussions are critical to the learning process and will make this class much more interesting and fun for all of us. **Each student is expected to volunteer substantive comments freely. Quality (versus quantity) is important.** Your score will be determined by my assessment of your contributions. The “system” that I’ll use is, at the beginning of the course, everyone starts with a score of “100”. Each time you participate in class or interact with me, I’ll update your participation score upwards or downwards by an appropriate amount based on the interaction:

• Absent from class = -10; after missing two classes, your grade drops by a letter grade for each additional class missed
• In attendance, but makes no contribution = +5
• In attendance and participates in the class discussion = +7
• In attendance and makes substantial contributions to the class discussion = +10

Participation does not have to be limited to class sessions only. If, for example, you bring a relevant current newspaper or magazine article to my attention, I’ll count this as part of the participation grade as well. I will make every attempt to involve every student in this process, but it is possible that I may consistently overlook a potential contributor. Please
bring this to my attention. This process may be considered somewhat subjective but, through our collective efforts, we can ensure that it is fair. Some criteria for effective class participation are:

1. Is there a willingness to participate and is the participant also a good listener?
2. Are the points made relevant to the discussion and linked to the comments of others? Are comments well thought out or just “thrown out”?
3. Do the comments show evidence of rigorous analysis?
4. Is there a willingness to test new ideas, or are all comments “safe”? For example repetition of case facts without analysis and inference is “safe”, but a somewhat off-the-mark comment that leads to creative discussion will be considered valuable.
5. Do the comments clarify, highlight, and synthesize important aspects of earlier comments and lead to a clearer statement of the concepts being covered or to new knowledge/insights?
6. Do the comments identify overlooked points and points that turn out to be influential in further discussion?

Comprehensive Final Exam
The final exam will be comprised of questions drawn from the assigned readings, lectures notes (elaborated on both in-person and via posted videos), and the case studies. They will be in the form of multiple choice, short answer, and quantitative analysis, and are intended to ensure that you’ve understood and retained key terms and concepts from the course, and that you know how to apply them in “real-world” situations.

Classroom Etiquette
Cell phones should be turned off. If there is a situation where you need to be able to receive a call during class, you should use the “silent” mode on your phone and quietly leave the room when a call comes in.

Laptop computers are permitted to be open during class but note that it’s relatively easy to identify when students are using devices for non-class-related activities. I reserve the right to ask that laptops be closed at any time and to call on any student using a laptop in class.

I greatly appreciate students arriving on time for class and getting back from breaks. Please let me know beforehand if you must leave class early.

Be respectful of others and generally treat your conduct in this class the same way you would in any other professional situation.

Thanks in advance for your efforts to create a class environment that works for everyone!

Tentative Course Schedule (our actual mileage may vary)
First, a caveat:
I customarily make substantial modifications to the course after each time it’s taught to incorporate student feedback and reflect the “state-of-the-art” in supply chain management. As a result, there are bound to be some “bumps” along this “journey of
“discovery” that we’re taking together. Suggestions and constructive criticism on what works and what doesn’t and generally how to make this course great are very much appreciated; direct your comments to me directly or to the Associate Dean.

In addition, I’m always introducing new things into the course and I’ll likely try to inject other materials as I come across them during the mini-semester. It is possible that, as we “get into” the material, I’ll want to make some modifications to the course schedule due to timing and/or content issues. My commitment is to give you enough advanced notice on modifications to sufficiently prepare.

(Harvard Course Packet cases and articles are in italics; extra credit readings are identified by a “*”)

**Week 1: Foundations of Supply Chain Management**

In The News*: Stress Test For the Global Supply Chain (NY Times, March 19, 2011); www.nytimes.com/2011/03/20/business/20supply.html?pagewanted=all&_r=0

Core Curriculum: Supply Chain Management (Gaur, Harvard Business School)

Case: The Dabbawallah System: On-Time Delivery, Every Time (Thomke and Sinha; Harvard Business School)

In-Class Video: Follow That Dabbawalla: Home Cooked Meals, the Mumbai Way (Economist Magazine Videos, May 17, 2009)

**Week 2: Forecasting and Fulfilling Demand**


Core Curriculum: Forecasting (Wheelwright and Winslow, BYU-Hawaii)

Case Analysis: A-CAT Corp: Forecasting (Sharma; Ivey School of Business)


**Week 3: Operational Improvement, Lean Manufacturing, and Quality**

In The News*:


Core Curriculum: Designing, Managing, and Improving Operations (Shapiro, HBS)
Core Curriculum: Process Analysis (Shapiro, HBS)

Article: Decoding the DNA of the Toyota Production System (Spear and Bowen, Harvard Business Review, January 2006)

Core Curriculum: Managing Quality (Bohn, UC-San Diego)
Core Curriculum: Managing Quality With Process Control (Shapiro, HBS)

Article*: How to Compare Six Sigma, Lean, and the Theory of Constraints (Nave, Quality Progress (www.asq.org), March 2002);
www.lean.org/Admin/KM%5Cdocuments/76dc2bfb-33cd-4ef2-bcc8-792c5b4ef6a6-ASQStoryonQualitySigmaAndLean.pdf

In-Class Video:
Boeing 737 Lean Manufacturing (February 2011); www.youtube.com/watch?v=--y0U1Qux9EA
Watch Robots Put Together a Telsa (July 2013); www.fastcoexist.com/1682635/watch-robots-put-together-a-tesla

Week 4: Planning and Managing Inventories in a Supply Chain

Case Analysis: Bayonne Packaging, Inc.

In The News*: The Trouble Lurking on Wal-Mart's Empty Shelves (Time, April 9, 2013); http://business.time.com/2013/04/09/the-trouble-lurking-on-walmarts-empty-shelves/

Core Curriculum: Managing Inventory (Hammond, Harvard Business School)

Article*: Building a Flexible Supply Chain for Uncertain Times (McKinsey Quarterly, March 2009);
www.mckinsey.com/insights/operations/building_a_flexible_supply_chain_for_uncertain_times

Read*: Ten Ways to Improve Inventory Management (Bain and Company, July 6, 2011);

Week 5: Supply Chain Networks


Core Curriculum: Strategic Sourcing (Pierson and Shih, Dartmouth and HBS)

Article*: 10 Fascinating Facts About the Hidden Industry That Touches 90% of What You Own (Fast Company, September 5, 2013); www.fastcoexist.com/3016687/10-fascinating-facts-about-the-hidden-industry-that-touches-90-of-what-you-

Article: Welcome to “The Matrix”: At FedEx’s Sorting Hub: 1 Night, 1.5M Packages (CNET, July 12, 2014); www.cnet.com/news/at-fedex-sorting-packages-1-5-million-at-a-time/

In-Class Videos:
March of the Machines (60 Minutes, January 11, 2013); www.youtube.com/watch?v=IYvhOg4kwe0
Amazon’s Jeff Bezos Looks To The Future (60 Minutes, December 2, 2013); www.cbsnews.com/videos/amazons-jeff-bezos-looks-to-the-future/

**Week 6: The Role of Technology and the Web on Global Supply Chains**

**Case Analysis:** Scientific Glass, Inc.: Inventory Management


Article: The Trouble With Enterprise Software (Rettig, MIT Sloan Management Review, Fall 2007); sloanreview.mit.edu/article/the-trouble-with-enterprise-software/


**Week 7: 21st Century Supply Chains: Challenges and Opportunities for Executives**

**Case Analysis:** KL Enterprises, Inc.: Putting Information Technology to Work


In-Class Video: Make Your Own Products: 3D Printing Reaches Consumers (Time.com; view to 3:38); http://techland.time.com/2013/01/15/make-yourself-into-an-action-figure-3d-printing-reaches-consumers/#ixzz2pYnGdUI9
The Dabbawala System: On-Time Delivery, Every Time (Thomke and Simha, Harvard Business School, 2013)

1. What are some of the factors/"secrets" that have allowed this supply chain to be so successful (e.g., high service performance) for so long?

2. Why do world-class companies like FedEx study the dabbawala system? What do they expect to learn?

3. How could “technology” and other proposed improvements potentially hinder the system rather than help?

A-CAT Corp: Forecasting (Sharma, Ivey School of Business, 2013)

1. Using various methods and models available for forecasting, what are some suggested ways forward for A-CAT?

2. Which method is best suited and gives the best possible results and why?

3. What qualitative factors can be considered to improve the forecast experience?

Bayonne Packaging, Inc. (Shapiro and Morrison, Harvard Business School, 2012)

1. What is Bayonne’s industry, type of operation, and therefore its key competitive priorities? What are its main problems?

2. What is current capacity utilization in the work centers (excluding Finishing where capacity is variable)?

3. What is the capacity in pieces per day for the Die-cut work center, if it were running orders of 30,000 pieces in the following three cases: (a) None of the orders can be ganged (batched); (b) pairs of orders can be batched; (c) all of the orders can be batched? Assume there are 15 available work hours per day and that the average setup takes 2.5 hours.

4. Assume that 40 of the orders partialled in October each broke into a production run in the Royal/Queen work center, resulting in two setups for these orders instead of one. (a) What would capacity have been in October without these additional setups? and (b) What was capacity with these additional setups?

5. What size of orders would you route to the Royal/Queen work center, and what to the Staude work center?

6. What is the yield at each of the work centers Sheet, Print, Die-cut, and Royal/Queen? What is the cumulative yield for an order that the sheeter starts with 40,000 sheets?

7. How do you explain Bayonne’s performance problems, and what should John Milliken recommend to Dave Rand?
Scientific Glass, Inc.: Inventory Management (Wheelwright and Schmidt, Harvard Business School, 2011)

1. What are the problems facing SG in January 2010?

2. How much external funding will have to be raised in 2010 in order to finance operations?

3. How do SG’s problems illustrate the relationship between the number of warehouses and inventory levels?

4. What alternatives are available for dealing with inventory problems? How would you evaluate the alternatives?

5. What actions should Ava Beane propose to Eric Gregory and Melissa Hayes?

KL Worldwide Enterprises, Inc.: Putting Information Technology to Work (Kesner, Northeastern University, 2005)

1. What are the business drivers and challenges for KL Worldwide Enterprises?

2. What are the operational and organizational characteristics of KL, and how do these help or deter the enterprise from realizing its business objectives?

3. What are the primary IT enablers for a business such as KL, and how does the current state of its IT rate in terms of addressing corporate needs?

4. As the CEO of KL, what would be your prioritized list of IT investments? Would your colleagues on the executive committee agree with your selection and prioritization? Why or why not?

5. How is the Internet leveraged within KL? What needs to change? Where are there opportunities for greater leverage?

6. What needs to happen with KL’s ERP systems (i.e., Oracle and SAP) to provide a greater ROI in these technologies and to enable the future growth of the enterprise?

7. Are the supply chain issues at KL primarily cause by inadequate IT or do the associated business processes need to change as well?