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Title: Bridging the gap between university and industry: experiences with a senior level undergraduate supply chain course

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Abstract

Teaching operations and supply chain management courses can be challenging especially because textbook materials and “real” life experiences don’t always coincide. At Eastern Washington University a new approach has been introduced with a heavy emphasis on practical knowledge, i.e. oriented towards careers in supply chain management.

The approach taken is comprehensive, i.e. both purchasing and logistics aspects of supply chain management are treated, and focuses on analysis and the application of theories rather than for example memorization of textbook material. More than half of the time, students were interacting with companies either in company visits, during which students had to analyze the specific supply chains and their implications for management, and in small projects during which students performed quantitative analysis to help companies.

Despite several challenges, the approach has led to increased industry interaction, more practically oriented knowledge for students, increased knowledge on job opportunities and requirements, and industry feedback on class content.

Keywords: Internationalization, production location, international manufacturing

Introduction

The College of Business and Public Administration at Eastern Washington University offers 11 majors. One of the majors is Operations Management. The operations management major ‘starts’ with a core undergraduate operations management course,
OPSM-330, at the junior level. Following this are three advanced operations classes, including a supply chain management course, one in each of the academic quarters. Furthermore, students have to select an additional three elective courses. The supply chain management course, OPSM-428, is a senior level course which is offered in the fall quarter. The course is a four credit course that meets twice a week for 2 hours. For business students, it is an elective course. For operations management majors it is a required course. When this course was taken over by the first author in the fall 2002 quarter the course content was focused on the purchasing side, i.e. materials management. Burt, Dobler and Starling (2003) was used as the class textbook. Classes involved some lecturing and a heavy emphasis on case discussions. After the course was taught, several conclusions were reached with regard to the supply chain course as well as the operations management major. First, although cases were used, the students did not really grasp the value of the theories for practical applications. Second, students had, in general, a negative idea about industry in the Spokane area, i.e. they thought not much industry existed in Spokane and there were not many opportunities for jobs. Third, the textbook was too much oriented on purchasing issues rather than the management of supply chains. Fourth, the operations management major had typically low enrollments, see table 1. EWU offers 11 majors, so on average a major can expect a market share of 9%, that is, without counting double-majors.
Table 1: Operations management majors at EWU

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of graduates</th>
<th>Number of OPSM-majors</th>
<th>Market share</th>
</tr>
</thead>
<tbody>
<tr>
<td>'96-'97</td>
<td>369</td>
<td>9</td>
<td>2.4%</td>
</tr>
<tr>
<td>'97–'98</td>
<td>396</td>
<td>7</td>
<td>1.8%</td>
</tr>
<tr>
<td>'98-'99</td>
<td>340</td>
<td>10</td>
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<td>385</td>
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<td>10</td>
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<tr>
<td>'02–’03</td>
<td>496</td>
<td>5</td>
<td>1.0%</td>
</tr>
<tr>
<td>'03–’04</td>
<td>440</td>
<td>9</td>
<td>2.0%</td>
</tr>
</tbody>
</table>

This led to four challenges:

1. Make the course more practice oriented
2. Educate the students about local industry
3. Include management of supply chains in the course
4. Increase enrollments in the operations management major

Class approach in 2003

In the fall 2003 quarter several changes were implemented based on the challenges mentioned above. The quarter contained twelve weeks and the last week was scheduled for finals. Twelve students enrolled in the course.
First, in an effort to combine the first and second challenge, it was decided to show students the practical relevance and importance of supply chain management by introducing the students to the local industry. Visits were arranged with four local companies during the last two weeks of the quarter (week ten and eleven). The companies were in different industries and had different supply chain positions. These visits were scheduled towards the end of the quarter so that by that time the students were already familiar with supply chain management topics from class sessions. The students were required, in groups of three students, to write a report about these visits in which they outlined the different approaches of the different companies and to present their findings the last day of class. The visits typically included a company tour of 40 minutes up to an hour followed by 20 – 30 minutes of questions and discussions.

To facilitate the preparation for the company tours, the second (and final exam about the theory) took place in week nine. This exam was an open book exam which had only one question:

“Immediately after graduating from EWU, you have found a job as a consultant. In your new job you are required to go into companies, analyze their supply chains and come up with suggestions to improve how the different client companies manage their supply chains. Since you have to analyze many companies, you have decided the time is ripe for a ‘structured instrument’. Develop an ‘instrument’ that analyses the foundations of supply chain management in the client companies.”

Second, as a response to the third challenge the textbook was changed to a more logistics oriented book, i.e. (Simchi-Levi, Kaminsky and Simchi-Levi, 2003). However, important
aspects from the purchasing viewpoint were introduced in several lectures, e.g. negotiating tactics. Most of the class meetings were still focused on case discussions and some cases were used that explicitly focused on purchasing aspects.

Third, as a response to the first and third challenge, two guest speakers were invited. One guest speaker held a logistics position and talked about this type of job. She visited the classroom in the third week of the quarter. The other guest speaker held a purchasing position and talked about that type of job. She visited the class in the fourth week. Both speakers provided the students with practical information about working in supply chain management, the challenges and the type of skills required. They also showed the students the importance of purchasing as well as logistics aspects in supply chain management.

As a result of the increased practical exposure, the class time was reduced to 15 meetings instead of the ‘normal’ 21 meetings in the quarter. Two of those meetings were scheduled for tests so all in all only 13 class sessions were available to discuss supply chain management theories and case discussions. Therefore a quick start needed to be made with the material. To accomplish this, a ‘comprehensive’ exam was given during the second lecture in the quarter. This test served several purposes. It allowed students to become quickly familiar with the essentials of supply chain management, it served as practice for the students to learn to identify the most important topics in a timely manner (the students were explicitly told about this goal), and knowing the broad overview of supply chain management allowed better case discussions. When the students were introduced to the idea of the comprehensive test, they were told to imagine a situation where a very important customer comes up to a company and essentially asks for
something impossible, e.g. a large number of products in a very short time period (rush order). In such an instance a company will have to deal with that customer and the problem, so they will have to come up with innovative ways to somehow get it done. The students were told to view the test in a similar way.

The test contained 30 multiple choice questions and, by necessity, it was of a general nature and did not ask for specifics (the book contains approximately 350 pages). The test was extensively discussed the next class meeting so that everybody was aware of the main issues. Examples of test questions were:

- Challenges in supply chain management are related to:
  a) Risk and global optimization
  b) Risk and local optimization
  c) Uncertainty and global optimization
  d) Uncertainty and local optimization

- There are no compelling reasons for a company to hold inventory
  a) True
  b) False

- Risk pooling suggests that demand variability is reduced if one aggregates demand across locations
  a) True
  b) False

The fourth challenge was not explicitly dealt with but it was assumed that if students became more familiar with operations management and if they could sense the practical usefulness as well as get an indication from companies about what the companies are
looking for when they hire, then students would become more attracted to the operations management major and word-of-mouth could then lead to increased interest in the major.

Evaluation

In general terms, the class was considered quite successful. Student evaluations revealed that students considered the course very valuable (average an 8.3 and median a 9 on a 9 point scale). In general students liked the company visits and case discussions. Informal conversations with students showed that many also appreciated the early comprehensive test. Although initially viewed with suspicion, most students considered it a challenge and worthwhile experience. The average and median scores on the early comprehensive test were respectively 22 and 23 out of 30. This was considered quite a good result given the short time period allowed for studying.

Some additional comments from students were that they would have liked visits earlier in the quarter so that they can connect the theory with practice earlier. Students also indicated that it might be worthwhile to have more company visits because the first couple of visits were rather new and they felt inexperienced. They felt that after four visits, they would benefit from some additional visits since they became more aware of how to handle them.

The companies also valued the experience. The companies indicated that they appreciated to get in touch with students and that the students had good questions. The companies were also asked about what they look for in supply chain management candidates, in other words what skill set is important to cover in the classroom. In general, the feedback showed that the class should focus on a combination of purchasing and logistics issues
and that the companies were especially interested in people with analytical skills, be able to make decisions, be comfortable with spending a lot of time on the phone (particularly for buyer-positions), and be able to handle large amounts of data.

**Class approach in 2004**

Based on the experiences in 2003 and the feedback from students and companies several changes were made for the fall 2004 quarter. This quarter was similar to the fall 2003 quarter, i.e. there were eleven regular weeks and the twelfth week was scheduled for exams. There were 18 students enrolled in the course.

First, company feedback clearly indicated that supply chain management positions in industry have to deal with purchasing as well as logistics aspects. Although both were treated in 2003, dealing with only one textbook left room for improvement. Since no book was found that satisfactory combined the viewpoints of purchasing and logistics, there was a desire to use two books. However, for cost reasons, combining for example Burt, Dobler and Starling (2003) with Simchi-Levi, Kaminsky and Simchi-Levi (2003) was not an option. After reviewing several books, a choice was made to use Burt, Dobler and Starling (2003) for the purchasing perspective and to use a trade-oriented book by Frazelle (2002) to highlight the logistics aspects. Frazelle (2002) includes a number of quantitative techniques that allows students to analyze the supply chain performance. Some of the companies involved in the 2003 visits were consulted about this material to check whether the treated topics would be of value to them when they hire people for supply chain positions.
Second, because of the perceived value of company visits, these were extended and used earlier in the quarter. This time, nine companies were visited between the third week and the tenth week of the quarter. The plan was to have one class meeting a week (for case discussions) and one company visit a week during this time period but scheduling difficulties led to some changes. In two instances there was a combined visit to two companies that were intimately working together. Three of the companies had been involved in the 2003 visits as well. The new companies included a hospital and an airport to emphasize service oriented organizations.

Furthermore, it was decided to carry out small logistics oriented (quantitative) projects for some of the companies as well. These were scheduled in week nine of the quarter, after the companies had been visited, i.e. the students were already somewhat familiar with their assigned company. The class was divided into six groups of three students. Two groups of students went to the same company where, instead of conducting a quantitative analysis project, they were invited to ‘walk-along’ with supply chain professionals for the entire day. One group focused on purchasing aspects, the other group focused on logistics aspects. The students attended several meetings during that day which allowed them to get a fairly good impression of the content of supply chain management jobs as well as requirements for these positions. The other four groups conducted a small research project. They met with companies in week nine but had to work on the project over the next couple of weeks. The results of all groups were orally presented during the final day of class in week twelve. The students had to prepare a report (one copy for the instructor and one copy for the company) which contained three parts: a theoretical part outlining key supply chain issues, a practical part analyzing the
company visits highlighting commonalities and differences, and a practical part containing their project. The first two groups had to write about their experiences during the day they spent at their assigned company. Company representatives as well as operations management colleagues, the department chair and college dean were invited for these presentations. Two groups had a forecasting project. One group had to look at the potential for outsourcing production to China, India and one other country that they decided. One group examined logistics issues within a local hospital and the cost of not receiving supplies when needed.

Due to the early company visits, there was no time for guest speakers early in the quarter so these were not used. However, to facilitate students with their job search, it was decided to introduce them to professional societies where they can learn about job demands and job opportunities. Furthermore, discussions with companies showed that some companies specifically look for certain types of certification when they hire people. Therefore, presentations by APICS and ISM were scheduled in week eleven.

The early comprehensive test approach was again applied in this quarter and it was again discussed in-depth during the next class meeting. The test was heavily oriented on the Burt, Dobler and Starling (2003) book but also contained some questions on Frazelle (2002). Together these books contained approximately 1050 pages. The test consisted of twenty multiple-choice questions. Some examples of questions were:

- Which of the following is not one of The Four Phases of Supply Management?
  a) Generation of Requirements
  b) Sourcing
  c) Pricing
d) Profit Sharing

e) Post Award Activities

• Which of the following is not one of the three types of buyer-supplier relationships presented in the textbook?

  a) Transactional
  b) Transcendental
  c) Collaborative
  d) Alliance

• Collaborative relationships are typically used for the procurement of commodity items.

  a) True
  b) False

• Which of the following is not one of the conditions demanding negotiation?

  a) Impossible to estimate costs with a high degree of certainty
  b) Price is not the only important variable
  c) Market must consist of an adequate number of sellers
  d) Purchasing firm anticipates a need to make changes in the specification
  e) Special tooling of setup costs are major factors

• Which of the following is correct?

  a) Logistics activity profiling is the first step in logistics master planning.
  b) Logistics activity profiling is a systematic analysis of item and order activity
  c) Logistics activity profiling is designed to quickly identify the root cause of problems, pinpoint major opportunities for improvement, and to provide an
objective basis for project-team decision making.

d) All of the above are true

Which of the following is correct?

a) The Customer Service Policy (CSP) is the first step in proactive customer and demand management.

b) The CSP defines the service targets and objectives for logistics.

c) Many companies don’t have a CSP.

d) All of the above are true.

In 2003, students had to develop an instrument to analyze supply chains which they used for the company visits late in the quarter. Since in 2004 the visits were scheduled much earlier, this approach was not feasible. Now, during the second week a lecture was provided with the main elements of supply chains and how to analyze company situations.

A comprehensive test about the theoretical materials was given in week eleven. In fact, the same test was used as for the first test to measure progress of the students. Of course, the students were not informed about this before the test. Furthermore, one additional change to the test was made. Essentially, it was estimated that the students should be familiar with the test and its concepts in particular because they took it earlier and it was discussed in the classroom. Therefore, an attempt was made to check how sure students were of their answers. For each test question the student had to provide two answers. One answer indicated the answer to the question. The second answer indicated whether they were sure about their answer or not. The following schema was applied: correct answer and sure: 2 points; correct answer but unsure: 1 point; incorrect answer and unsure: 0
points; incorrect answer but sure: -1 point. As a result test scores could range between -20 and +40, this was adjusted for grading purposes so that no student could actually achieve a negative score.

**Evaluation**

In general terms, the class was again considered successful. Student evaluations revealed that students considered the course excellent (average a 4.5 and median a 5 on a 5 point scale; by comparison the department average is a 3.3 and median a 3).

Specific comments provided by the students on the company visits were:

- “The company visits were an excellent learning experience.”
- “I felt that the company visits were an effective way in demonstrating different operations aspects. I feel that the group projects could have been assigned earlier with more time to work with companies”
- “The company visits are what made the course interesting. To be able to see these companies work and see that they are using the same theories and material that was learned in class”
- “The company visits helped me understand what was taught in class”
- “I loved the hands-on role playing things we did in class and outside of class. The company visits, though time consuming (drive time and gas money) help a lot in seeing how what we were learning in class applied to real world situations”.

Some comments from students indicated that from their viewpoint not all companies were equally prepared for our visit and that some of the visits were too general, i.e. they should have focused more on purchasing and logistics issues.
Informal conversations with students showed that many also appreciated the early comprehensive test. The average and median scores on the early comprehensive test were 14 out of 20, which was a little lower than in 2003 but the textbook sizes in 2004 were three times the size of the 2003 textbook. After the test, it was immediately noticeable that for the students receiving these types of scores on a comprehensive test so early in the quarter contained a very powerful message about their capabilities but also about studying/working in a smart way. Comments provided by the students on the early test were:

- “Having the final in the first week of class was a great simulation of real life as well as the only way to prepare for the company visits”
- “We were challenged in the beginning and then applied what we learned after that in the company visits and class time”

The second test, which contained the same questions resulted in average and median scores of 17 out of 20 correct answers, or 50% fewer mistakes.

To get a more formal evaluation from the companies, an evaluation form was developed which contained nine questions regarding their opinion about what should be taught in supply chain management courses, their experiences with the student projects, their opinion about the course format, and their hiring practices. The evaluation form was used during the final day of class, i.e. the student presentations. Ten companies were invited to these presentations (nine from class visits, one from the ISM presentation). Four companies showed up, two send a notice that they couldn’t make it and four didn’t respond. The company comments suggest that they consider this type of course with company visits and projects to be very valuable. Some indicated that they would like a
more extensive research project. Furthermore, they would consider the graduates for their entry-level supply chain positions.

**Challenges:**

Although the experiences with the course illustrate usefulness for student as well as companies, there are several challenges in teaching a course in this manner.

1) A balance has to be found between theoretical exposure and practical exposure. Practical exposure is nice and gives the students a much better sense of potential jobs and the skills required to perform those jobs but it can’t serve as a complete replacement of learning theories. Feedback from students indicates that five to eight company visits are enough to give them a good sense of what goes on inside companies. But, in a quarter system, that takes away quite some class time. The approach taken is to give early comprehensive tests and although students have been appreciative, it is unusual in the EWU context.

2) When company visits are included in the course, how should this aspect be graded? In 2003, the students wrote a report analyzing and the different companies. In 2004 they also included projects for some of the companies. In both instances grades were give by the instructor based on analysis et cetera. However, it would probably better to include some kind of grading element from the companies as well. There are several challenges with this. What should companies grade? How do you make sure that grading across companies can be compared? Will companies invest the time in grading a paper?
3) When projects are conducted, how big should they be? In 2004, the projects entailed data collection during one day and data analysis and report writing for almost three weeks. Yet, these projects were essentially small. Bigger projects, i.e. more meaningful projects, are more challenging because they have to start earlier. Starting earlier means that less time is available for general company visits. However, the advantage of the visits is that students get to see multiple different perspectives, i.e. it offers a broad perspective. Also, if the projects start earlier, then students may not yet be familiar with the companies. In the 2004 situation, during the project presentations, each of the students was aware of the issues going on in all of the companies because all were visited.

4) Should projects be split over different smaller groups in several companies, or for example take place in one company? One company allows in-depth knowledge about the company and multiple teams of students working on some issues may provide more benefits to companies. However, it takes a much bigger commitment from companies.

5) Balancing the different topics in supply chain management in one course. In the course a balance was sought in combining logistics and purchasing aspects but no comprehensive textbook was found. Using two books, leads to additional cost and more material for the students which is particularly challenging when class time is restricted due to company visits. Some of the companies suggested in their evaluations that more emphasis might be required on inventory and financial management issues. In addition, the type of projects given to the students indicates that forecasting is quite a challenging area for companies and skills in this area may
be extremely useful. The challenge is, if possible, to cover all these topics sufficiently in one course.

6) The number of companies showing up for the final presentation was disappointing. With their own existing responsibilities, the question is whether and how companies can be motivated to attend these types of events.

7) Another practical challenge is to schedule the visits. It requires extensive communications with companies and last minute changes from companies may alter the course design. The timing of making the appointments is also an issue. Making the appointments very early in the quarter, maybe too early for some companies, but leaving them ‘open’ until late in the quarter leads to uncertainty whether these visits will actually be achieved.

Conclusions

This paper describes a “new” approach to a senior undergraduate level OPSM class. In this approach, a heavy emphasis is placed on bridging the gap between university and industry by visiting local companies to learn about how they handle their supply chain and by performing small, mostly quantitatively oriented, projects for local companies. Although the benefits are clear, i.e. getting to know local companies, and practical approaches to supply chain management, there are many challenges in setting up this type of course. For example, help from local companies, scheduling it, scheduling the end presentation, etc. For future classes, some of the projects will be moved to earlier in the quarter and more extensive talks with companies will be held to make sure that the emphasis during the visits is supply chain management, not just their general operations.
References

