

Learning & Growing: Integrating Technology Undergraduates into the Development of an Industrial Case Study

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A national industrial distribution association approached us to develop a case study for its association members. The national association assumed responsibility for identifying educational needs of upper level, mid level, and lower level personnel in the industry. In the previous year, a case study had been developed to educate upper level managers in the strategic nature of distribution in their industry. The association found that upper level management had a great learning experience and wanted lower level workers to have the same opportunity to refine and enhance their knowledge on making inventory and warehousing decisions. The project objective was to develop a case study that would be used in a weekend workshop to educate operations and customer service personnel involved in making logistics-related decisions. The mid level operations and customer service personnel were to attend a two-day workshop to learn basic terminology, analyze the case study, and refine their current knowledge surrounding their job duties.

This article describes the process of developing a case study for a national trade association and integrating learning opportunities for undergraduate technology students at Purdue University. The needs assessment phase of this project became an Inventory and Warehouse Management course project. The educational goal for the weekend industrial workshop, based on the case study, was to accomplish the following:

- Be valuable for companies with \$5 million to \$400 million in sales.
- Address the environment where employees typically handle 3,000 to 8,000 stock-keeping units.
- Teach the attendees in a highly participative setting.
- Incorporate small group activities.

The educational materials to be developed for the weekend workshop were a new case study, workbook, supporting reading materials, PowerPoint presentation, glossary of common terms, and an evaluation instrument.

The topic areas to be covered in the case study and the weekend workshop were:

- Inventory management and control.
- Product backorder and returned goods.
- Facility selection and layout.
- New product introduction.
- Order fulfillment routines.
- Selection of transportation modes.
- Multiple branch issues.
- New technology adoption.
- Human resource management.
- Key productivity measures.
- International issues.

Background on Educational Component

One of the first steps in the case study development (to be described more completely under the methodology section) was to research the needs of the trade association members. The students accomplished this by developing and analyzing results of a survey administered to the industrial distribution trade association members regarding their logistics and operational educational needs. This task proved a valuable opportunity to integrate the project with a scheduled junior-level class at Purdue University in the School of Technology. The School of Technology (and the Industrial Technology Department) prides itself on teaching students applied concepts via hands-on learning, experiential exercises. Just as important is the need to address what Savage (2001) called “the challenge of dealing with the ‘Moving Target’ of Technology” (p. 9). Faculty must be committed to providing opportunities for relevant content in “learner contemporary” concepts and providing challenging coursework for students. What better chance to teach the concepts and topic areas identified earlier than having the Inventory and Warehouse Management students apply what they learn in the class to this project? The course content covered all topic areas necessary for the case study workshop, which made the case study development a great learning and teaching opportunity.

Faculty and students have evolved to the point where they value learning through interactive assignments. The objective of this project was to enhance students' learning through increasing knowledge in the following three areas: (a) systems knowledge; (b) topical areas such as inventory management, facility layout, product backorders, and other topical areas identified earlier for companies hiring industrial technology students; and c) reflectivity, which involves comparing one's thinking to experts and peers.

If students are to develop systems understanding, then they must engage in all aspects of the system, which includes elements, relationships among elements, operations that describe how the elements interact, and patterns or rules that govern the preceding relationships and operations (Lesh & Kelly, 2000). For example, topics in the Inventory and Warehouse Management class include new product introduction, order fulfillment, selection of transportation modes, new technology adoption, and so on. Each topic listed above is in itself a subsystem. These subsystems comprise the industrial distribution and manufacturing system.

Each topic must be understood along with the relationships to other topics and the rules and patterns that govern the complex industrial organization. By mapping out the needs of industrial distributors in several topic areas, students are able to attain systems knowledge of distribution topics.

The Society of Manufacturing Engineers (1999) worked with industry and colleges and universities to analyze the skills and knowledge necessary for college graduates to become effective workers in the manufacturing industry. The study identified 15 competency gaps including:

- Problem-solving abilities.
- Fundamental topic knowledge such as manufacturing systems, logistics, and product/process design.

This project gave students an opportunity to delve deeper into these topics by applying course topics and learning additional information about distributors' problems and issues.

Another learning objective of coursework is the ability to think reflectively, where reflective thinking involves actively monitoring, evaluating, and modifying one's thinking and comparing it to both expert models and peers (Lin, Hmelo, Kinzer, & Secules, 1999). This project gave students a chance to compare their beliefs about current issues in warehouse and inventory with distributor beliefs on the same issues.

Methodology

Case studies are valuable learning tools because the case study describes a real situation for learners. According to Smith and Ragan (1999), case studies are similar to simulations in that they present a realistic situation and require learners to respond as if they were responsible for solving the problem. "Case studies also require learners to select and manipulate multiple principles in order to solve problems" (Smith & Ragan, 1999, p. 145). In order to make this case study "real" to the inventory and warehouse personnel, the case study materials were developed using these four main steps:

1. Research the needs of the trade association members, with undergraduate Purdue students assisting faculty.
2. Establish an overall model for the case study.
3. Evaluate the case study first draft with assistance of association board members.
4. Finalize the case study and develop the supporting educational materials.

Step 1: Research the Needs of the Trade Association Members

The students had an opportunity to apply what they learned in class by developing a survey instrument to be administered to trade association industrial distribution members. The students were assigned a semester-long group project, with four students per group. The 1. Develop a list of questions for three topic areas from the suggested list above (inventory management and control, productivity, etc.).

2. Contact two distributors and document the results of their responses.
3. Generate a written report.
4. Present recommendations and suggestions to the class.

Each student group was asked to pick three topic areas from the list of topic areas to be covered in the case study. The students developed a list of questions to ask distributor personnel related to the topic area. The questions captured the information needed for the study. In order to validate the questions, the students individually assessed the questions and responded to the question to determine the types of responses to expect. Then, as a student group, the questions and responses were analyzed. Were the answers valuable? Were responses inconsistent? (i.e., Did one person respond completely differently from another person?), or Was the question unclear? Problem areas for each of the questions were then identified. The student groups then finalized questions with tables of responses expected from the distributors.

Example for topic area: Backorders and Returned Goods

Question: What is your policy for handling product backorders?

Answer 1: The backorders are filled as early as possible.

Answer 2: What is a backorder?

Answer 3: Backorders are filled before new orders are filled.

The students determined that different respondents might see each question uniquely different, so identifying some specific problems with the questions was necessary. Continuing on with this example, the students identified these problem areas for the backorder and returned goods topic area:

1. What is meant by backorders?
2. Is the prioritization of backorders the key?
3. The term policy is ambiguous.

The problem areas then forced the members of the student group to reevaluate their objective in asking the question and develop a more complete question. In this case the student group determined the following question would capture the essence of the information they were seeking:

When your company has an order that cannot be filled immediately from on-hand inventory, how do you make sure the customer gets its order?

The output from each student group was a survey customized for three topic areas. The trade association then gave the students a list of distributors to contact, and the students began the process of contacting the distributors via email and fax.

The student groups were responsible for contacting three to five distributors each and documenting the distributor responses by organizing the data in tables and charts. These results clearly identified key issues and problem areas for the distributors' case study and also statistics for most common responses and unusual responses. Another benefit from the results was the discovery of special jargon and terminology used in the industry. The students collected data from over 40 distributors, with at least four distributor respondents per topic area. For each topic area, the students aggregated the differences and similarities of responses. These similarities and differences in operating procedure were highlighted by size of company, product type, number of stockkeeping units, and location. This information gave an even clearer picture of the audience for the weekend workshop.

The data collection process was not over yet, however. We then visited distributor warehouses in the industry to further validate the survey results. On-site visits with different-sized distributors were particularly valuable for verification of the issues from the distributor survey responses. Although the distributors were in the same industry, each was unique in how it conducted business, the knowledge level of warehouse personnel, and terminology used by each employee. Lastly, these site visits confirmed that the workshop would have to be conducted at a level consistent with the typical warehouse and inventory personnel education and experience level. Given the varied backgrounds of the personnel, the workshop was developed using adult learning principles. Characteristics of adult learners are (a) their experience is a foundation for learning but each adult learner is unique in his/her needs because of age, ability, work experience, and cultural background, and (b) adult learners expect class time to be well spent and help

them immediately apply their knowledge to their daily lives (Wisma, 2001).

Step 2: Establish an Overall Model of the Case Study

The data collection site visit phase identified key competencies and areas for improvement for distributors in the industry. The six-page case study incorporated the human element with main characters the inventory and warehouse personnel would relate to, as well as key problems likely to be experienced in each company. The case was a scenario depicting problems that a “traditional” warehouse supervisor faced when the company was acquired by a much larger “world-class” parent company. The case described many operational issues that had to be corrected in order to meet the new standards for warehouse operations, including quantitative measures that provided for the basis of analysis and problem-solving exercises by participants.

Step 3: Evaluation

The six-page “Brees Floor Covering Case” and initial workshop objectives were forwarded to the industrial distribution association officers for feedback. Comments and suggestions were incorporated into the case study document.

Step 4: Finalize the Case Study

The workshop educational materials were finalized, including the case study, instructor’s manual, supplemental readings, glossary of common terms, and supporting multimedia materials. The in-class activities and workshop schedule were developed using the following adult learning principles (Wisma, 2001):

Adults need to know why they need to learn something.

- Adults need to learn by experimentation.

- Adults approach learning as problem solving.
- Adults learn best when the topic is of immediate value.
- Adults view learning as an active process in the construction of meaning.

Findings

Writing a case study proved to be a great opportunity for us in several areas. We were able to update our working knowledge of a specific industry. The teaching of undergraduate technology students was enhanced through a sharing of responsibilities with the students. An active learning environment linked with the real world was realized through this hands-on project. An end goal for the workshop was to motivate inventory and warehouse management personnel to learn more about their industry and new techniques in their field. This case will also be valuable as a learning aid in future warehouse and inventory management classes.

We challenge educators, graduates, students, industrial representatives, and others interested in technology education to engage in educational projects of this nature. Pick an operational area or industry to research and develop a case study. The benefits and challenges are many—a journey not to be missed!

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