Case Article

Keeping Logistics Under Wraps

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This paper describes a teaching case that integrates logistics network design with an ethical decision-making process. The ethical issues center on a proposed network design strategy for parcel transportation known as zone skipping, whose implementation in this setting would require the disguising of the identity of freight. The paper describes the case, discusses its pedagogical goals and provides some recommendations for using the case successfully in a logistics or optimization course.

Key words: distribution network design; integer programming; ethics

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1. Introduction

“Keeping Logistics Under Wraps” is a teaching case structured to provide a synthesis between logistics network design and practical ethics. Its main purpose is to help fill a gap in the current library of logistics education materials by requiring participants to adopt a holistic decision-making strategy that uses both quantitative modeling and stakeholder analysis. The case also exposes students to cost analysis for parcel transportation, a mode that is often omitted from logistics textbooks and other instructional materials; it also provides students with a large amount of data similar to the kinds of data sets that are available in the field.

The remainder of this paper is structured as follows. The next section provides a brief summary of the decision environment of the case. The third section discusses the pedagogical goals of the case and describes how the case addresses recommendations for future curriculum development made by contemporary research in general business and logistics education. The final two sections describe how the case is used in various types of courses and discuss results from several classroom implementations.

2. Case Description

Mark Grescovich is the traffic manager for Stationery Demand, a fictitious distributor of customized office supplies and paper products located in Blawnox, PA. Although the case describes a fictional scenario, the dilemmas the managers face correspond to a real situation that one of the authors experienced while acting as a consultant for a major firm in a different industry. Stationery Demand’s current contract with its parcel carrier is expiring soon, and the carrier has proposed a new contract with extremely high freight charges for shipments from Blawnox to the western United States. Mark suspects that the reason for this proposal is the lack of competition in the parcel industry; the current carrier knows that the other providers cannot satisfy Stationery Demand’s quality and customer service requirements, so that carrier does not perceive any danger of the customer switching to another carrier.

Mark formed a committee to determine Stationery Demand’s best response in light of the recent proposal. This committee has recommended that the company investigate a zone-skipping strategy (Frans and Woodmansee 1993) in which packages are shipped to pool points in the western United States.
via a truckload carrier and then delivered from these points via the parcel carrier at the prevailing market rates. Figure 1 displays the seven potential pool points that could accommodate the zone-skipping operation. The effectiveness of this strategy in this contract environment, however, is predicated on Stationery Demand’s ability (and willingness) to disguise the freight so that the carrier cannot tell that these items are originating from Stationery Demand. If the carrier were to discover the zone-skipping operation, Stationery Demand would be in violation of the terms of its contract with the parcel carrier, which states that the carrier will be the company’s sole provider of finished goods transportation for parcel shipments. The carrier could retaliate by canceling the private pricing terms with Stationery Demand for all shipments in the United States (not just on the West Coast), which would greatly increase the firm’s overall transportation and total logistics costs because the company has not been able to identify another transportation provider that can meet its customer service and delivery quality requirements.

Students are first asked in the case to determine the cost of the current direct distribution strategy with the proposed parcel rates. The case provides data for one representative week of shipments, and the students are instructed to extrapolate these shipments over the course of the year because there is little seasonality in this industry. The case also includes a matrix of parcel zones for shipments between Blawnox and the seven potential zone-skipping pool points shown in Figure 1 and the company’s 43 distributor locations in the western United States. The students are then asked to design an optimal zone-skipping network that includes deciding which pool points should be utilized and how best to assign distributor locations to the open pool points. Comparing the annual transportation cost associated with the optimal zone-skipping strategy with that of the direct distribution strategy with the high proposed rates provides insight into potential cost savings that the zone-skipping strategy could capture. See the case teaching note for the magnitude of this cost savings, along with the structure of the optimal zone-skipping network.

After completing the quantitative analysis, the students’ last task in the case is simply stated: What should Stationery Demand do? Should it implement the zone-skipping strategy, utilize the current direct distribution network while accepting the current proposal, or try another strategy? The questions listed in the body of the case take students step by step through a sound ethical decision-making methodology that uses the inputs from the quantitative models that the students have developed, and they also consider the qualitative factors that were not present in the model but can still impact the efficacy of the decision. The five-step methodology outlined in this case, which was synthesized from various other ethical decision-making frameworks (see Bommer et al. 1987,
Velasquez et al. 1996, Stainer 2004 for sample frameworks), is as follows:

Step 1. Identify the major stakeholders in the decision.

Step 2. Propose several courses of action that the decision maker could choose.

Step 3. Predict how each stakeholder would likely be affected by each of the potential decision alternatives.

Step 4. Isolate the trade-offs that must be managed and balanced by the decision maker.

Step 5. Recommend the alternative that the decision maker should choose. Explain why you selected that option; more important, discuss why you rejected each of the other seemingly viable alternatives.

Without being required to go through each of these steps, most students (especially engineering students, whose education focuses predominantly on mastering analytical methods) would simply claim that Stationery Demand should implement the zone-skipping strategy because of the significant annual savings that are predicted for the method. By working through the decision-making methodology, students are forced to consider the potential impact of the questionable business practice of disguising the origins of the freight on the employees and the future performance of the organization.

3. Pedagogical Goals

The main pedagogical goal of this case is to reinforce the responsible use of operations research models in an ethical decision-making process. The case provides a realistic, comprehensive decision-making environment similar to that which faces students when they enter the corporate world. Many courses incorporating a significant amount of mathematical modeling focus the majority of the class time and course work on illustrating and practicing the technical procedures. This can give students the false sense of security that these models provide the single best solution. Students need to be reminded that the justification of the model saying a solution is the optimal decision is not solely sufficient to recommend a particular course of action in a complex environment. By requiring students to consider the potential impact of various decision alternatives on the relevant stakeholder groups, the case reinforces that models are simply inputs to the decision-making process. Models should assist, not replace, decision makers (Gallo 2004, Drake et al. 2010).

A second goal of this case is to provide a challenging modeling problem from a technical perspective. Determining the optimal zone-skipping network design is not a trivial exercise, especially for undergraduate students. In fact, some students struggle with computing the cost coefficients representing the total annual cost of serving a particular distributor location through a given pool point. As is often the situation in practice, the case also purposefully provides information that is superfluous to the network design problem, requiring the students to determine which information is relevant to the modeling problem at hand. Students who are able to identify the optimal network successfully demonstrate their ability to model and solve a complex logistics network design optimization problem. Perhaps somewhat surprisingly, students who have completed the case assignment acknowledged that the analysis was difficult but reported that they enjoyed and valued the case experience specifically because it presented a realistic decision environment similar to the ones they will encounter in practice. This can be especially important in logistics engineering programs, whose curricula are traditionally bereft of such comprehensive case analyses; these kinds of holistic cases are much more common in business programs.

The case also requires that students analyze a logistics problem utilizing two different types of transportation with their own pricing structures: truckload and parcel transportation. It is particularly important that the case incorporates parcel transportation, because this type of transportation is often overlooked in textbooks and other cases. In 21st century logistics operations, a particular shipment of freight is more likely than ever to travel on more than one carrier’s equipment; thus, students should understand the economic efficiencies that can arise through the use of intermodal operations.

A final objective of this case is to introduce students to the type of ethical dilemmas that are often faced by professionals in the fields of logistics management and operations research modeling. These dilemmas are often more subtle than those faced by practitioners in other areas such as civil engineering, genetic engineering, and human resources. This subtlety necessitates additional effort and attention on the part of instructors to foster their students’ ability to recognize when they are facing such an ethical dilemma. Moral awareness is an important element of business ethics and moral reasoning development, and this case helps students to recognize ethical issues within a common business scenario. The case also assists in the development of systematic morality, in which ethical issues are understood in relation to the constraints and competing interests that exist within organizations (Rossouw 2002).

There has been much debate and many studies about the best way to integrate ethics education into the professional curricula of business and engineering programs. Regardless of the existence of a stand-alone ethics course in the curriculum, most educators and
researchers acknowledge the value of incorporating ethical issues into functional courses, thereby providing students with an interdisciplinary perspective that highlights the practical importance of ethical decision making in the field (Sims and Brinkmann 2003). Case studies are commonly employed in business and engineering courses to raise ethical issues and to serve as a basis for class discussion; although many educators recognize the dearth of teaching cases and materials to perform the task adequately (Baetz and Sharp 2004, Zandvoort et al. 2000, Felder and Brent 2003).

This case, coupled with discussions of other ethical issues in logistics that have been identified in other studies (e.g., Murphy et al. 1991, Smyrlis 1999, Carter and Jennings 2002), should help develop students' sensitivities to the ethical challenges of logistics management. Incidentally, Carter and Jennings identify a litany of ways in which transportation decisions play a role in a firm’s logistics social responsibility program, yet they do not discuss the ethical issues of freight labeling outside of the transportation of hazardous materials. Thus, this case supplements the discussion of other ethical issues in logistics operations that have been highlighted in other studies and reports.

A number of recent articles have bemoaned the current state of business education, suggesting that too many professors focus on quantitative methods at the expense of the managerial necessity of balancing quantitative and qualitative factors in decision making. These studies call for an increased emphasis on practical decision making with a holistic perspective to complement the common academic subject matter (Bennis and O’Toole 2005, Hughes 2006). Rutner and Fawcett (2005) argue that supply chain education in particular should focus on the integration and strategic management of the functional areas within the supply chain. By emphasizing a stakeholder perspective for making the decision, this case forces students to abandon the myopic goal of minimizing distribution costs in favor of advocating a more effective strategy that considers how all interested parties, including the firm as a whole, will be affected by the decision in both the short and long term.

4. Suggested Classroom Use

This case is appropriate for a variety of courses at the undergraduate and graduate level in both business and engineering schools. We have used this case in undergraduate logistics courses in both business schools (a transportation course primarily focused on qualitative issues) and engineering schools (a logistics engineering course primarily focused on quantitative modeling). We have also used the case in a graduate business course that applies the management science tools of optimization and simulation to supply chain modeling problems. It would also be appropriate for undergraduate and graduate operations management courses in business schools, although the instructors may have to adjust the case to use it with undergraduate students.

Quantitative methods for logistics network design are taught at both levels with various degrees of sophistication; the case, however, is flexible in that it does not specify which techniques should be used. In courses where network design is mostly discussed in a qualitative manner, students could implement trial-and-error or heuristic methods in spreadsheets to develop “good” solutions. Students in logistics modeling or optimization courses, in contrast, could model and solve the integer program required to obtain the true optimal network design. If optimization students do not have much modeling experience, instructors could provide the pool points that should be utilized; then the students would only have to identify the optimal allocation of distributor locations to the open pool points.

In its complete form, the integer program to be solved in this case is too large for the basic Solver tool in Excel to handle (because it requires more than the 200 decision variables that this tool can accommodate). This is not typically a problem for mathematics or engineering optimization courses that employ optimization engines such as GAMS, AMPL, or XpressMP, but it can be a challenge for business school courses that usually rely on Excel. Instructors in these courses have two options: (1) have the students download a free trial version of Premium Solver, which can handle a few thousand decision variables; or (2) reduce the problem to be solved by cutting several customer locations and/or potential pool points out of the problem. We provide some suggestions for the latter method in the teaching notes.

The case was designed to be implemented as a small-group assignment that the students complete outside of class. We usually give the students two weeks to perform the technical analysis and prepare a case report. Regardless of the nature of the assignment, we recommend that instructors conduct a wrap-up discussion session after the students submit their case reports. We divide a typical 85-minute class session into the following sections:

- A 20-minute review of the mathematical modeling required to determine the optimal zone-skipping network design
- A 45-minute discussion in which the students can share the stakeholders that they identified, their possible decision alternatives, and the ways in which the stakeholders would be affected by the alternatives
- A 20-minute discussion of several additional (as many as time allows) extension questions explained.
in detail in the teaching notes and summarized in the list below. These six additional discussion questions increase the flexibility of the case to fit into many different courses because instructors can choose the questions that are most relevant to their particular course objectives. Instructors can focus on general ethics issues, such as forms of business deception and the ethics of the carrier’s pricing policy, or they can focus on operational issues such as sensitivity analysis or the impact of sales force incentives.

- Are any forms of deception in business ever justified?
- Is the parcel carrier’s pricing policy ethical?
- What are the potential long-term implications of the zone-skipping strategy?
- What performance incentives are faced by the parcel carrier’s account manager who drafted the proposal for Stationery Demand?
- Would Stationery Demand or the parcel carrier be justified in suing the other company for their business practices? Should the government pass laws against business practices like zone skipping?
- Is there any significant risk in making tactical business decisions like the design of a distribution network that is based on cost parameters, such as the published parcel carrier rates that are subject to change at any time?

For a variety of reasons, some instructors may not want to require their students to perform a complete technical analysis over the course of several weeks. The case would still serve as an adequate basis to discuss the ethical issues the decision makers face. The instructor could provide the costs of the current direct distribution network and the zone-skipping network and then lead the students through the ethical decision-making process as a class. One other method of facilitating the discussion that works quite well is for the class to generate a list of possible courses of action together. Then the students split into groups, each of which is assigned a specific decision alternative to advocate. After 10–15 minutes of deliberation, each group has the opportunity to explain why its strategy should be selected. The case was written to maximize the flexibility it provides the instructor to best fit it into his or her specific course.

Regardless of how the case is incorporated into a course, we recommend that the instructor refrain from framing the case as an “ethics” case. Students are often comfortable in discussing ethical issues and raising ethical considerations in a decision-making scenario when they are either in a dedicated ethics course or are told that they are studying ethics. The case better accomplishes its pedagogical goals of raising students’ moral awareness if they are challenged to recognize that a common business decision environment has ethical dimensions that reach beyond quantitative modeling.

5. Classroom Experiences

Feedback from the students who have used this case in class has been overwhelmingly positive. They appreciate the opportunity to work on comprehensive, realistic problems rather than traditional, mechanical homework problems that are usually assigned to give them with a chance to practice particular modeling techniques. The engineering students in particular (somewhat surprisingly) relish the opportunity to discuss the ethical, managerial, and strategic issues that this case raises.

Using the case in business and engineering classrooms presents slightly different challenges for instructors. Business students, especially MBA students, are normally used to analyzing cases and preparing case reports that require stakeholder considerations. Their major struggles concern the mathematical modeling of the logistics network. Engineering students, in contrast, can usually handle the network modeling (although undergraduate students do tend to have difficulty formulating the cost of serving a particular customer through a given pool point). The engineering students may require additional guidance in adopting the stakeholder perspective and preparing a concise, coherent case report.

Although every class generates a different set of possible decision alternatives in group reports and/or in the class discussion, the set always contains several creative and insightful possibilities that signify that the students have thoughtfully considered the facts provided in the case. The teaching notes include a representative, but incomplete, list of plausible decision alternatives that students have proposed in the past.

It is always interesting to observe the specific strategies that the student groups ultimately recommend. Inevitably, a large number of groups suggest that Stationery Demand utilize zone skipping, even though it requires disguising the origins of the package. The students acknowledge that this dishonesty could have long-term negative ramifications, but the savings are just too great. These students often provide some suggestions for implementing the zone-skipping strategy to mitigate the risks of adverse effects. A number of groups, however, usually conclude that the zone-skipping operation is too risky, and they end up advocating another strategy.

One implementation of this case was particularly enlightening for us. One of the authors presented this case to a group of Mexican logistics educators in a workshop highlighting new pedagogical innovations. Each participant was a professor in a Mexican university, and approximately two-thirds of them had attained Ph.D. degrees. When these educators discussed the issues presented in this case, they universally denounced the zone-skipping strategy as
unethical and dishonest. It was clear in their eyes that no amount of cost savings could ever justify zone skipping and that an alternative course of action should be recommended. Part of this reaction may be attributable to a general distrust of U.S. trucking operations in Mexico as a result of the problems with border crossing that still exist more than a decade after the adoption of the North American Free Trade Agreement (Haralambides and Londono-Kent 2004, Drake and Rojo 2008), but the dishonesty of the zone-skipping policy was clearly the most influential issue. This experience clearly illustrates the differences in business cultures and mores around the world. American students and professionals who have discussed this case advocate a much larger variety of decision alternatives, whereas the Mexican educators were unanimous in their disdain for the idea of zone skipping.

With groups that are unanimously for or against the zone-skipping strategy, it is especially powerful to spend a significant amount of discussion time considering the first discussion question (Are any forms of deception in business ever justified?). The instructor can play devil’s advocate by constructing a spectrum of deceit from the trivial (e.g., telling a co-worker that you like his hideous new haircut) to the severe (e.g., falsifying accounting records). Regardless of the strategy students adopt in the case, most everyone will justify the trivial untruth and rebuke the severe one. Unfortunately, however, most business decisions fall somewhere in the middle of the spectrum, which makes them more difficult to assess. The teaching notes contain several valuable references about honesty in business and suggest a discussion exercise that increases students’ awareness about the criteria that they use to make difficult decisions.

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References
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