EXAMINER'S REPORT

AUGUST 2002

LOGISTICS MANAGEMENT

General Comments

The results this August were quite good with most getting through. The way this course and exam is structured requires one to really get into the theory, the techniques and how to apply the ideas in practice. This follows a learning cycle. Ideally people should look at the cases early on to get an idea of the types of problems which occur. These are mixtures of marketing, logistics, mathematics and strategy. Subsequently one should get into the theory, but not spend the year learning it off. Usually it is reasonably well done. Basically I expect a clear understanding of what is in the text and some practical illustrations from outside, such as from Irish applications. The middle part of the year should be spent on the quantitative techniques, hopefully linking them into the cases and the theory, and anecdotes about Irish companies where possible. People can get through by focusing on one of the parts, but this year there were few instances of full marks for a question. Consequently, people who failed invariably did one of the sections very poorly and were not able to compensate from another section. It is safer to prepare all the sections.

Case Study

The case questions are geared at bringing one through a process of analysis, evaluation, diagnosis and prognosis. Most people tried all parts of the case section, and attempted all the sections in the exam. Consequently there were fewer than ever failures due to not attempting one or more sections. In the past this was the most common cause of failure and the reason for the high average failure rate. It should be understood that Logistics is important not just of itself but also because it requires one to put on one's quantitative thinking cap when addressing marketing problems. When answering the case you should use the structure of the questions; it had five parts this August. Within each part it is a good idea to make a statement, possibly using a headline or point form, and then justify it in a few sentences.

Quantitative questions

There is no need to do roughwork and then write your answer out neatly. It wastes your precious time. Transcribing quantitative answers takes effort that would be better used on another question. Do your chosen questions as best you can. If you think you are making a mistake say so; then try to correct it. If you blank out, just leave two pages so that you can move onto other questions. Maybe later you will be able to do the rest of that question. Do not waste your time doing restarts. This August several of the failures had spent some time rewriting answers. Maybe they could have passed if they had not.

The idea of having two different quantitative sections is to separate the less standard (C) question from the standard (D), the unstructured from the straightforward application of algorithms. Let's look at Section D first. In recent years there has been a decline in the quality of these answers.

The **transport** question is an example of a standard application of an algorithm which not many people got right. Because a simple transport question can be too simple compared to one on linear programming, I usually include a few of the little complications. If the amount of material available and the amount required do not match then there will be a requirement for a dummy row or column. If the totals in a set of rows equals those in a set of columns, then there may need to be a dummy allocation to some route to ensure that the network is connected, so that one can get all the shadow costs. Also, if some of the costs are similar to others there is the possibility of multiple solutions. This was also the case. A lot of people started off badly without even noticing the need for a dummy column.

The other such question in Section D was supposed to be a standard application of **graphical linear programming** with sensitivity analysis. As I said before it seems to have not been well prepared generally. It is not a simple method; one must develop an understanding of the technique. The basics are straightforward. 1. Develop the constraints. 2. Draw the graph. 3. Find the corners most likely to be best. 4. Put these into the objective function to get the best one. Generally this was not done well, even though it is fairly routine work.

The main reason for having such questions on this course, and indeed having a subject such as Logistics on the Graduateship, is to stretch future marketing practitioners intellectually sufficiently to prepare them to address real marketing decision problems. A central issue in marketing is how to use your resources and plan your sales so as to get the best added value (usually profit) for your company. A linear programming question gets to the core of this issue. As long as this topic seems to be poorly addressed, or avoided altogether, it is likely to appear on future examinations.

Section C contained a **formulation** question. I include this kind of question occasionally because it exemplifies exactly the key skill needed in logistics, that of modelling a decision. Only a few knew what to do. The key to this is the starting point. You must take an immensely practical point of view and say "what do we need to decide here?". In this case it is the following: "I have three kinds of variables over the months from June to October. These are how many units of normal production I should produce, how many units I should produce using overtime, and how many units should I store at month end to carry over to the next month."

The question is what does the logistic expert tell the production manager which will lead to a best decision? Fifteen figures: the amount of normal and overtime production, and the amount stored, for each of the next five months.

You then use some language to express the relationships. I call the amount of normal production for June Xni where i = 1 for June, amount of overtime production Xoi and amount stored Xsi.

The answer then is:

Minimise €60(Xn1+Xn2+Xn3+Xn4+Xn5) + €80(Xo1+Xo2+Xo3+Xo4+Xo5) + €12(Xs1+Xs2+Xs3+Xs4)

subject to non-negative amounts (naturally), i.e. $Xni \geq 0$, $Xoi \geq 0$, $Xsi \geq 0$.

Normal production capacity limits: $Xni \leq 4{,}000$ units for i = 1, … 5;

Overtime production capacity limits: $Xoi \leq 1{,}200$ units for i = 1, … 5

The difficult constraints are those that provide the end of month balancing of stock.

$$
\begin{aligned}
Xn1 + Xo1 - Xs1 &= 2{,}400 \\
Xs1 + Xn2 + Xo2 - Xs2 &= 4{,}200 \\
Xs2 + Xn3 + Xo3 - Xs3 &= 4{,}800 \\
Xs3 + Xn4 + Xo4 - Xs4 &= 6{,}000 \\
Xs4 + Xn5 + Xo5 &= 8{,}000
\end{aligned}
$$

Difficulties with questions such as this raise questions about what a graduate of the Marketing Institute should be able to do. One the one hand there are practitioners out there who are doing all this in practice, and could balance production and storage at the end of a month in their sleep. On the other hand there is excellent computer software that can carry out any kind of simple calculation. One role for the Graduate should be to be able to marry the expertise of the past with the software capabilities of the future without always having to call for help.

The main mistake that students make is to try and combine several different but similar constraints into one. These are not guideleines, they are specific instructions that, ultimately are given to a computer. If there is one overriding rule, it is break up the constarints into specific ones.

The other Section C question was on **stock (inventory) control**. This is a long section in the text and likely to occur every year. There was considerable variability in the quality of answers. Most people got the first part right, getting the economic order quantity of 632 units for Widgets, and 775 for Gadgets. Generally the key to my seeing if inventory is understood is to put in something unusual and to require a calculation of total costs. Many people got the total inventory related costs of €1,897 and €2,324. The dividing line was forgetting to include the supply costs of €48 by 6,000 and €60 by 9,000. These are needed because the alternative is a fixed price for both together. This gives a total costs of €836,439.18 for the current system.

Most people missed the point that the economic order quantity is not relevant for the combination because they are to be supplied monthly. This kind of error reveals the difference mentioned above between understanding what is going on and just plugging figures into formulae. Thus the cost of ordering will be 12 by €300 = €3,600, and the cost of storage will be (6,000 + 9,000) / (12 * 2) by €6 = €7,350. Dividing the difference between this and the current total costs by the total demand of 15,000 gives a suggested marginal price of €55.27. The company should changeover if they are offered a lower price, i.e. €55 or less.