THE OPEN CASE
“HOW AND WHERE TO PRODUCE”

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Abstract
In the winter 2004/2005 semester, 275 Third- and Fifth-Year of full-time students of the managerial-economics section of the Business and Economics faculty at Mendel University analyzed the case “How and Where to Produce”. This paper describes the results of student-team analyses from the different years of study.

The purpose of the paper is to report how students at different levels in the program approached the case analysis. A further objective is to compare the approaches and draw conclusions. The findings have the potential of assisting faculty to improve the teaching-learning process in the Operations Management course at Mendel University. The authors provide recommendations for teachers towards improving the quality of the educational process, not only in the Operations Management seminars, but also in other subjects at Mendel University in Brno.

KEY WORDS: Open case, capacity, teaching-learning process, production location

INTRODUCTION
One type of case studies is the ‘open’ case study, which describes a real situation and relevant problem(s) for which students must find and recommend alternative solutions. The openness relates not only to the different possible outcomes, but also to the “openness” of the description of the situation and the problem – neither of which are defined explicitly [Erbes, Pošvář, Žufan, 1998].

Students themselves are narrowing the definition by deciding on several premises (e.g., they estimate market demand for newly introduced products, choose how to finance a new investment, select the attitude of the decision-maker toward risk, etc.). Students have to use prior experience and knowledge acquired in different subjects and applies it to the case on hand. Thus the case can play the role of integrator of particular subjects [Erbes, Pošvář, Žufan, 1998]. This paper analyses differences in the approach of students of the Third and the Fifth year of full-time study to the definition of case premises and to their case recommendations.

METHODOLOGY
The main project in seminars in Operations Management at FBE MUAF in Brno is the case “How and Where to Produce” from the agricultural feed industry in the Czech Republic. This case study has been used since the academic year 1997/1998. Its use was extended and improved by incorporating actual information from the analyzed industry for the academic year 2004/2005.

The case study “How and Where to Produce” belongs to the special type of “open case study”. Many novices to case teaching believe that a case study should include all the information students need to be able to suggest courses of action. One school of thought, however, suggests to exclude information
students can easily find from accessible sources of information. In an open case study scenario, the situation is not completely and definitely described. It is a case study which has the following structure: partial description of a situation, definition of a problem, missing solution. In other words, the case study is not only open (undefined) in terms of the outcome, but also in the description of the situation. This type of case study encourages students to become more creative.

During the 2004/2005 winter semester, 167 full-time students of the Third year and 108 students of the Fifth year in the department of managerial economics at Mendel University, studied Operations Management. All students analyzed the case “How and Where to Produce” in written form in teams of two to four students. Third year students formed 49 teams and Fifth year students formed 30 teams. The data presented in this paper are based on written student case analyses. Students received the case in November and presented their analyses orally in their respective classes in early December 2004.

THE CASE STUDY

KRMOS Corporation, located in a small village in East Bohemia, started to import Energol, a feeding complement for cattle, from COLAC, Ltd., Great Britain, in 2002. Thanks to its economic and financial benefits, the product Energol quickly proved highly successful. In 2003, COLAC came up with an innovation. The company introduced an energy-protein product called GIGAPRO as a component in the feeding mixtures for milk cows. Exports to the Czech Republic of the new product through KRMOS followed. Shortly after introduction to the Czech market, demand for GIGAPRO increased rapidly. This led management of KRMOS Corporation to consider licensed production of the product in the Czech Republic.

COLAC, Ltd, the producer of GIGAPRO, is willing to sell a production license for the product. A very important raw material for the product is fish flour. Importing fish flour to the Czech Republic will significantly increase the price for GIGAPRO. Therefore, management approaches the Moravian food-producing firm SITO that is engaged in plant-oil production. Tests by COLAC have proved that fish flour can be replaced by rape extracts, which has the side benefit of increasing the quality of the product. During negotiations, KRMOS proposes to SITO, to jointly produce GIGAPRO.

Students are expected to address the following three questions:
1. Which production alternative do you recommend and which factors did you consider?
2. Do you recommend production at the KRMOS or the SITO site? Explain?
3. Does your proposal envision an investment of less than 5 years? What is the probability that the return of the investment will take longer? Explain.

INFORMATION AVAILABLE TO THE STUDENTS

Market study (estimated demand for GIGAPRO)
The market study is based on the premise that GIGAPRO’s main impact will be on milk production. For that reason the market study deals with the consumption and production of milk in the Czech Republic. Two factors determine the volume of milk production, the milk yield of cows and the number of cows. The survey of the market reveals the following range of outcomes. Between 20-30% to 50-60% of all cows might be fed with GIGAPRO and the expected milk yield might rise to between 3,000-4,000 liters, possibly 5,000 liters and higher. Experts claim and most commodity studies show, that by 2006, the number of milk cows in the Czech Republic is expected to decrease to between 400 and 450,000 (from 466,000 in 2003). An extrapolation from the increase in milk consumption and the expected increase in the milk yield of cows puts the most probable number of milk cows in 2006 at 430,000.

Information on level of production
COLAC, Ltd., is offering two levels of production, GP-2 and GP-4 with a maximum of 20,000 and 40,000 tons respectively. Investment and variable costs differ at the two levels (Table 1).

<table>
<thead>
<tr>
<th>Type of production line</th>
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| GP-2 | GP-4 |
|----------------------------------|
| STRUCTURE OF INVESTMENT AND VARIABLE COSTS FOR GP-2 AND GP-4 |
Investment costs (millions of CZK) | GP - 2 | GP - 4
--- | --- | ---
Unitary variable costs (thousands CZK per ton) including:
- rape extracts costs | 7.50 | 7.50
- other material costs | 3.40 | 3.40
- labor costs | 0.20 | 0.18
- energy costs | 0.25 | 0.23
- other variable costs | 1.45 | 1.31

Production site
The final product contains 80% rape extracts, which are being produced by SITO. Selecting SITO in Olomouc as production site would result in cost savings because of avoided transportation of rape extracts. At the KRMOS site, land could be purchased at a lower price. Setting up the GP-2 line at the KRMOS site would cost CZK 6 million. The cost for the GP-4 line would amount to CZK 8.4 million. Locating the lines at the SITO site, the costs would be CZK 15 million for the GP-2 line and CZK 21 million for the GP-4 line. Expected cost for labor is 30% lower at the KRMOS location.

The authors expected that with the information provided, the student teams would be able to:
- Estimate market demand based on the milk consumption in the Czech Republic, exports, trends on the population and milk yield of cows in the Czech Republic
- Consider the financial position of both firms and decide on a premise for the financing the investment through internal or external sources.

RESULTS
The first step in the analysis of the case was to estimate the expected market demand for GIGAPRO in 2006, the year when the production lines were expected to be operational. Slightly more than half (53%) of student teams solely relied on the information provided in the case. It appears that they considered the case data to be final and all-inclusive, a fact mentioned by most teams during the in-class presentations. Of the Third-Year-Student-Teams, 63%, solely relied on the case data provided, while of the Fifth year student teams, 37% did so (Table 2).

<p>| SOURCES USED TO ESTIMATE MARKET DEMAND |</p>
<table>
<thead>
<tr>
<th>Total</th>
<th>Third year Teams</th>
<th>Fifth year Teams</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teams considering case date only in their analysis</td>
<td>53 %</td>
<td>63 %</td>
</tr>
<tr>
<td>Teams considering total consumption</td>
<td>47 %</td>
<td>37%</td>
</tr>
</tbody>
</table>

Evaluating and deciding on productions lines showed the following differences between study year teams: Some teams (39% overall, 35% of the Third year teams and 47% of the Fifth year teams), evaluated production lines GP–2 and GP–4 in terms of unit variable cost and the expected demand for GIGAPRO.

The second largest group based the selection of the production lines on the calculation of total variable costs, total investment costs and total revenues: 61% of teams overall, 65% of Third year teams and 53% of Fifth year teams. In these teams, the expected demand for GIGAPRO and the suggested selling price were absolutely critical (Table 3).

Setting the selling price proved to be difficult for students. Data provided suggested that KRMOS Corporation management contemplated a selling price of 13,500 or 14,000 CZK per ton for GIGAPRO and that demand for GIGAPRO was expected to be highly inelastic for selling prices between 12,000 and 14,000 CZK per ton.
TABLE 3
EVALUATION OF PRODUCT LINES

<table>
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<tr>
<th></th>
<th>Total</th>
<th>Third year Teams</th>
<th>Fifth year Teams</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teams considering unit costs</td>
<td>39 %</td>
<td>35 %</td>
<td>47 %</td>
</tr>
<tr>
<td>Teams considering total costs</td>
<td>61 %</td>
<td>65 %</td>
<td>53 %</td>
</tr>
</tbody>
</table>

Most student teams (70 % overall, 71 % of Third year teams and 67 % of Fifth year teams) decided on using the lowest selling price contemplated by management. They recommended this price even though the resulting return of the investment would take longer than the five years requested (Table 4).

TABLE 4
SETTING THE SELLING PRICE

<table>
<thead>
<tr>
<th></th>
<th>Total</th>
<th>Third year Teams</th>
<th>Fifth year Teams</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teams recommending the lowest price: 13 000 CZK</td>
<td>70 %</td>
<td>71 %</td>
<td>67 %</td>
</tr>
<tr>
<td>Teams recommending the highest price: 14 500 CZK</td>
<td>30 %</td>
<td>29 %</td>
<td>33 %</td>
</tr>
</tbody>
</table>

Most students (98 % of all teams) based the selection of the location for the production of GIGAPRO on a comparison between avoided transportation costs (which would have to incurred at KRMOS site) and the higher labor costs and higher price of land at the SITO site. Team responses differed between study year teams. Overall 43% of the teams calculated unit costs (39% of Third year teams and 50% of Fifth year teams) and 57 % of teams overall calculated total costs (61 % Third year teams and 50 % of Fifth year teams) (Table 5). Of all teams, 7 % (98% were Third year teams) computed the transportation costs incorrectly.

None of the teams considered production location from the point of view of KRMOS Corporation, the principal issue under consideration. An overwhelming majority of student teams (91 %) recommended the SITO production site at Olomouc, 60 kilometers from the KRMOS site, because of the annually recurring, high transportation costs. Student teams ignored the fact that SITO was only one of several possible suppliers. They also ignored the inherent risk in locating production at a distant site.

TABLE 5
DECIDING ON LOCATION FOR PRODUCTION

<table>
<thead>
<tr>
<th></th>
<th>Total</th>
<th>Third year Teams</th>
<th>Fifth year Teams</th>
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</thead>
<tbody>
<tr>
<td>Teams using unit cost</td>
<td>43 %</td>
<td>39 %</td>
<td>50 %</td>
</tr>
<tr>
<td>Teams using total cost</td>
<td>57 %</td>
<td>61 %</td>
<td>50 %</td>
</tr>
</tbody>
</table>

To compute the return of an investment a variety of methods are usually used: payback period, accounting rate of return (ARR), rate of return (ROI), discounted cash flow (DCF), residual income (RI) and economic value added (EVA). Most Third year teams (98 %) calculated the return of the investment using the easy to apply “pay-back period”, because at Mendel University, the other (more sophisticated) methods are introduced in the 4th year of study in the course Financial Management. It is, therefore, puzzling, that many Fifth year teams (63 %) also used the “pay-back period” method. A possible explanation is that students were not explicitly required to use a specific method and/or that they shied away from using net-present value based methods which demand additional efforts in consulting amortization tables, determining interest and tax rates (Table 6).
TABLE 6
EVALUATION OF THE RETURN ON INVESTMENT

<table>
<thead>
<tr>
<th>Teams using ‘payback period’</th>
<th>Total</th>
<th>Third year Teams</th>
<th>Fifth year Teams</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teams using ‘net-present value’ based method</td>
<td>85 %</td>
<td>98 %</td>
<td>63 %</td>
</tr>
<tr>
<td></td>
<td>15 %</td>
<td>2 %</td>
<td>37 %</td>
</tr>
</tbody>
</table>

A query for alternative financing arrangements was referred to only in passing at the end of the case, but not as a direct question. This most likely explains why more than half of all teams (56 %) did not address this issue (Table 7). Furthermore, the majority of students who referred to the financing of the investment opportunity did so without supporting (calculated) details.

TABLE 7
CONSIDERING FINANCING ALTERNATIVES

<table>
<thead>
<tr>
<th>Teams dealing with the financing</th>
<th>Total</th>
<th>Third year Teams</th>
<th>Fifth year Teams</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teams not addressing the financing</td>
<td>56 %</td>
<td>65 %</td>
<td>40 %</td>
</tr>
<tr>
<td></td>
<td>44 %</td>
<td>35 %</td>
<td>60 %</td>
</tr>
</tbody>
</table>

CONCLUSION

The main difference of how Third- and the Fifth-Year-Student-Teams approached the case analysis lay in the complexity and sophistication of their recommendations. Fifth-Year-Student-Teams, on balance, used more sophisticated methods of analysis (sometimes too complicated) than their counterparts. They were also more likely to make an effort clearly spell out the premises of their recommendations. Third-Year-Student-Teams approached the analysis with more diligence, but very often worked only with the information directly referred to in the case, accepting the information as definitive and final.

Many Third-Year and Fifth-Year students used total quantities in their analysis despite the fact that this made the results less transparent. Third-Year-Student-Teams, who for the most part had less experience and had taken fewer business and finance courses, tended to rely in their analyses on total quantities more often than Fifth-Year-Student-Teams. It was also noted, that many Fifth-Year-Student-Teams were not willing to apply ‘net present value’ concepts because this would have required additional efforts on their part.

Overall the authors believe that ‘open case studies’ [as defined by Erbes, Pošvář and Žufan] afford the learner more flexibility and more possibilities for enhanced learning. The variety of suggested courses of actions proposed by the Student-Teams seems to corroborate this conclusion. The results also indicate that many students very often are not willing to work more than they have to. They did not do more than what was explicitly asked for in writing in the case.

ENDNOTES

1. The paper is a part of the research conducted at FBE MUAF in Brno under No. GA MSM 6215648904.

REFERENCES

