Week 6 Assignment

[Individual Project] Linear programming and project management

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This Assignment will differ from other Assignments you have completed in the past. The key difference is you will leverage the POM-QM for Windows software in order to resolve your real-world scenarios. In line with the topics for Week 6, you will focus on solving linear programming and project management problems.

To complete this Assignment:

By **Wednesday (Day 7)** compile your responses to the questions in one MS Word file and then submit it to the Week 6 Turnitin link.

POM-QM for Windows software

For this part of this project, you will need to use the POM software:

1. Read Appendix IV of the *Operations Management* (Heizer and Render, 2014) textbook.
2. Review the linear programming section from the POM manual:

   Weiss, H.J. (2013) *POM-QM for Windows manual.* Upper Saddle River, NJ: Prentice Hall. Available from the 'Help' menu in the POM-QM Windows software. (Accessed: 30 December 2014).

   You may also wish to research and review online tutorials regarding the linear programming module and/or view the following resource.

   Valverde, R. (2014) *QM for Windows linear programming* [Online] YouTube. Available from: https://www.youtube.com/watch?v=uHsQSG75sPk (Accessed 23 April 2015).
3. Install and launch the POM-QM for Windows software. From the main menu, select Module and then Linear Programming.
4. Program the linear programming formulation for the problem below and solve it with the use of POM. Refer to Appendix IV from the Heizer and Render (2014) textbook.

Note: Do not program the non-negativity constraint, as this is already assumed by the software.

For additional support, please reference the POM-QM for Windows manual available from the 'Help' menu in the POM-QM Windows software.

Individual Project, part 1

A firm uses three machines in the manufacturing of three products:

- Each unit of product 1 requires three hours on machine 1, two hours on machine 2 and one hour on machine 3.
- Each unit of product 2 requires four hours on machine 1, one hour on machine 2 and three hours on machine 3.
- Each unit of product 3 requires two hours on machine 1, two hours on machine 2 and two hours on machine 3.

The contribution margin of the three products is £30, £40 and £35 per unit, respectively.

The following are available for scheduling:

- 90 hours of machine 1 time
- 54 hours of machine 2 time
- 93 hours of machine 3 time

The linear programming formulation of this problem is as follows:

Maximise $Z = 30X_1 + 40X_2 + 35X_3$

$3X_1 + 4X_2 + 2X_3 <= 90$

$2X_1 + 1X_2 + 2X_3 <=54$

$X_1 + 3X_2 + 2X_3 <=93$

With $X_1, X_2, X_3 >= 0$

To answer this question:

Answer each question and explain your reasoning or show your calculations.

1. What is the optimal production schedule for this firm? What is the profit contribution of each of these products?
2. What is the marginal value of an additional hour of time on machine 1? Over what range of time is this marginal value valid?
3. What is the opportunity cost associated with product 1? What interpretation should be given to this opportunity cost?
4. How many hours are used for machine 3 with the optimal solution?
5. How much can the contribution margin for product 2 change before the current optimal solution is no longer optimal?

Individual Project, part 2

For this part of this project, you will need to use the POM software:

1. Review the linear programming section from the POM manual:

   Weiss, H.J. (2013) *POM-QM for Windows manual*. Upper Saddle River, NJ: Prentice Hall. Available from the 'Help' menu in the POM-QM Windows software.

   You may also wish to research and review online tutorials regarding the linear programming module.

2. Program the project management problem below and solve it with the use of POM. Select Project Management(PERT/CPM) module, and then select the option File->New->Mean, Std dev given items.

Activity	**Mean duration**	**Std. dev. (days)**
A	11	0.9
B	13	1.1
C	7	0.2
D	9	0.8
E	6	1
F	7	1.2
G	10	0.7
H	9	0.6

I	8	0.8

Table 1: *Activity, duration and standard deviation*

To answer this question:

Answer each question and explain your reasoning or show your calculations.

1. Calculate the project completion time.
2. Indicate the critical path activities.
3. What is the probability of completing this project between 38 and 40 days?
4. What are the slack values for activities C and F? Interpret the meaning of their slack values.

To submit your Assignment to Turnitin, click the "View/Complete" link for Week 06 Assignment -- Turnitin.