Digital Technologies and Value Creation (Lecturer: Philippe Blaettchen) – Linear Programming Exercise

For each of the following situations:

1. What are the decision variables?
2. What are the constraints?
3. What is the objective?
4. Write down the corresponding optimization problem
5. Solve the optimization problem using Excel Solver

Situation 1

A company makes two products (X and Y) using two machines (A and B). Each unit of X that is produced requires 50 minutes processing time on machine A and 30 minutes processing time on machine B. Each unit of Y that is produced requires 24 minutes processing time on machine A and 33 minutes processing time on machine B. At the start of the current week there are 30 units of X and 90 units of Y in stock. Available processing time on machine A is forecast to be 40 hours and on machine B is forecast to be 35 hours. The demand for X in the current week is forecast to be 75 units and for Y is forecast to be 95 units. Company policy is to maximize the combined sum of the units of X and the units of Y in stock at the end of the week, while meeting demand.

Situation 2

A local health center wants to produce a guide to healthy living. The health center intends to produce the guide in two formats: a short video and a printed book. It needs to decide how many of each format to produce for sale. Estimates show that no more than 10,000 copies of both items together will be sold. At least 4,000 copies of the video and at least 2,000 copies of the book could be sold, although sales of the book cannot exceed 4,000 copies. Each video will sell for 50$ and each book for 30$. How can the health center maximize its income from the sales of both products?

Situation 3

A farmer has 80 hectares of his farm available for planting corn and cabbages. He must grow at least 10 hectares of corn and 20 hectares of cabbages to meet demand. He prefers to plant more corn than cabbages, but his workforce and equipment will only allow him to cultivate a maximum of three times more corn than cabbage. If the profit on corn is 800 euros per ha and on cabbages 500 euros per ha, how should the farmer plant the two crops to make a maximum profit?