RIGA TECHNICAL UNIVERSITY

FACULTY OF COMPUTER SCIENCE AND INFORMATION TECHNOLOGY

INSTITUTE OF APPLIED COMPUTER SYSTEMS

Introduction to Operations Research
Assignment 2
Linear Programming Model

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➢ Question

- Prepare a report (PDF document) on the task:
- A television company has to decide on the number of 27- and 20-inch sets to be produced at one of its factories.
- Market research indicates that at most 80 of the 27-inch sets and 20 of the 20-inch sets can be sold per month.
- The maximum number of work-hours available is 1000 per month.
- A 27-inch set requires 20 work-hours and a 20-inch set requires 10 work-hours. Each 27-inch set sold produces a profit of $140 and each 20-inch set produces a profit of $90.
- A wholesaler has agreed to purchase all the television sets produced if the numbers do not exceed the maxima indicated by the market research.
- To do:

1) Formulate a linear programming model for this problem.
2) Use the graphical method to solve this model.

➢ Answer

- Let x be the number of 27-inch sets and y be the number of 20-inch sets produced.
- A 27-inch TV is $140, and a 20-inch TV is $90. Based on these data, we will try to maximize the total profit with the equation **$Z = 140x + 90y$**.
- Since market research shows that no more than 80 of 27-inch sets and no more than 20 of 20-inch sets can be sold per month, we can write the inequalities as follows:
  - **$0 \leq x \leq 80$**
  - **$0 \leq y \leq 20$**
- Since a 27-inch set requires 20 operating hours and a 20-inch set requires 10 operating hours, and also, the maximum number of available working hours is 1000 per month, we can write the constraints as:
  - **$20x + 10y \leq 1000$**

- **Graphical Solution**
  - We can graph the constraints and find the feasible region that satisfies all the constraints.
  - The feasible region is the region that lies between the lines $x = 0$, $x = 80$ and $y = 0$, $y = 20$ and below the line $20x + 10y = 1000$.
  - The optimal solution can be found by finding the vertex of the feasible region. The vertex can be found by finding the intersection of the lines forming the constraints. In this case, the most suitable vertex of the feasible region is the point (40, 20).
  - Let's use the values at this point in the equation:
    - $140x + 90y = Z$
    - 140*40 + 90*20 = **7400**
  - The optimal solution is to produce **40** 27-inch sets and **20** 20-inch sets, which will give a maximum profit of **$7400**.

Graphical Representation