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Project management with CPM/PERT methods – Introduction

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MINISTRY OF EDUCATION,
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Many people, managers need to plan projects. It means, they must coordinate a lot of activities, a lot of workers. Some of activities depend on each other(in some way), some activities are independent on other ones. They need to optimize time schedule and cost of the project.



If we plan a project, we are interested in following questions:

- What is the shortest possible time in which we can finish the project and how to do it?
- How many people do we need to finish the project in the time?
- What are the cost of the project? Is it possible to optimize the cost of the project?



REP company was asked to reconstruct the house of NH company. NH company had identified works, which were necessary to do and REP company estimated the duration of each activity. To plan the project it was also necessary to identify predecessors for each activity, the boss of REP company decided, which activities had to be finished before the beginning of others. All information is provided in the following table.



activity	description	duration (days)	predecessors
A	eviction of technic equipment	3	–
B	eviction of furniture	5	A
C	floor repairs	10	B
D	interior plumbing	5	E
E	exterior plumbing	7	–
F	interior painting	4	D
G	exterior painting and fixtures	4	E
H	Install the flooring	4	F



Steps of the solution.

- We display the project network.
- We identify the **earliest start time (EST)** and **earliest finish time (EFT)** for each activity, each node.
- We identify the **latest finish time (LFT)** and the **latest start time (LST)** for each activity.
- We identify the **critical path** of the project and critical activities.
- For non-critical activities we identify



Graphical visualisation

If we want to display a project as a graph, we construct **oriented network**, it is called a **project network**.

Two types of project networks: **activity-on-arc (AOA) project network** – in this case, each activity is represented by an arc; nodes are used to separate activities from each of its immediate predecessors; **the activity-on-node (AON) project networks** – where each activity is represented by a node; arcs are used just to show the precedence relationships between the activities.

We will use only the activity-on-node projects network.



The network is such type of a graph, which starts by one node and ends by one node, too.

The starting node is a node, where the beginning of the project is, it displays a situation, when no activity has started yet. The last node is the node, where all activities are finished. Between these two nodes there are all other nodes which present all activities, one node presents one activity. Therefore, in case of project which consists on 5 activities, it is presented by a project network which contains 7 nodes – first one, last one and five nodes between them (= 5 activities must be done).



Network for the prototype example

