INTRODUCTION TO PROJECT MANAGEMENT - MS PROJECT

1. Definitions of basic terms

Project

Today, many activities in society, organizations and enterprises are carried out in the form of time-limited projects. The implementation of projects leads to significant changes, which result in the creation of a new product, service, unique solution or streamlining and modernization of activities and services that are provided in a new quality. When defining the term project, we are based on several definitions:

- ✓ A project is a temporary effort that aims to create a unique product, service, or achieve a certain outcome.
- ✓ A project is an organized effort aimed at achieving a certain goal and can be understood as a work plan that has a result at the end.
- ✓ A project is a unique process carried out to achieve a goal. In general, it consists of a set of coordinated and managed activities with specific start and end dates, while respecting defined requirements and constraints in terms of time, costs and resources.

From a practical point of view, a project is a set of tasks that are carried out (and must be completed) according to a developed timetable to achieve a set goal. Tasks are performed by a group of people (project team) led by a project manager, who is a key person in the successful management of the project progress. The project manager supervises project planning, managing the schedule of project tasks, monitoring the fulfilment of tasks and deadlines, identifying problems and possible risks threatening the project, applying changes in the project and successful completion and evaluation of the project. From the point of view of project team management, the task of the project manager is to assemble it, assign tasks and responsibilities, coordinate work, ensure communication between team members and inform the team about the progress and results of the project.

Project characteristics

Based on definitions, it is possible to define the characteristics of a project that distinguish it from commonly performed processes or activities as follows:

- ✓ The project is unique and unrepeatable - it creates a unique product or service.
- ✓ The project has a clearly defined goal.
- ✓ The project is temporary - it has a defined beginning and end, after reaching the goal, it ends.

- ✓ The project has a developed plan - a comprehensive document that describes the goals, schedule, budget of the project.
- ✓ The project is developed gradually (from the general objective to its more detailed formulation).
- ✓ The project has limitations - it must be completed within the specified time, achieve a defined set of tasks and goals, and must adhere to the set budget.
- ✓ Labour, material and financial resources are consumed during the implementation.
- ✓ The project is implemented by the project team and managed by the project manager.
- ✓ The project has a client who determines the direction of the solution and releases financial resources.
- ✓ The project is characterized by complexity – various methods and means are used during its solution.
- ✓ The project has a high level of uncertainty and risk due to external factors.

Examples of projects by industry:

- ✓ Information and communication technologies (building a network infrastructure of the company, introducing a new ERP system of the company, development of a mobile application, development of a website)
- ✓ Construction (construction of road infrastructure, construction of an apartment complex, bridge, shopping centre)
- ✓ Production (modernization or introduction of a new production line)
- ✓ Marketing (launching a new product/service, launching an advertising campaign)
- ✓ Organization of a unique event (conference, music festival, international exhibition)
- ✓ Science and research (development of new medicines)

Project triangle

Each project is limited by its time, cost and scope. A project triangle is used to graphically represent the interdependencies between:

- ✓ costs (total price of the project),
- ✓ time (total project duration).
- ✓ scope (overall complexity and work of the project)

The quality indicator (project outputs) is added to the triangle.

Figure 1 Project triangle - optimally managed project

The aim of the project implementation is to:

- ✓ achieve the desired parameters of the product, service or result,
- ✓ meet them within the set deadline or earlier,
- ✓ within the set budget.

Neither side of a triangle can be changed without affecting at least one of the other two sides of the triangle, such as:

- ✓ Reducing costs can increase the duration of the project and reduce its scope.
- ✓ Reducing the time (duration) can lead to increased costs and a reduction in the scope of the project.
- ✓ Increasing the scope can prolong the project in time and increase costs.

In practice, project management brings various complications and the "balance" between constraints is violated. Most often, there is a delay in the schedule (time), cost (budget) overruns, when the effort to meet the time or budget of the project leads to a deterioration in its quality. According to the published results of the survey (PM360, 2023), up to 70% of projects are unsuccessful, or the project solver does not deliver what was promised to the customer. The most common reasons for project failure are budget overruns (55%), mismatch between business and project goals (44%), lack of support from project sponsors (41%), unclear project goals (37%).

When is a completed project evaluated as successful?

From the point of view of the project triangle, a project is successful if it has achieved the planned goals in the required quality, within the specified time, while adhering to the planned costs, has not caused negative impacts and the interested party (client/customer) is satisfied with the result.

Project management

Project management is a way of organizing work to manage unique tasks and activities that are different from routine, day-to-day processes. What distinguishes the project from the process management and routine management of the organization's activities **is its uniqueness** and final outputs. The founder of project management is Henry L. Gantt, who, together with F. Taylor, began to apply the scientific principles of management in American steel mills (1887-1893). For the analysis of work procedures in production, he introduced the so-called A Gantt chart in the form of a graphically represented sequence of project activities. Project Management Definitions:

- ✓ Project management is a special type of management focused on planning, implementing, tracking and evaluating project results.
- ✓ Project management is the planning, organization, and management of project activities and resources, while respecting time, resource, and cost constraints.
- ✓ Project management is the application of knowledge, knowledge and skills, tools and techniques to project activities to meet the requirements of the project. It involves planning, organizing, monitoring and reporting on all aspects of the project and motivating all stakeholders to achieve the project objectives.
- ✓ Project management is the sum of activities consisting in planning, organizing, managing and controlling the resources of a company with a relatively short-term goal that has been set for the implementation of specific goals and objectives.

The application of project management in project implementation should answer the questions:

- ✓ What tasks must be performed and in what order?
- ✓ In what time sequence should the tasks be carried out and what is the deadline?
- ✓ Who will complete these tasks?
- ✓ How much will it cost?
- ✓ What if some tasks are not completed as planned?
- ✓ How to communicate the details of the project after its completion?

The implementation of a project in the sense of project management theory is preceded by its preparation, which means defining the goal (purpose) of the project, developing a time schedule of tasks and allocating fulfilment resources. During the implementation of the project, individual tasks of the schedule are performed by resources - the project is "shifted" to its end. At this stage, the project manager continuously checks and monitors the implementation of the project plan. After completing all tasks, the project is formally completed, the final

product is handed over to the client and the final project documentation is processed.

Project lifecycle

Every project has a defined beginning and end. The project is divided into phases in terms of time and the nature of the activities carried out. The sequence of individual phases of a project forms its **life cycle**. According to PMI (2008), the project life cycle is a set of generally successive phases through which a project passes from its inception to its completion, the names and number of which are determined by the needs of the organization implementing the project.

In general, the life cycle of a project consists of phases:

1. Initiation (initiation)
2. Project preparation and planning
3. Implementation
4. Project management (control and monitoring)
5. Termination

The phases are arranged in a logical sequence - the output (termination) of one phase is usually the input for the next phase (Figure 2). The exception is the planning and management phases, as they are present in all phases of the project lifecycle.

Figure 2 Project lifecycle phases I

Project initiation - is the phase of starting a project, defining the project (purpose, goals, scope, stakeholders). It is a formulation of an idea of what is to be achieved by the implementation of the project. For this purpose, the Feasibility Study and the Project Plan documents have been prepared. In practice, the Feasibility Study document is *usually a condition for project approval*, demonstrating whether the project is economically and financially feasible and sustainable. A project plan is

a comprehensive document that describes the objectives of the project, its activities, sources of funding, timeline, expected results and possible risks.

Project preparation and planning - is the most important and demanding phase of any project. In this phase, a project team is "assembled", which, together with the project manager, develops a comprehensive and detailed project plan. The plan specifies and describes in detail the project activities, task schedule, time schedule, resource plan, project budget, risk plan and project outputs (quantitative and qualitative parameters).

Project implementation - at this stage, the project plan is put into practice: individual tasks and activities are implemented in real time, resources are consumed, and funds are drawn according to the budget. The phase involves allocating, coordinating and managing human, material and budgetary resources.

This includes regular meetings of the project team to monitor the progress of the project, and if necessary, adjustments to the project baseline. The result of the phase is the creation of material outputs of the project and their handover to the client.

Project management - takes place throughout the project life cycle and is carried out by the project manager in accordance with the project plan and risk management plan. The essence is the control and monitoring of project activities, monitoring the progress of project implementation, changes to the original plan (as needed).

Completion of the project - is the final stage of implementation. The project is factually and formally completed, its progress, benefits, fulfilment of goals are evaluated, and the final documentation is compiled. At the same time, the problems that arose during the implementation of the project are summarized to prevent these problems in similar projects solved in the future.

2. Microsoft Project Software Tool

Microsoft Project is a specialized project management software tool, covering all phases of the project lifecycle from planning to project completion and evaluation. The program is available in several editions:

- ✓ Local solutions: standalone desktop application (MS Project Standard, MS Project Professional) or server (Project Server)
- ✓ Cloud solutions in Microsoft 365: Project Online Professional and Project Online Premium, Project Web App (browser-based interface).

In the text, we present practical samples/outputs of the desktop version of MS Project Professional 2019.

How to process a project through MS Project?

Based on the theory of project management, the main point of practical project implementation is its detailed development into a plan. It is a relatively demanding process that "copies" the project life cycle - from defining tasks, allocating fulfilment resources, continuous control and monitoring of task fulfilment, to project completion and evaluation. The MS Project program can be used throughout the process. Its use in solving each specific project is only a supporting tool for the project manager, the success of the project is based on the knowledge and skills of the project manager in project management and the project team. MS Project can be used for the following project activities:

- ✓ Create a structured project plan.
- ✓ Define in detail the tasks of the project and the time schedule for their fulfilment.
- ✓ Define the resources that will be used to complete tasks.
- ✓ Define costs at the level of the task, stage, the entire project.
- ✓ Monitor the progress of the project plan.
- ✓ Apply different views and reports to your project.
- ✓ Process output reports for project evaluation.

MS Project User Interface

After starting, the program asks the user to select a working file: create a new, empty project or open an already processed project. The user also has a choice of project templates (i.e. a pre-prepared project with all characteristics: duration, tasks, resources and their assignments, Gantt chart). The program's working window is structured as follows:

1. Main Command Menu
2. Ribbon: graphic-command menu for individual command tabs
3. Tools: context menu for the View panel
4. Document part of the project: tabular part and graphic part

The tabular part of the project is used to insert project tasks into rows (task name), columns have names and define other characteristics of the task (e.g. duration, start/end date of the task, predecessors, etc.). Rows and columns can be added/removed as needed. On the right side of the view is a Gantt chart in which the sequence of tasks is graphically displayed - the tasks are displayed in the form of "tabs" - Figure 3.

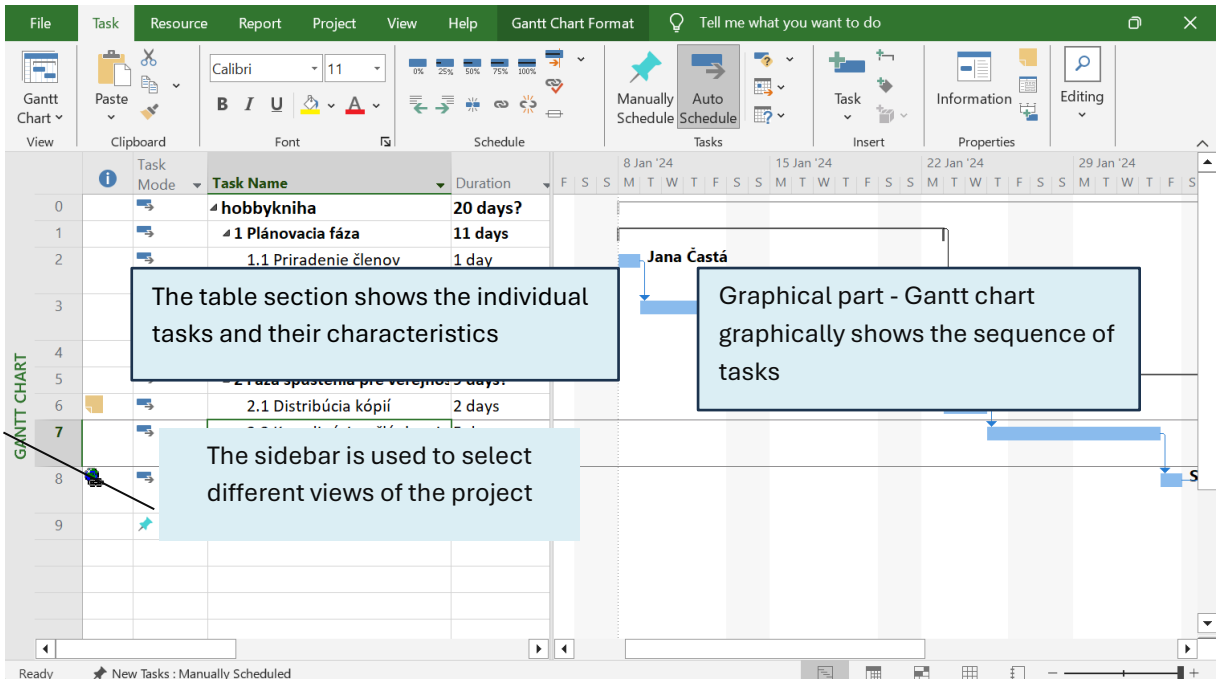

Figure 3 Program Work Window

Main Menu

The main menu contains all the commands needed when working with a project file. Individual tabs logically group commands by main areas:

- ✓ The **File** tab contains commands for working with the project file (create a new one, open/save/print an existing project) or change program settings. The **Project Information menu** allows you to display **the Advanced Properties of** the project file (descriptive information of the project: name, subject, author, keywords) or **Project Statistics** (specific information about the project being processed - Figure 4.

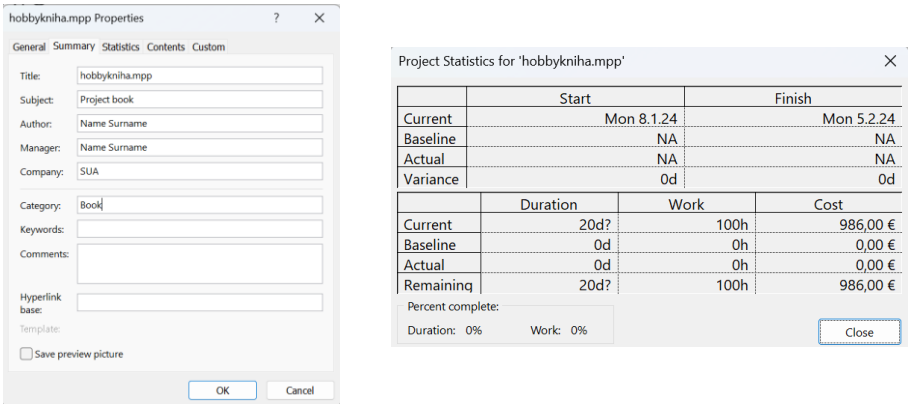

Figure 4 File Menu - Project Information

- ✓ The **Task tab** contains commands for working with tasks in the project - it allows you to insert different types of tasks, format them, set the percentage of task completion, view the details of each task. It also

includes the ability to set a task scheduling mode (manual, automatic) and the ability to check project tasks (check for dates and time discrepancies).

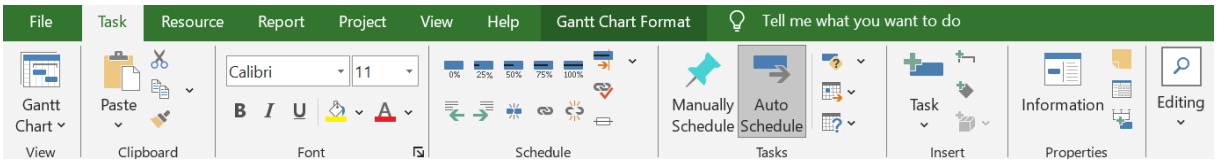

Figure 5 Tab Task

✓ The **Resource tab** contains commands for working with resources that perform tasks. You can use commands to assign resources to tasks, view their properties, or level off overallocated project resources that are overallocated due to their over assignment to tasks (the resource's available working capacity is less than the total time required to complete those tasks). MS Project works with three types of resources; their detailed description is in next chapter.

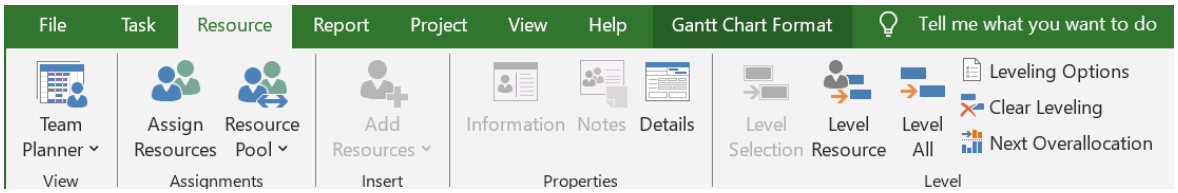

Figure 6 Tab Resource

✓ The **Report tab** contains commands for creating various graphic/visual reports (outputs) of the project. It also allows you to compare two versions of a project. In practice, reports are used to monitor the progress of the project (evaluation of some statistics), but they are mostly used in the final phase - completion and evaluation of the project.

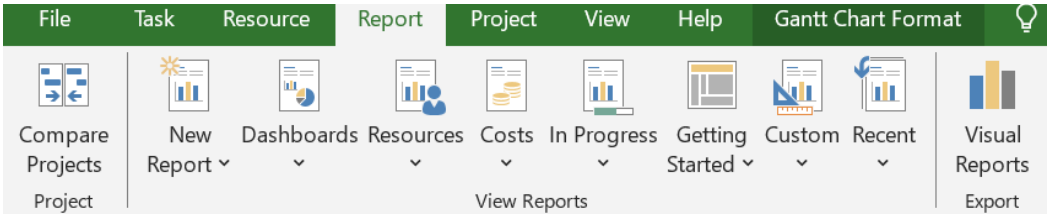

Figure 7 Tab Report

✓ The **Project tab** contains commands that apply to the project (set project information, project calendar, track project progress, and check project status).

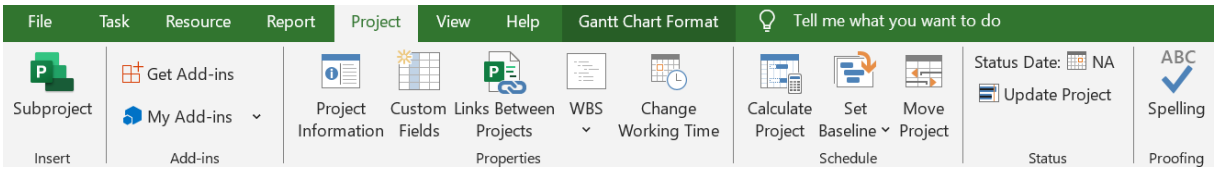

Figure 8 Tab Project

✓ The **View** tab offers various views of tasks, resources, allows filtering/sorting of tasks or resources, setting a time scale for a Gantt chart, or displaying a project timeline.

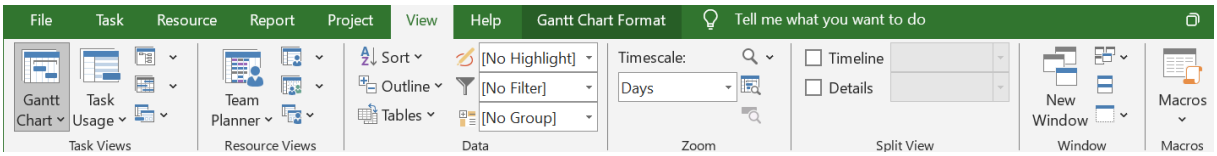

Figure 9 Tab View

✓ The **Tab - Gantt Chart Format tab** is designed to format the Gantt chart, it offers predefined color styles. It allows you to view critical tasks, task slack. In addition, it allows you to view the project outline, task summaries, and outline numbers, which displays a structured project schedule divided into individual phases with subtasks.

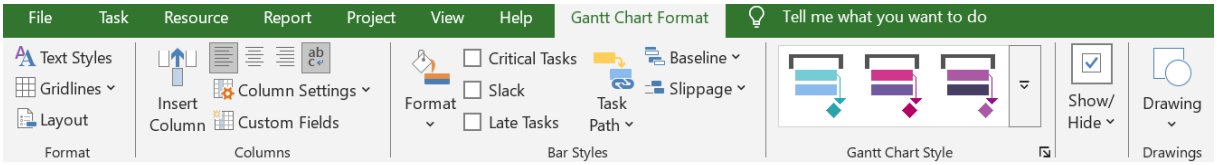

Figure 10 Tab Gantt Chart Format

Processing a project in MS Project

A project is a work schedule that is preceded by the initial preparation of the project: defining a list of tasks, defining task fulfilment sources, and defining important deadlines. The preparation of the project in the program consists of the following activities:

1. Defining the tasks of the project and the time schedule for their fulfilment.
2. Define project resources and assign them to tasks.
3. Display of costs at the level of the task, stage, entire project.
4. Creating a structured project plan - dividing the project into summaries (stages), setting milestones.

After creating a new project file, the program asks for the **Project Information setting** (Figure 11), where you need to enter **the start**[1] or **end date** of the project and other project characteristics. At the same time, you need **to set up all exceptions for non-working time (for example, holidays during the year)** in the Project Calendar.

[1] For a project planned from the start date, it is crucial when the project ends. When scheduling from an end date, a fixed end date is determined in advance (e.g., a product launch date announced).

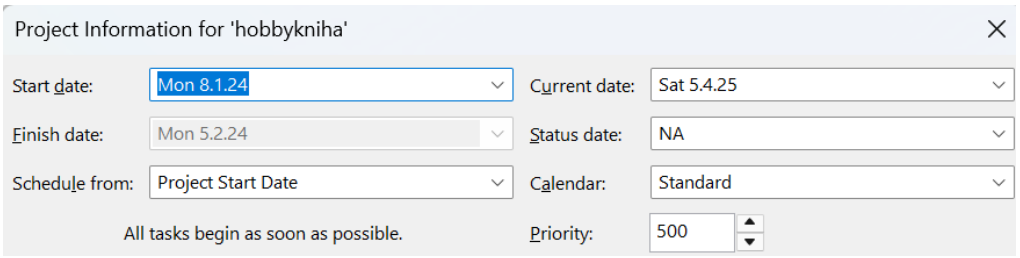

Figure 11 Setting up a project

The next step is to insert the project tasks into the tabular portion of the Gantt Chart view. Each project consists of its division into sub-activities - **tasks**, so it is advisable to have a detailed list of tasks that form the "skeleton" of the project plan prepared in advance. In a program for working with tasks, the **Task tab** is used.

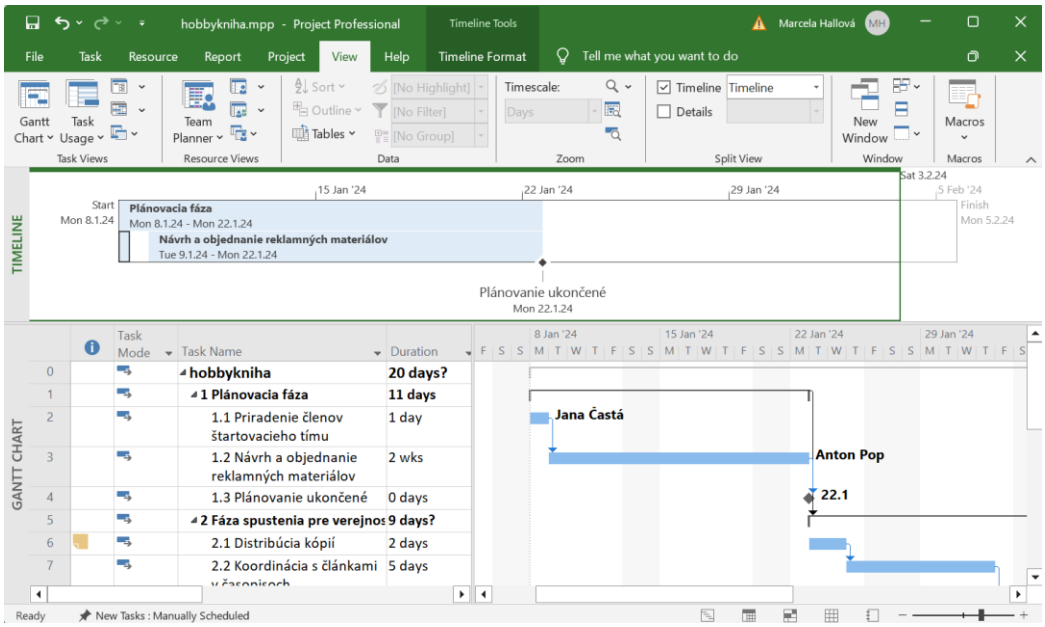

Figure 12 Project example

Figure 12 shows an example of a processed project. In the table section, tasks are displayed as a numbered list. Each task has defined characteristics in columns: name, duration, start and finish dates, dependency on other tasks (so-called predecessors) and allocated resources. In the graphic part, the tasks are shown in the form of coloured strips, the length of the strip expresses the duration of the task. The progress of all tasks is displayed as their sequential sequence (*the so-called waterfall model of the project*), expressing the sequence of task completion. To create a structured form of the project, it is necessary to group the related tasks into **summaries**, several summaries form the overall **outline** of the project.

A separate view of the summaries (and their subtasks) is ***the timeline***, which shows the sequence of project stages in colored blocks.
Different types of tasks can be inserted into the project:

- ✓ Common task - has a specified start and end date and has resources allocated for their fulfilment.
- ✓ Milestone - is a task with zero duration, indicates an important event in the project (for example, the completion of a project stage), has no resources assigned to it, and is usually the last task of that stage. A milestone identifies a critical point in the project plan (as a "transition" point to a new stage of the project). In the Gantt chart, it is identified by the icon ◆.
- ✓ Recurring task - has a defined time interval of regular repetition during the project (e.g. control meetings of the project team), the indicator of a repeated task is the ⟳.

Summary - represents the stage of the project, it is made up of a list of subtasks. It is highlighted in bold in the text and in the Gantt chart by a continuous line above the subtasks.

After you create a project schedule, you need to assign resources to each task to perform the tasks. Resources are continuously consumed during the completion of project tasks. The following types of resources can be assigned to tasks in a project:

- ✓ **Work resources** (people or an inanimate work resource, e.g. a special device). The specificity of work resources is their limited availability, they have their own **defined calendar**, which determines their working and non-working hours. Poor planning of assigning a work resource to multiple tasks at the same time can lead to **resource overload,** which means that More work is required of the resource than it is able to do in a given time. The program indicates that the resource is overloaded with an icon in the tabular part of the Gantt chart. Resource overload is a risk that, in practice, can lead to missed deadlines and disrupt project schedules. There are several techniques for eliminating the overload of working resources, in the program there is a separate menu for balancing resources.
- ✓ **Material resources** are consumed during the implementation of the project. These resources are not limited in capacity and in case of exhaustion, they can be replenished in a short time in the required or unlimited amount (e.g. sand). They are defined in units of measurement (liter, meter, piece). They do not have a defined calendar and availability.
- ✓ **Cost resources** are expressed as fixed costs when assigned to a specific task (e.g., airfare, space rental, training cost). They do not have a defined calendar and availability.

When you insert resources into a project, you must **define a cost** for each resource in **the Resource Sheet** (Figure 13) - cost per unit of work of a work resource, price per unit of material consumed, or fixed cost.

	Resource Name	Type	Material	Initials	Max.	Std. Rate	Ovt. Rate	Cost/Use	Accrue	Base Calendar
1	Jana Častá	Work		J	100%	42,00 €/hr	63,00 €/hr	0,00 €	Prorated	Standard
2	Sylvia Santová	Work		S	50%	1 100,00 €/wk	0,00 €/hr	0,00 €	Prorated	Standard
3	Tomáš Nikon	Work		T	100%	2 700,00 €/wk	0,00 €/hr	0,00 €	Prorated	Standard
4	Anton Pop	Work		A	100%	0,00 €/hr	0,00 €/hr	0,00 €	Prorated	Standard
5	Peter Lesný	Work		P	100%	55,00 €/hr	0,00 €/hr	0,00 €	Prorated	Standard
6	Textoví editori	Work		T	400%	45,00 €/hr	0,00 €/hr	0,00 €	Prorated	Standard
7	Cestovanie	Cost		C					Prorated	

Figure 13 Resources and cost statement

When you assign resources to tasks, the program automatically recalculates all costs, and the total **project budget** and sub-budgets of each project stage are displayed. The **Project Statistics** view shows other important information about the project: total duration (in days), total work (in hours), and total cost (see Figure 13).

After the project plan is processed in the program, the project implementation phase follows, the individual tasks begin to be fulfilled according to the schedule. At this stage, it is important to continuously check the implementation of the project plan by the project manager and the responsible project team members. The control allows you to react to unexpected events that occur during the implementation of the project (e.g. employee outage, non-delivery of materials, bad weather, etc.) and to modify the original project plan (e.g. replenishment of a worker, time shift/shortening of the task duration). With the help of the program, the project manager can:

- ✓ Track the progress of the project plan and update it.
- ✓ Apply different views and reports to your project.
- ✓ Process output reports for project evaluation.

To track the progress of the project in MS Project, it is necessary to save the so-called **the original plan**, which is a copy of the plan that was originally created. The baseline contains the initial setting of all project values (time units, resource allocations, budget) and can be understood as a "model solution" of the developed project schedule. In the current project**, the data of individual tasks is continuously** updated according to their actual progress - real task durations, actual work performed, real costs are entered. The project manager can monitor and analyze how the actual implementation of the plan differs from the original plan. As needed, it can change the actual project schedule, deploy additional resources to tasks, or reschedule tasks.

To display the tracking of the actual progress of the project, it is possible to use the **Gantt chart view for tracking (**Figure 14), where the graphic part shows the progress of the project (percentage of task completion) as well as the difference between the actual (blue bar) and the original (gray bar) project plan. **the critical**

path of the project (red bar), i.e. the sequence of tasks that have a direct impact on the project's finish date (for example, tasks that cannot be postponed, otherwise the entire project would be delayed).

A suitable view for monitoring the actual progress of the project is also **the Project Statistics** (Figure 5 – previous chapter), where the difference between the original plan and the current plan for Duration, Work and Project Costs is summarized. Based on them, the project manager can determine whether the project "sticks" to the originally planned values and what is the percentage of project completion in relation to the total time and work performed.

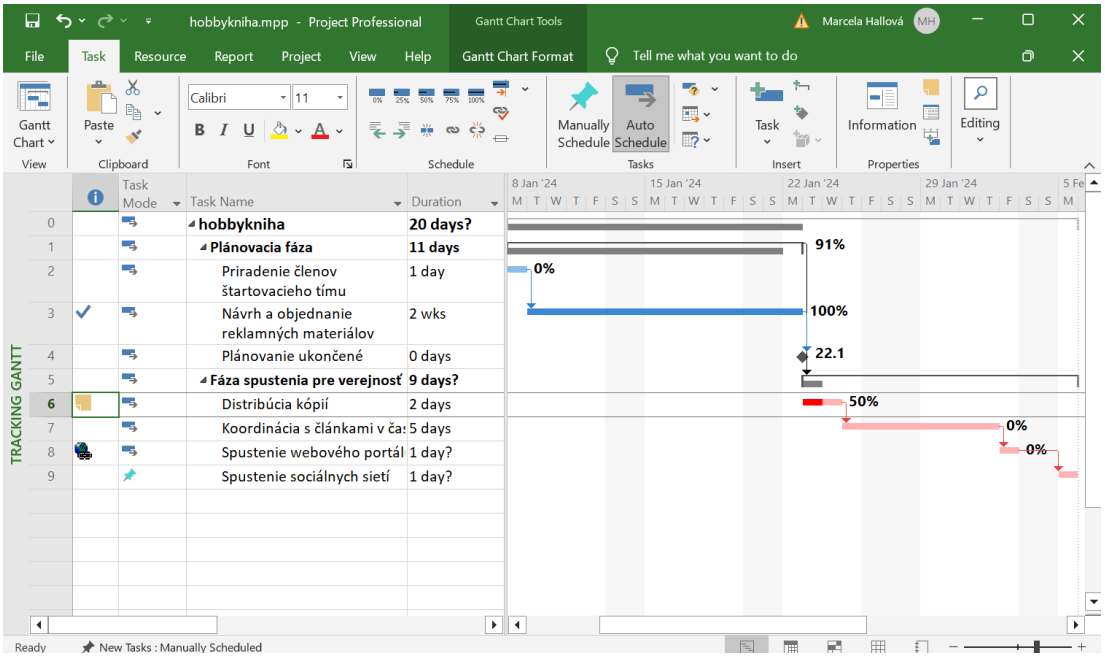

Figure 14 Tracking Gantt Chart

Project completion is the last phase of the project: all project tasks are completed, the achieved result of the project is formally accepted and accepted by the project client, the project team is dissolved. At this stage, the project is evaluated, and the final project documentation is processed. When processing the final project report, MS Project is used mainly for the processing **of output reports** (Figure 15). The reports provide a simple form of analysis and evaluation of the project, they are intended exclusively for printing. The user can use the predefined templates and modify them according to their requirements. The visual appearance of reports is in the form of tables, graphs, comparisons.

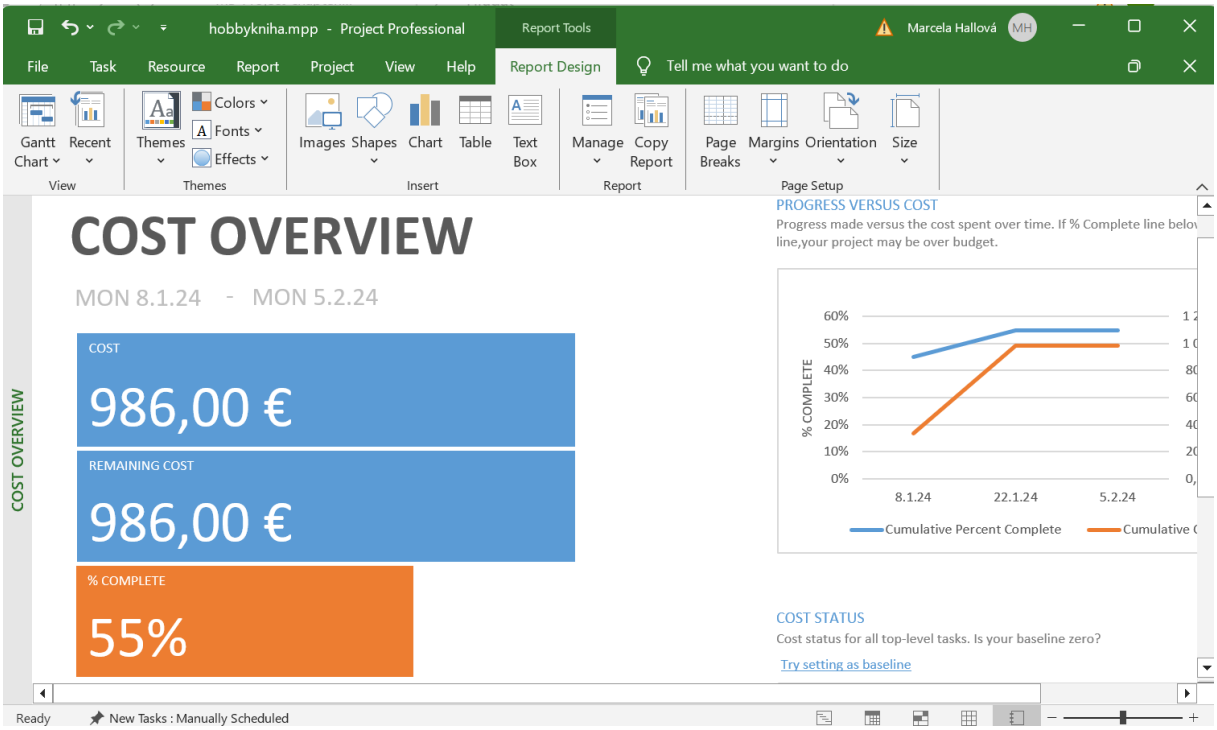

Figure 15 Output report – Cost overview