8. COMPUTER TOOLS FOR PROJECT MANAGEMENT

The project management is a complex activity that requires among others:

- Information intercourse referred to the project, information that is in big amounts more and more frequently.
- Applying diverse calculation models, specific to the project management, that are several times complex.

All this arguments justify the appearance of Computer Aided Project Management Software. The implying of this software has as its purpose the ease of the project management.

The Computer Aided Project Management Software helps the managers to build project plan, introduce and organize all the necessary details in order to accomplish their objectives.

Microsoft Project is situated among the main software applications used in projects management, helping cover all the steps of the project management - planning, tracking and the control, closing the project.

TABLE OF CONTENTS

8.1. SPECIFIC CONCEPTS OF THE COMPUTER AIDED PROJECT MANAGEMENT 5

8.1.1. DEFYING THE PROJECT NOTION 5
8.1.2. PROJECT MANAGEMENT 5
8.1.3. DEFYING THE OBJECTIVE AND ACTIVITY 6
8.1.4.. SOFTWARE APPLICATIONS USED IN PROJECT MANAGEMENT – GENERAL CONSIDERATIONS 6
8.1.5. SOFTWARE FACILITIES FOR PROJECT MANAGEMENT 6
8.1.6. EXAMPLES OF SOFTWARE FOR PROJECT MANAGEMENT 7
8.1.7. CRITERIA FOR SOFTWARE SELECTION FOR PROJECT MANAGEMENT 7
8.1.8. THE ADVANTAGES OF USING SOFTWARE FOR PROJECT MANAGEMENT: 8
8.1.9. INTRODUCTION TO MICROSOFT PROJECT 8
8.1.10. FACILITIES OFFERED BY MS PROJECT 8
8.1.11. INFORMATION INTERCOURSE CONCERNING THE PROJECT 9
8.1.12. THE LAUNCH OF MS PROJECT PROGRAMME 9

8.2. THE PHASES OF PROJECT MANAGEMENT IN MS PROJECT. 10

8.2.1. THE SUB-PHASE OF PLANNING THE PROJECT 10
8.2.2. DEFYING THE PROJECT 10
8.2.3. START A PROJECT 10
8.2.4. GENERAL SETTINGS OF THE PROJECT 11
8.2.5. DEFYING THE PROJECT'S CALENDAR 11

8.3. PLANNING THE ACTIVITIES 13

8.3.1. DEFYING AND INTRODUCING THE LIST OF ACTIVITIES 13
8.3.2. ESTIMATING ACTIVITIES' DURATIONS 13
8.3.3. DEFYING THE MILESTONE ACTIVITIES 13
8.3.4. ESTIMATING THE ACTIVITIES' PERIOD OF TIME BY USING THE PERT ANALYSIS 14
8.3.5. INTERRUPTING AN ACTIVITY 14
8.3.6. CREATION AND DEFYING THE CALENDAR 15
8.3.7. GANTT DIAGRAM 15
8.3.8. DEPENDENCIES BETWEEN ACTIVITIES 15
8.3.9. DEFYING TASK DEPENDENCIES IN MS PROJECT 15
8.3.10. THE CONSTRAINTS 16
8.3.11. ADDING SUPPLEMENTARY INFORMATION 16

8.4. PLANNING PROJECT RESOURCES 18

8.4.1. ESTIMATING NECESSARY RESOURCES 18

8.4.2. DEFINING THE LIST OF THE RESOURCES AND THE CALENDAR OF THE RESOURCES 18
8.4.3. RESOURCE INFORMATION WINDOW 19
8.4.4. ASSIGNING/DISTRIBUTING THE RESOURCES TO THE PROJECTS 20
8.4.5. ASSIGNING THE RESOURCES TO ACTIVITIES 20

8.5. PLANNING PROJECT COSTS 21

8.5.1. ESTIMATING PROJECT COSTS 21
8.5.2. ENTERING ACTIVITIES' COSTS. 21
8.5.3. DEFINING AND DISTRIBUTING THE COSTS 21
8.5.4. PREPARING COSTS MANAGEMENT 22

8.6. PLANNING QUALITY AND RISKS 23

8.6.1. COMPLYING WITH QUALITY STANDARDS 23
8.6.2. CONSIDERATION ABOUT QUALITY STANDARDS 23
8.6.3. IDENTIFYING AND PLANNING THE RISKS 23

8.7. OPTIMIZE PROJECT PLAN 25

8.7.1. OPTIMIZE AFTER THE ACHIEVEMENT DATE OF THE PROJECT 25
8.7.2. CRITICAL PATH. CRITICAL ACTIVITY 25
8.7.3. TECHNIQUES OF PLANNING ACTIVITIES 25
8.7.4. PLANNING CALCULATION 25
8.7.5. DIRECT CALCULATION 25
8.7.6. INVERSE CALCULATION 26
8.7.7. TOTAL FLOAT 26

8.8. OPTIMIZE THE PROJECT PLAN FOR RESOURCES 27

8.8.1. VISUALIZATION OF THE RESOURCES ALLOCATIONS IN TABLE VIEW 27
8.8.2. GRAPHIC VISUALIZING OF RESOURCE ALLOCATION 27
8.8.3. VISUALIZATION OF RESOURCES USAGE 27
8.8.4. PLANNING OVERTIME WORK 28
8.8.5. SOLVING SUPRA-ALLOCATED RESOURCES 28
8.8.6. SOLVING SUPRA-ALLOCATED RESOURCES BY LEVELING 29
8.8.7. LEVELING IN MS PROJECT 29
8.8.8. FACTORS THAT INFLUENCE THE LEVELING IN MS PROJECT 29
8.8.9. LEVELING ALTERNATIVES IN MS PROJECT 29
8.8.10. THE SUB-ALLOCATED RESOURCES 30
8.8.11. INFORMATIVE COMMENTS 30
8.8.12. EVALUATION OF OPTIMIZATION RESULTS 30

8.9. OPTIMIZING THE PROJECT PLAN TO MEET THE BUDGET 32

8.9.1. RECONSIDERING THE COSTS 32
8.9.2. OPTIMIZING THE PLAN OF THE PROJECT IN ORDER TO REDUCE THE COSTS 32

8.9.3. OPTIMIZING THE PLAN OF THE PROJECT IN ORDER TO INCREASE THE BUDGET 33
8.10. DISTRIBUTE THE PROJECT PLAN 34
8.10.1. SPREADING THE INFORMATION AS WRITTEN MATERIALS 34
8.10.2. REPORTS CONTAINING GENERAL INFORMATION REGARDING THE PROJECT 34
8.10.3. REPORTS CONTAINING INFORMATION REGARDING THE ACTIVITIES OF THE PROJECT 34
8.10.4. REPORTS REGARDING THE COSTS 34
8.10.5. REPORTS REGARDING THE PLANNING OF THE PROJECT 35
8.10.6. REPORTS REGARDING THE PROJECT'S CHARGES 35
8.10.7. ON-LINE DISTRIBUTION OF THE INFORMATION REGARDING THE PROJECT 35
8.11. TRACKING AND MANAGING THE PROJECT 36
8.11.1. TRACKING AND CONTROLLING THE PROGRESS OF THE ACTIVITIES – BASELINE PROJECT 36
8.11.2. TRACKING AND CONTROLLING ACTIVITIES' EVOLUTION – SAVING A BASELINE PLAN 36
8.11.3. RECORDING ACTIVITIES' PROGRESS 36
8.11.4. INDICATORS FOR RECORDING THE ACTIVITIES' PROGRESS 37
8.11.5. FOLLOWING UP THE PROGRESS OF EACH ACTIVITY IN GANTT DIAGRAM 37
BIBLIOGRAFIE 38

8.1. Specific concepts of the Computer Aided Project Management

This chapter will present fundamental notions specific to **project management.** In this way the project notion will be defined, it will be presented the concept of **project** management as well as a series of notions like those referring to the: objective of a project and the notion of activity. Starting with these notions, it will be made a general presentation of the software used in **project** management, and then it will be made the connection to project management software, namely the Microsoft Project. After a short introduction, it will be presented the launching way and its interface.

8.1.1. Defying the project notion

*A **project** is a **temporary** effort, made **progressively,** in order to realize a **unique** product or service.*

Temporary:

- Every **project** has defined its beginning and its ending.
- The duration of the project is finite.
- The temporary term doesn't apply to the product / the service resulted from the project.
- The temporary nature of the project is given by the following aspects :
    - market opportunity – most of the projects are limited by the request of products / services
    - the **project** team that is formed and realizes the project it will be dissolved at its ending.

Unique:

- every product / service realized is different from the others alike

Progressive:

- because every **project** is unique, the features of the product / service have to be elaborated progressively, in steps, in a constant increase, being careful at the details.

8.1.2. Project management

***Project Management** represents the application of knowledge, techniques and instruments on the activities of the project, in order to achieve its objective. It requires the project initiation, planning, execution, control and its closing.*
*In other wording, the **project** management is the process of planning, organizing, and administrating the activities and resources in order to achieve an objective, taking into account the time, the resources or the expenses limitations.*

Starting from these considerations, it can be said that a **project** is characterized by three factors that interact, setting up the **project's triangle**:

- **Time**: refers to the necessary time in developing the project and it is reflected by the *planning of the project.*
- **Money**: refers to the expense of the resources (personnel, equipments, materials) implied in the project.
- **Scope**: refers to the objectives and the activities of the project and also to the necessary work in accomplishing them.

The relation between these factors is specific to each **project** and it determines the type of the problems that might appear, as well as the solutions necessary for their solving.
By extrapolation the intercourse logic of these factors at the level of the **project management**, it can be obtained the **project management triangle**.

8.1.3. Defying the objective and activity

As it was revealed from the project's triangle presentation, one of the essential factors of the project refers to the **objective** or to the project objectives. To achieve a project **objective,** one or several **activities** have to be realized. .
One of the ways of defying the objective and the activity is represented in the following picture:

8.1.4.. Software applications used in project management – General Considerations

The project management is a complex activity that requires among others:

- Information intercourse referred to the project, information that is in big amounts more and more frequently.
- Applying diverse calculation models, specific to the project management, that are several times complex.

All this arguments justify the appearance of Computer Aided Project Management Software. The implying of this software has as its purpose the ease of the project management.
Today, the software market develops continuously. And in this domain, of **project management**, specialized software has been developed. In order to understand their use, it will be presented a series of information concerning the facilities, the advantages, and the criteria of choosing software for project management.

8.1.5. Software facilities for Project Management

There can be enumerated among the software facilities for **project management** the followings**:**

- They calculate budgets and control costs

- They allow defying working schedules.
- Communication using the E-mail.
- Graphs.
- They import/export data.
- They work with multiple projects and sub-projects.
- They generate reports.
- Resources management.
- Planning.
- They monitor and control the projects.
- Security.
- Data sorting and filtering.
- "What-if" analyses.

These facilities may be considered for several times such as selection criteria between these software applications. More precisely, each of these facilities is characterized by certain parameters having specific values for the software application.

8.1.6. Examples of software for project management

Examples of software for project management:

- **Microsoft Project**
- CA-Super Project
- Project Scheduler
- **Primavera**
- Time Line
- High-End Project Management Software

8.1.7. Criteria for software selection for project management

- Software capacity.
- Documentation and facilities of help on-line.
- The ease in using it.
- Available facilities.
- Other systems integration.
- Installing requests.
- Capacities to intercourse.
- Security.
- The support offered by the supplier.
- Expense.

It is obvious that each of these criteria has a certain weigh in choosing a software. For example, the software capacity refers to the number of **activities** of a **project that** can be managed with such software. There are projects with tens of activities that require easier software applications. On the other hand, there are projects with

thousands of activities, and in this case it is required a software to be able to manage a big volume of information.

8.1.8. The advantages of using software for Project Management:

- Accuracy.
- Permissiveness.
- Easy to use it.
- The ability of working with complex projects.
- It allows modifications.
- It stocks data.
- Speed.
- "What-if" analysis.

Usually, after the advantages of such software have been presented, it should be mentioned some *cautions* concerning the use of Software for Project Management:

- De-concentration because of the software
- Super-loading with information
- Super-trust in software
- False security sensation

The project management activity is a complex activity that requires among the others:

- The information intercourse referring to the **project**, information that is in big amounts more and more frequently.
- Applying diverse calculation models, specific to the project management, that are several times complex.

All this arguments justify the appearance of Computer Aided Project Management. The implying of this software has as its purpose the ease of the project management.

8.1.9. Introduction to Microsoft Project

One of the software project management applications is Microsoft Project.

According to a given project, **MS Project** stocks data referring to the project in its own data base (files *.mpp) in order to use them in calculating and maintaining the planning of the project and the costs, thus the project's plan being obtained.

8.1.10. Facilities offered by MS Project

The facilities offered by **MS Project** are presented in the picture below:

In the planning process **MS Project** it can calculate diverse working times, resources, equipments and expenses in accordance with the picture below:

MS Project keeps the information introduced as data fields and on their basis, it calculates other project data. In order to have an easier handling, these data fields are presented as tables.

8.1.11. Information intercourse concerning the project

A simple plotting of the information intercourse module concerning the **project** is presented in the picture below.

The more the data concerning the project are precise, the more the resulted project's plan is precise.
The project's plan is built starting from the following information:

- **Activities**
- **Durations**
- **Dependences**
- **Resources**
- **Costs**

The planning of activities in **MS Project** is made starting from a series of details concerning to these ones, as it is revealed in the picture:

8.1.12. The launch of MS Project programme

From the **Windows** operating system bar click on ***START,*** and then from the ***Programs*** menu choose ***Microsoft Project.***
After launching, the software is presented in the form of graphic interface in accordance with the picture below.

As in any Windows application, it can be noticed a graphical user interface organized in the following main zones: text menus, buttons that represent commands used very frequently in the software and a table zone for data introduction.
The commands of **MS Project** application are grouped on menus as it follows:
File, Edit, View, Insert, Format, Tools, Project, Window, and Help.

8.2. The phases of Project Management in MS Project

Project Management in **MS Project** requires covering of three phases in accordance with the picture below:

The achievement of each of these phases requires the covering of many steps (sub-phases).

8.2.1. The Sub-phase of planning the project

The first stage, the one of planning the project, includes the following sub-stages:

8.2.2. Defying the project

Defying the project implies covering of the following steps:

- Project initiation:

The planning phase of a project can span a significant length of time and involve many people, so it's important to define the:

  - **The objectives**
  - The hypothesis (the conditions) of developing the project (true factors, real or certain)
  - The constraints

The purpose management plan is also prepared in the planning stage in order to permit the administration of changes concerning the project's objectives.

- Defying the project's results

It implies the establishment of the products and services that are to result from the project.

- The starting of a new **project** in **MS Project**

It refers to the project's preliminary data defying in **MS Project**: the start date of the project, the planning type (after the start date or the finish date), the calendar of the project, and the time unit for activity periods, the currency (LEI, USD, EURO so on). The saving of the file is also made in this phase.

8.2.3. Start a project

The establishments of the start date (finish) and also of the project scheduling type (after the start date or the finish date) are set in ***Project Information*** window from the ***Project*** text menu.

8.2.4. General settings of the project

The details that concern the general setting of the project can be configured from the ***Options*** window in ***Tools*** text menu. Starting from this point, it can be configured the parameters referring to:

- The mode of visualizing the project – ***View*** section:
  - date displaying format
  - elements referring to the currency used in the **project** ($, EURO, LEI a.s.o.)
- the work calendar of the project - ***Calendar*** section:
  - the start date of the week;
  - the start month of the fiscal year;
  - the default start hour of a working day;
  - the default finish hour of a working day;
  - the number of working hours for a day/week/month;

- the planning of the project – ***Schedule*** section:
  - the default schedule of the activities (after the start date of the project or after the current date);
  - the duration unit for scheduling the period of activities (days, hours, minutes, weeks, months)
  - the working time unit (days, hours, minutes, weeks, months)
  - the dafault type of activities (it establishes the mode how **MS Project** recalculates those 3 intercourse fields: **work, duration** and **units**).

8.2.5. Defying the project's calendar

For defying the calendar after a project is being developed it will be used the ***Change Working Time*** window from ***Tools*** menu.

This window allows the modifying of the standard calendar of the project development by defying the working and non-working days of the year and by defying the daily working hours. For example, in establishing a day of the year as a non-working day, that day is selected and marked as being ***Nonworking time***.
In case there are activities and resources (human or equipments) in the **project** that are developed after another calendar than the standard calendar of the project, then, it can be defined other calendars that correspond to the specific requires of the activity or resource.
To define a new calendar use the ***New*** command and introduce the name of the new calendar in the new open window and specify the copy after which this calendar will be generated.

Then return to ***Change Working Time*** window in which are defined the working days and the daily working lapse of time of the new calendar.

8.3. Planning the activities

The planning of activities implies defying and introducing the list of **activities**, their **duration's** estimation, the establishment of **dependencies relationship** and **constraints** between activities. All these things will lead to the schedule of the project activities.

8.3.1. Defying and introducing the list of activities

On the basis of data established in the defying phase of the project, it results the necessary work quantity which can be transposed in phases and **activities**. Thus it should be obtained the list of **activities** and their hierarchical structure on phases. These are introduced in **MS Project** in ***Task Name*** column from the ***Entry Table***.
The hierarchy of the activities on stages (phases), sub-stages (sub-phases) a.s.o., is realized using the indenter buttons (indent and out-dent) in accordance with the picture below:

After finishing the entering and the hierarchy of the activities list, **MS Project** will display this list in ***Entry Table*** under a visual form which is easy to cover and follow. It has to be noticed the fact that the activities (the table rows) are numbered using a grey column. The number of each row (activity) is called ***Task ID*** and it represents the identification number through which this activity cans intercourse with other activities.

8.3.2. Estimating activities' durations

The duration of an activity represents the necessary working time for achieving the activity. Thus, after the list of activities has been built, it can be introduced their duration. This is possible by entering in ***Duration*** column the duration of each activity, in time units according to the project development (E.g.: days, hours and minutes).

8.3.3. Defying the Milestone Activities

A Milestone Activity is a reference point marking a major event in a project and used to monitor the project's progress. Any zero duration activity will be defined automatically by **MS Project** as a Milestone Activity.
The different duration activities can be also defined as Milestone activities by activating the ***Mark Task as Milestone*** option from ***Task Information*** menu, ***Advanced*** section.

The situation in which a Milestone type activity has other duration than zero, it can be exemplified by the finishing phase of a **project** which is materialized by an approval

process that can take several days. This approval process can be planned as a **Milestone type activity** with a distinct duration from zero.

8.3.4. Estimating the activities' period of time by using the PERT analysis

To estimate the duration of **activities** it can be used the PERT Analysis, through which, for every activity, the optimistic, pessimistic, and the expected durations are introduced in. On their basis, **MS Project** will calculate a weighted average of these durations. This calculation is based on the weight allotting for the three possible developing scenarios: the pessimistic, optimistic and the expected one. Thus, the weight is allotting by default:

- 4 for the expected duration,
- 1 for the pessimistic duration
- 1 for the optimistic duration

The sum must be always 6 (for respecting the Gaussian 6σ probability distribution). In case of atypical situations, these values can be modified and thus the calculation will be well-balanced accordingly.
In order to make possible a PERT analysis in **MS Project,** firstly it is activated the corresponding buttons menu.
The ***PERT Analysis*** option is activated from the text ***View*** menu, the ***Toolbars*** submenu.
It is used the PERT analysis table by pressing the ***PERT Entry Sheet*** command (the first button from the left of the **PERT Analysis** buttons bar). In this table are introduced the 3 durations for each activity: the optimistic, pessimistic and the expected ones. In case the project is considered to develop closer than the pessimistic situation (optimistic), then the distribution weights can be modified in other way than implicitly by the ***Set PERT Weights*** command (the second button from the left of the **PERT Analysis** buttons bar).

The durations' calculation on the basis of PERT analysis is made by ***Calculate PERT*** command (the fourth button from the left of the ***PERT Analysis*** buttons bar).
To return to the ***GANTT Chart*** it is selected from the ***View*** text menu, the ***Gantt Chart*** option.

8.3.5. Interrupting an activity

In case a situation has to be interrupted (the necessary activity materials haven't arrived yet, the same resources are used simultaneously with other activity, a.s.o.) it is used the ***Split Task*** command from the ***Edit*** menu and then click on the **Gantt diagram** on the activity bar, the place where the interrupting activity is needed.

8.3.6. Creation and defying the calendar

In case a certain **activity** is developed in other way than the project standard calendar, then it will be defined a calendar for this activity, that will be assigned from the ***Task Information*** menu, the ***Advanced*** section.

8.3.7. Gantt diagram

At the same time with introducing the information in Gantt table, on the right side of the table it will be also automatically presented the corresponding diagram called **Gantt diagram**. In this diagram, the activities are presented in the bars shape whose lengths are direct proportional to the activity durations. In other words, the activities are presented graphically in a Gantt diagram, depending on time.
MS Project represents Gantt diagrams in multiple graphic formats, permitting the display on multiple information diagrams such as: the name of the activity, the dependent relations between activities, and the human resources allocated on activities a.s.o.

8.3.8. Dependencies between activities

Dependent relations can be established between two or many activities. These refer to the logical connections that can occur between activities regarding their time "placing". Those **dependent relation** types are presented in the following pictures.

If the activity is represented as a bar whose length is direct proportional to its **duration**, then the representation of these **dependent relations** for the 4 types is explained in accordance with the pictures.

Depending on the time scheduling of two **activities** between a **dependent relation** was established, it can also be defined a *s* parameter that refers to the **lag/lead** between the two **activities**. Its significance is presented in the picture below.

8.3.9. Defying task dependencies in MS Project

The defying of a task **dependency** between two **activities** can be made quickly by introducing in the ***Predecessors*** column the ***ID*** (no. of activity identification) corresponding to the activity the dependency is made with.

Another method for introducing the **dependencies** is found in the ***Task Information*** window, ***Predecessors*** section, according to the picture:

As it can be seen, it can also specify the type of the dependency and the lag/lead time.
An **activity** can have one or many dependencies with other activities.
The dependencies are established depending on the each activity signification and depending on its part within the project. Thus, it can result an intercourse between project's activities that can be defined by dependent relations. For each **dependency,** it will be established its type (meaning one of the 4 types).
Thus, after establishing dependencies for all activities, a logical distribution in time results, that in a **Gantt chart** is presented as in the picture below.

8.3.10. The constraints

A constraint is a limitation that refers to the start date or the finish date of an **activity,** a restriction that can be set on the start or finish date of a task. I can be specify that a task must start on a particular date or finish no later than a particular date.
It can be defined eight types of constraints in **MS Project** in accordance with the picture.
The constraint refers only to a certain **activity**.

The constraints can be defined in **MS Project** in ***Task Information*** window, ***Advanced*** section, in accordance with the picture.

As it can be seen, the constraint can be defined from the ***Constaint type*** and the ***Constraint date*** fields.

When planning the project according to the start, all activities to be defined will be constrained by default in an ***As Soon As Possible*** type.
If the date of starting is defined for an **activity**, **MS Project** automatically assigns a constrain of ***Start No Earlier Than*** type.
If the date of ending is defined for an **activity**, **MS Project** automatically assigns a constrain of ***Finish No Earlier Than*** type.

8.3.11. Adding Supplementary Information

In case you want to add supplementary information to a certain **activity, MS Project** gives you the possibility to write supplementary information in the ***Notes*** section, definition of the *hyperlinks* of attaching files.

Adding supplementary information to an **activity** can be done in the ***Notes*** section from the ***Task Information*** window.

To define a hyperlink for an activity, you should select the activity and than use ***Hypelink*** command from the text menu ***Insert***. In the window that will appear you can add the address of the person you want to get in touch with.

8.4. Planning project resources

After having identified the project's purpose, defined the **activities'** list, and the **duration** of the activities, you can make the preliminary estimates for determining the requests and identification of the resources for the activities defined above can be fulfilled with. The resources can be persons, equipments or materials necessary for achieving the activities in the project.
The resources planning stage contains the following steps:

8.4.1. Estimating necessary resources

Estimating and identifying necessary resources should be done only after taking into account the following steps:

- Re-analyzing the purpose and the list of project's **activities** will lead you to basic estimations regarding the resources.
- Gathering information about the previous similar projects by studying the actual projects data base.
- Analyzing the influence of the number of the resources on the activities' duration. In most cases, the duration of an activity is influenced by the number of the assigned resources. Meaning by this that, for instance, the duration of a production activity done by one person can be shorten to half if it is assigned to two persons.
- Analyzing the influence of the capabilities and experience of the available human resources.
- Updating the activities duration. By gathering supplementary information regarding similar projects you can update the estimations of certain activity duration.
- Identifying the type of the resources and the necessary quantities. According to the gathered information you can identify the necessary persons, equipments and materials and the quantities accordingly.
- Certifying the number of resources by an expert. Submitting the documentation for the necessary resources together with the estimations about the duration of an activity done by a member of an experienced and qualified staff in order to obtain a confirmation of the estimations that were already done.

8.4.2. Defining the list of the resources and the calendar of the resources

For entering the information about the resources you should activate the resources table. You can do this in **MS Project** by changing the work mode in ***Resource Sheet*** from the ***View*** in text menu.

As you can notice, the resource table contains several information regarding the resources. Thus, when defining a resource you can also enter information about:

- ***Resource Name*** – name of the resource
- ***Type*** – Type of the resource: in **MS Project** you can define the ***work*** type resources for human resources or equipment and ***material*** type resources for material resources.
- ***Material Label*** – for material resources, in this field you can enter the unit measure (e.g., for concrete, you will enter KG or Tone as a measure unit)
- ***Initials*** – initial of the resource name
- ***Group*** – name of the group the resource belongs to. For using the date base about the resources more efficiently, you can use this filed for cateogorizing each resource by the group it belongs to (e.g.: Production, Design, Consumables, etc.)
- ***Max. Units*** – for human resources or equipment type at maximum capacity the resource can work during the considered period of time. For instance, a resource can be available for work 50%, 100%, 300% of the total work time (full time). A person working 8 hours a day planned in the **project** with 50% **Max. Units** will be taken into account within the **project** with a maximum 4 hours a day. The values higher than 100% will be considered that there are more resources involved in the **project** at the same time (300% for the resource of mechanic type means using three mechanics).
- ***Std. Rate*** – payment standard rate per time for the resource working within the normal working hours.
- ***Ovt. Rate*** – payment rate per time for the resources working extra-hours.
- ***Cost/Use*** – for the cost of the resource for each time it participate to an activity. It does not depend on the worked hours.
- ***Accrue At*** – for assigning the costs of the resources. At the beginning, during or at the ending of the activity.
- ***Base calendar*** – for the normal basic calendar according to which a particular resource is going to participate to the **project**.

8.4.3. Resource Information Window

Entering information about a resource can be done by filling in the cells in the line in the ***Resource Sheet*** table or by activating the ***Resource Information*** window of the resource (double click on the resource line in the table). This window contains for important sections for entering the information about the resources:

- ***General*** section – general information (resource name, e-mail, initial, group, code, resource type, label, etc.);
- ***Working Time*** section – assigning the resource calendar;
- ***Costs*** section – defining the resource costs;
- ***Notes*** section – entering the supplementary information (notes)

For ***Costs*** window we should mention that for the selected resources you can define several payment rate for the A, B, C... sub-sections. This means that o resource is

paid different during the project according to the activities the resource participates to.

8.4.4. Assigning/distributing the resources to the projects

A resource barely participates to only one **project** from the start to the end without having other responsibilities. This is the reason it is difficult to distribute the resources to more than one project.

8.4.5. Assigning the resources to activities

For assigning the resources to activities you should activate ***Gantt Chart*** mode from the ***View*** in the text menu. For each activity you can assign resources by selecting the resources you want in ***Resource Names*** column or in ***Task Information*** window in ***Resources*** section.

Thus, for a certain **activity** you can assign one or more resources, and define the quantity (***Units***) for each of them.
When assigning the resources to an activity then **Gantt diagram** will indicate for each activity assigned resources (resource number, etc).

8.5. Planning project costs

This stage contains three steps as shown in the picture below:

8.5.1. Estimating project costs

By estimating the **costs** you can identify the resources and/or the necessary **costs** for fulfilling the activities of the project.
It is also necessary to follow successive logical steps for this stage as follows:

- Searching and analyzing the similar projects data bases regarding the **costs**.
- Entering information about costs
- Revision of the planned costs
- Optimizing the costs

Entering the information about the costs means:

- Entering the **costs** of the resources as installments (standard or extra-hours) or
- as fix **costs** **cost-per-use** (for ***work*** type resources a **cost** will be assigned each time the resource is used and for the material type resources the cost will be assigned without taking into account the units).

These information about costs can be entered directly in the ***Resource Sheet*** table or in the ***Resource Information*** window.

8.5.2. Entering activities' costs.

In case you want to assign a cost to an activity you can do it by using the *Cost* table activated in ***View*** *in* the text menu in the ***Table*** sub-menu (***Gantt Chart*** work mode).

Revising the planned **costs** refers to reviewing the total **costs** displayed by criteria as:

- Distribution of the costs acc. to activities. In the ***Cost*** table from ***Gantt Chart*** you can view details regarding the distribution of the costs for activities (see picture above).
- Distribution of the costs acc. to resources. In the ***Cost*** table from ***Resource Sheet*** you can view the costs distributed acc. to resources as shown in the picture below.

8.5.3. Defining and distributing the costs

After entering all information about the **costs** the following step is to save it as project's budget before managing it. In this stage you can:

- add supplementary informative notes about the budget (use ***Notes*** sections from ***Task Information***, ***Resource Information***);
- communicate the budget to other persons who are involved;
- export the information about the budget to other application that may use it (company's financial software, etc.);

8.5.4. Preparing costs management

During this stage you can set:

- the date of starting the fiscal year (***Tools***, ***Options*** in ***Calendar*** section);
- control of the calculation methods for the **costs**. You can check and personalize several options regarding the methods to calculate the **costs** in ***Tools*** menu, ***Options*** – ***Calculation*** section.

Defining the methods of accumulating the **costs** (at the begining, during and at the ending of the activity). You can control folowing the ***Accrue At*** column in ***Resource Sheet*** table.

8.6. Planning quality and risks

In this stage you can identify and apply the quality standards to be complied with in order to accomplish all project requests as well as the way they influence the purpose of the **project**.

8.6.1. Complying with quality standards

Complying with the quality standards means:

- Applying quality standards of the company, on the basis of company's quality policy.
- Complete description of the product or the service provided by the project. Thus, you can identify a series of main elements to compare all other similar elements to during project execution in order to check the compliance with such standards.
- Applying the quality standards associated with the category the product or the service belongs containing the results of the project.

8.6.2. Consideration about quality standards

How the purpose is influenced by the quality standards is one of the main issue of the project. In this stage you should take into account the following matters:

- Purpose impact over quality. Thus, you can diminish the purpose in order to comply with the project due date or with the set budget. Another situation that may occur is that after accomplishing the project plan you may still have time and money left. You can change the purpose of the project for both situations. But when changing the purpose you should take into account the quality as well. When diminishing the purpose you get a lower quality and the opposite.
- Changing the purpose of the activities. Usually, when changing the purpose of the activities, you eliminate activities or reduce their duration. Such change can have a bad influence on quality due to the fact that you assign less activities or time in order to get a set result.
- Changing the resources quality. If you try decreasing the costs of the project, one of the solution may be replacing the more expensive resources with less expensive ones. This solution influences the quality as well.

8.6.3. Identifying and planning the risks

After starting a project, events hardly to predict can appear and can add new risks concerning the project progress. Therefore planning for risks identification and reducing suppose to take in account following aspects:

- Planning alternative plans (for emergency situations). It means building plans for risk management (list of potential risks, solutions for reducing them, what risks can be ignored so on). In this way it is possible to:

- Identify high risk tasks
- Identify budget risks
- Identify resources risks

Consult with others resources to identify risks

Insert risk probability (MS Project permits defining of new custom fields about risks and it can apply different formulas based on that)

8.7. Optimize project plan

After planning the **activities**, the resources and the **costs** the user can start applying the optimization methods.

8.7.1. Optimize after the achievement date of the project

The user is supposed to follow the steps as shown below:

8.7.2. Critical path. Critical activity

For a better understanding of the way this optimization can be done by using **MS Project**, we will offer you the fundamentals for consideration. Thus, the figure below illustrates the notions of **critical way** and **critical activity**.

8.7.3. Techniques of planning activities

Further, we will approach the fundamental aspects of the techniques of planning the activities in the project management.
The most known techniques of planning the **activities** are illustrated in the figure below.

8.7.4. Planning calculation

The planning uses critical method technique witch is based on two **calculation** systems: **direct** and **inverse**. We present you the following notions:

We considered that an activity is represented in time as a bar the endings of which can be as follows:

- ES- early start – the earliest start
- LS-late start – the latest start
- EF- early finish – the earliest finish
- LF- late finish – the latest finish

8.7.5. Direct calculation

Direct calculation is specific to the projects that are planned by their starting date as it is shown in the figure below:

Direct calculation example:

8.7.6. Inverse calculation

Reverse calculation is specific to the projects that are planned by their finishing date as it is shown in the figure below:

8.7.7. Total float

The total float in **MS Project** is also called *Slack*.

8.8. Optimize the project plan for resources

This perfecting type is made after achieving the project plan, and then, the revising of allocated resources is needed in order to identify **the super-allocated resources** or the sub-allocated ones.

8.8.1. Visualization of the resources allocations in table view

In order to do this, it is chosen the ***Resource Usage*** option from the ***View*** text menu. This way of visualizing under table shape represents the activities it participates in for every resource. It is specified the work quantity allocated to the respective resource for each **activity** (for example the no. of working hours). It can be visualized the distribution of these working hours in time on the right side of the table (no. of working hours allocated on the working days of the calendar).

The red resources are **super-allocated resources**. Right beside them, on the ***Indicators*** column it is marked a yellow exclamation mark rhombus inside of it that indicates the fact that this super-allocated resource should be leveled.

The black resources are sub-allocated or allocated resources at their maximum capacity.

8.8.2. Graphic visualizing of resource allocation

This is made by choosing the ***Resource Graph*** option from the ***View*** text menu.

This way of visualizing indicates, under the bars graphic representation shape, the distribution of the allotting work for a resource depending on the time unit. Thus, in case of a **super-allocated resource** red bars will appear indicating the work quantity that exceeds the maximum limit (*max units*) in that period of time.
The blue bars indicate the allocated work quantity for an equal period of time or under the maximum limit of the resource.
To navigate from one resource to another, the scroll-bar or ***Page Up*** and ***Page Down*** keys can be used.

8.8.3. Visualization of resources usage

To visualize the use of resources in **activities,** it can be also used the ***Resource Usage*** mode of visualizing from the ***View, More Views*** text menu.

By selecting a resource from the ***Resource Usage*** table, the **Gantt diagram** will be displayed, in the inferior part of the table, along with the **activities** the respective resource was allocated in. Thus, the details concerning the resources and the **activities** can be visualized in a single visualizing mode.

By using these visualizing modes, the super-allocated resources can be identified easily. As a completion, the emphasis of these resources can be also made by using the corresponding filters.
For example, in ***Resource Sheet*** visualizing mode from the buttons menu, the criterion, after which the resources will be displayed, is chosen from *Filter*: ***Over allocated Resources*** (the super-allocated resources):

These filters can be defined in a similar mode for each visualizing mode in part.
The identification of the resources that remained available for the **project** can be made, for example, in the ***Resource Usage*** visualizing mode, ***Format*** text menu, ***Details*** sub-menu, and from here the ***Remaining Availability*** is selected**:**

The solving of the **over allocated resources** by planning the working time outside the ordinary calendar (overtime work).
Implicitly **MS Project** calculates the necessary work in achieving an **activity** using the ***standard rate*** on time unit for every allocated resource. To take also into account the rate outside the ordinary working calendar (***overtime rate***), it has to be planned the working time outside the ordinary working calendar.

8.8.4. Planning overtime work

The visualizing mode ***Task Usage*** is selected from the ***View*** text menu. From the ***View*** menu, ***Table*** sub-menu is chosen out of which ***Work*** is selected. The column ***Work*** is selected and the ***Column*** command is chosen from the ***Insert*** menu. In ***Field Name*** option, ***Overtime Work*** is chosen and then press ***OK***. As a consequence, a column has appeared in ***Task Usage*** table, ***Overtime Work***, in which the planned working time outside the standard calendar for a certain activity can be inserted in.

8.8.5. Solving supra-allocated resources

For the **project** plan to be perfected in relation with the resources implicated in the **project,** it has to be solved the problems generated by the **supra-allocated resources**. For this to accomplish, the solutions suggested in the picture below can be taken into account.

8.8.6. Solving supra-allocated resources by leveling

One of the methods offered by **MS Project** for solving the **supra-allocated of the resources** is that of ***leveling***. By leveling the resources conflicts or delay supra-allocated or the interruption of certain activities are solved. As a consequence, the leveling can also modify the finish date of the project. By leveling the allotting of the resources on activities isn't modified and the type of material resources isn't affected. In other words, the leveling affects only the working type resources (***work***): persons or equipments.
Because one of the factors that affect the **leveling** is represented by the activity priority, before starting the leveling, the corresponding priorities to each activity should be introduced in. For this to accomplish, from the ***Task Information*** window, ***General*** section, the priority is introduced as a number between 1 and 1000. The more the value grows bigger, the more the priority grows bigger, too.

8.8.7. Leveling in MS Project

In order to activate the leveling, it is used the ***Level resources*** command, from the ***Tools*** menu. A window will appear in accordance with the picture below.

The leveling process can be done automatically or manually. Thus, if the automatic leveling is selected, then the resources will be leveled automatically with the changes made during the planning. If the manual option is chosen, then the leveling will be done only when the ***Level Now*** command is activated.
When the leveling is made by ***Clear leveling values before leveling*** option, the aprioristic delays and the interruptions will be eliminated.
Another option is the one of applying the leveling on the whole **project** duration or just partially.

8.8.8. Factors that influence the leveling in MS Project

As it is noticed, many factors are taken into account in leveling. Among the most important, there are those presented in the picture below.

In order to make the leveling, it has to be known after which criterion the **activities** will be delayed or interrupted to resolve the resources conflicts. Thus, firstly **activities** that generate resource conflict are identified, and then it is decided which of the activities will be leveled.

8.8.9. Leveling alternatives in MS Project

MS Project suggests 3 leveling alternatives:

Other solutions that may be taken into account in order to solve the resource conflicts:

- The available resources control to work in the project. Thus, the standard working calendars or the calendars for each resource can be revised. Thus, the time allocated can increase and the quantity of working time allocated to the project increases, too.
- Modifying the **activities** duration. Thus, the duration modification affects
    - the finish date of the project,
    - **the super-allocated resources**
    - **the expenses**
    - the purpose
    - the quality
- Delaying the **activities** until their allocated resources have the necessary time to achieve them. In this situation, it has to be taken into account the **total float** of the **activity** that is delayed (if this allowance is positive, then the activity is non-critical and it can be delayed without affecting the finish date of the project and if the **total allowance** is zero, then **the activity is critical** and its delay will be late and the finish date of the project, too).
- Interrupting the activities. In case of a resource conflict, the lower priority activity can be interrupted. The activities interruption can also be made by modifying the corresponding calendars of the activities. For example, it is declared as a non-working period the duration needed for the **activity** to be interrupted.

8.8.10. The sub-allocated resources

Another problem in perfecting the project on resources refers to the sub-allocated resources. In this way, the more efficient use of the resources has to be looked after and that is why the following solutions can be taken into account:

- Eliminating the working time outside the standard calendar (***overtime***)
- Planning the sub-allocated resources to other activities;
- Adjusting the allocated time to a resource for an **activity**
- Modifying the activity **durations.**

8.8.11. Informative comments

In the perfecting process on resources it don't have to be neglected the additional information, that has to be taken into account. In this way, informative comments can be introduced in **MS Project** at the activities level (***Task Notes***), at resources' (***Resource Notes***) or at the level of assigning the resources on activities (***Assignment Notes***).

8.8.12. Evaluation of optimization results

This evaluation means the glance of the following aspects:

- Verifying the sub and super-allocated resources one more time
- Revising the and the project **expenses**
- Spotlighting the **critical way**
- Spotlighting the mode in which the implied resources affect other projects

By spotlighting the critical activities in **MS Project,** the mode of visualizing the ***Detail Gantt*** is activated from the ***View*** text menu, ***More Views*** sub-menu. Other method represents the use of the corresponding filter: ***Critical***.

8.9. Optimizing the project plan to meet the budget

Such optimization refers to the situations when the planned costs according to the project plan don/t comply with the project budget. Consequently, all aspects related to the budget must be reconsidered. We should also mention that by modifying the budget, according to the triangle theory of the project, the other two components of the project are also affected: the project's duration and purpose.
We will present the steps to be followed for optimizing the **budget.**

8.9.1. Reconsidering The Costs

The **costs** of the resources that are assigned to the related activity should be reconsidered first, and then the total costs of the project. For achieving such objective, the user should have in view the three costs assignments:

- Viewing the costs assigned to a specific activity: the **activities' costs** table activates in the ***Gantt Chart*** view mode from the **View** text menu, and then selecting ***Cost*** in the ***Table*** section.
- Viewing the costs assigned to the resources: the costs by resources can be viewed in the ***Resource Sheet*** viewing mode from the **View** text menu, and then selecting ***Cost*** in the ***Table*** section.
- Viewing the total costs of the projects: by choosing the ***Project Information*** from the ***Project*** text menu. In this window the user should press the ***Statistics*** button for opening a new window as the one shown below:

8.9.2. Optimizing The Plan Of The Project In Order To Reduce The Costs

In case the estimated costs are higher than those under the budget, some action must be taken in order to reduce the **costs**. Taking the following action can do such reduction:

- Reviewing the planning of the resources:
    - Modifying payment installments assigned to the resources. For accomplishing this objective, the user should put into effect the modifications to all payment installments assigned for the resources of all the **activities** that are involved or should differentiate the installments by the activities.
    - Choosing less expensive resources.
    - Eliminating the assignment of some resources by certain **activities**. This is the case the user finds that, in order to accomplish the activity, he/she needed less resources than planned initially. Reviewing the time assigned for the resources by the **activities**.
- Reviewing the planning of the costs:
    - Reducing the costs by modifying ***standard rate***, ***overtime rate*** and ***cost per use***
- Reviewing the purpose of the project in order to comply with the budget.

8.9.3. Optimizing The Plan Of The Project In Order To Increase The Budget

This is the situation when the **costs** that had been initially planned lead to a lower budget than the estimated one or the estimated time is not sufficient compared to the real one. In this case, the user can take the following action:

- Discussing to the beneficiary. The beneficiary can decide whether to finish the **project** sooner than estimated and he/she can decide how to use the remaining time and budget.
- Verifying the contract in order to identify possible provisions describing the situation the project should be finished sooner or the **budget** is lower.
- Improving the purpose of the **project**. If there is some extra time or money the user can improve the purpose by adding some more stages and activities.
- Increasing the quality standards.

8.10. Distribute the project plan

During this stage the user should follow up the distribution of the information related to the **project** to the team members working for the **project,** as well as to other persons who have the right to have access to such information.

8.10.1. Spreading the information as written materials

For such materials, **MS Project** offers solutions for creating written materials:

- Printing different viewing ways:
    - ***Calendar*** – planning the **activities** as a calendar
    - ***Gantt Chart*** – **charting the Gantt** of the **activities**
    - ***Network Diagram*** – project network diagram
    - ***Task Usage*** – distribution of the resources by **activities**
    - ***Resource Graph*** - graphical presentation of the work distribution by resources
    - ***Resource Sheet*** – table of the resources
    - ***Resource Usage*** – distribution of the **activities** by resources
    - ***Task Sheet*** – the table of the list of the activities with their starting and finishing date, and the related assigned resources.
- Printing the information regarding the **project** as reports. **MS Project** allows the user to print reports of many types. In this respect, in the ***View*** text menu, the user should choose the ***Reports*** option for opening a new window as shown in the figure below:

8.10.2. Reports containing general Information regarding the project

Reports containing general information regarding the **project** of which the user can choose one of the following reports:

8.10.3. Reports containing information regarding the activities of the project

Reports containing information regarding the **activities** of the project of which the user can choose one of the following reports:

8.10.4. Reports regarding the costs

Reports regarding the **costs** of the project of which the user can choose one of the following reports:

8.10.5. Reports regarding the planning of the project

Reports regarding the planning of the project of which the user can choose one of the following reports:

8.10.6. Reports regarding the project's charges

Reports regarding project's charges of which the user can choose one of the following reports:

WE should also mention that for accessing the section regarding the reports the user should install a printer driver the system the **MS Project** runs on.

8.10.7. On-line distribution of the information regarding the project

One of the **MS Project** integrated methods for distributing information on-line is the one provided by the MS Project Server. Thus, the information are distributed among the members of the team using the server. Accessing the information is secure and the MS Project Server administrator sets the access rights of the members.

Another way of saving information regarding the **project** is saving the as a WEB page. For doing this, the user can use ***Save As Web Page*** command in the ***File*** text menu. The user should further follow several steps for specifying the details regarding the information to be exported in WEB format.
By the basic fields in the database to be exported as WEB pages, in the third stage the user should enter the data category (regarding the activities, resources or responsibilities) and in the fourth stage – the user should identify the fields.
In the final stage, the user obtains a file in *.html format that can be viewed by any Internet browser.

Starting with this export solution, the user can define different procedures for publishing the information regarding the project containing the company's information system. In this respect, the user can use solutions for available Internet Intranet or Extranet network.

8.11. Tracking and Managing the Project

This stage refers to the fact that the plan of the project is ready and the project can start to run and, as a consequence, the user can start following up and **managing the project**.
The following figure illustrates the steps to be made within this stage:

8.11.1. Tracking and controlling the progress of the activities – baseline project

After finishing the planning process of the **project**, the next step is to save the reference project plan (*baseline plan*).
The base line plan is the initial plan of the **project** that can be used as a base line plan (compare) for following up **project's** evolution. This is in fact a choice for planning the project when saving it as a base line plan which contains information regarding:

- **Activities** (starting, finishing date, duration, work, costs, work time)
- Resources (work, costs, work time)
- Assignments (starting, finishing date, duration, work, costs, work time)

By using MS Project the user can save several versions of a baseline plan (maximum 11 versions).

8.11.2. Tracking and controlling activities' evolution – saving a baseline plan

Save Baseline command in ***Tools*** text menu is used for saving a baseline plan, the ***Tracking*** sub-menu. A window will display as shown below:

The user can select a baseline project version in this window (maximum 11 versions) using ***Save baseline*** command and selecting ***Entire project*** using ***For*** command. As it is shown in the window above there is also the possibility of saving a partial baseline regarding the selected **activities** (***Selected tasks***).

8.11.3. Recording activities' progress

Once the project was started, it should be followed up and, consequently, information regarding the progress of the **activities** should be gathered. This can be achieved by discussing with the team members involved in the activities.
The ***Task Sheet*** is selected from the ***View*** menu, the ***More Views*** sub-menu. After that, Tracking is selected from the ***View*** menu, ***Table*** sub-menu. The table will be displayed according to the picture:

8.11.4. Indicators for recording the activities' progress

By the way the evolution of the project is followed up, using indicators can do recording the progress of the activities:

Recording the percentage of accomplishing the activities
If the user knows the percentage of accomplishing the **activities**, the percentage can be entered in the table above in the ***% Comp*** column.

Recording the actual durations of the activities
In case the user knows such actual durations of the **activities'** progress, he/she can enter them in the table above ***Act. Dur*** column.

Recording the actual starting and finishing dates of the activities
In order to follow up the starting and finishing dates of the activities, the user can enter them in the table above in the ***Act. Start*** and ***Act Finish*** columns.

Recording the actual effectuated work quantities
In case the user knows the effectuated work quantity for each **activity,** he/she can enter them in the *Actual* column in the ***Work*** table regarding ***Task Sheet.***

8.11.5. Following up the progress of each activity in gantt diagram

After entering the information regarding the following up of the **project's management**, **MS Project** displays a part of these indicators as shown above. For instance, the figure below displays the way the user can view the progress of each **activity** on the **Gantt diagram** (black bars over the blue ones).

Bibliografie

1. *****, Microsoft Project 2000, Documentaţia Help a aplicaţiei software.
2. Chatfield C., *Microsoft Project 2000 Step by Step,* Editura Microsoft Press, ISBN 0735611211
3. Conway K., *Software Project Management,* Editura Coriolis, ISBN 1576108074
4. Friedlein A., Web *Project Management,* Editura Morgan, ISBN 1558606785
5. Schwalbe K., *Information Technology Project Management,* Editura Course Technology, ISBN 076001180x