

The analysis of the functionality of modern systems, methods and scheduling tools

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Abstract. Calendar planning is a key tool for efficient management applied in many industries: power, oil & gas, metallurgy, and construction. As a result of the growing complexity of projects and arising need for improvement of their efficiency, a large number of software tools for high-quality calendar planning appear. Construction companies are facing the challenge of optimum selection of such tools (programs) for distribution of limited resources in time. The article provides analysis of the main software packages and their capabilities enabling improvement of project implementation efficiency.

1 Introduction

The method of area development by building complexes is used in Moscow nowadays. Also, the building of the central part of the city is actual too. Often it includes reconstruction and restoration adapted for housing or commerce of existing buildings. The increasing competition is observed in modern conditions, so the technical customer must organize the building production effectively. It will enable to realize the maximum benefits at minimum costs of time and resources. Besides that, the failure of the construction period is a serious problem in construction today. It leads to increasing costs of the project implementation and consequently to the profit's loss of construction participants. The construction of complex of objects requires long-term planning and so appears the problems of formation of long-term construction flows, which includes the issue about the optimization of priority development of objects of the construction flow. Therefore there is a need for tools, that allows to select the optimal sequence of construction, which is resistant to distributing factors at the same time. Currently the solution of this issue is only at the level of methodological foundations, which are quite general in nature. Therefore, there is a need to solve the problem, which is focused on modern instrumental-based scheduling. [1]

Scheduling refers to the fundamental principles of management and it is used in many industries, such as: energy, oil and gas sector, metallurgy, construction. The reason for the development of scheduling is the increasing complexity and the need in upgrading of

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effectiveness of their implementation. The task of the optimal allocation of scarce resources in time is faced before the construction companies.[6]

Investment-construction project is a complex system, which moves from one condition to another through the life cycle. These conditions are called as phases of project. Each phase has its own characteristics and risks. That's why the scheduling problems differs for each phase. [2]

The initial phase (pre-investment phase) – is characterized by the fact, that there is no accurate information about the project. Only aggregated indicators can be known, and only the general conception of the project can be presented. In this phase the scheduling solves the following tasks: the assessment of the project's effectiveness and feasibility, the timing of the project and its cost, the drafting of the investment process.[4]

The investment stage (the main stage of project) includes the negotiation and conclusion of contracts, design, construction, marketing. Scheduling allows to obtain the optimal tender offer, when the trades are carried. It allows to solve the following tasks: development of the condensed schedule of works, the schedule of funding, the statements in need of human and material resources [6]

2 The analysis of the functionality of modern systems

In terms of planning it can be divided into two stages: project development and control over its execution. The tasks of the first stage includes defining the scope of work, development of work and cost calendars, development of timetables, resource assignment, calculation and optimization of the target dates, making schedules of workforce and schedules of machines and mechanisms, the formation of the schedule of material procurement and material's delivery, defining the costs on different stages and risk assessment. [2]

In accordance with the tasks, which are lying ahead scheduling nowadays, there are many modern systems, which should have the following capabilities:

- The creation of organizational-technological scheme;
- Mean of calculating, according to the method of the critical path;
- Means of resource scheduling;
- Means of monitoring of the project's implementation process;
- Tools for creating reports and graphical presentation of the project structure;
- Means of cost analysis.

Means of creating of the organizational-technological scheme includes:

- The description of the global planning parameters of the project;
- The description of the structure of complex of works;
- The support of the project calendar.

Means of resources and costs planning for individual works and about the whole project includes:

- The support of resource calendars;
- Resource assignment;
- Scheduling with limited resources;
- Maintain a list of resources and cost items.

Means of verification of the execution process includes:

- Fixation of planned parameters of the project schedule;
- Input real indicators of assigned tasks;
- Comparison of planned and actual indicators;
- Forecasting the performance of future works.

Tools for creating reports and graphical representation of the project structure includes:

- The Gantt chart;
- The network diagram;

- PERT chart (Program Evaluation and Review Technique).

In ninety fifty eight was created (1958) a technique of PERT-method analysis of time for each individual task and for minimum time of the project at whole for countering the uncertainty.

The most common part of PERT is the critical path method, which was appeared at the end of twentieth century. It's novelty lies in the fact, that the timing of the project's phases are cut by fifty per cent, which means that fifty per cent probability of their achieving are established. Also the possibility of the parallel using of resources excludes, and with help of the buffers of resources the critical chain protects from non-performance of terms. However, if you turn to major projects, you will see, that method failed, because the terms were exceeded and the budget increased. In result, the shortcomings were revealed. For example, the project manager, who knows, that the timing of the project is artificially increased (resource buffers), allows you to waste time, and as a result, the failure of the timing happens when the problem occurs.[4]

Methods of resource scheduling allow us estimate the project's completion time, project's costs and build the optimal resource schedule and control the state of affairs.

In the basis of the first programs for project management, which have appeared about forty years ago, the algorithms of the network planning and calculating of time parameters of the project on the critical path method were lying. These programs allow to calculate early and late stages of the project and display them on the Gantt chart. In the future, with help of the development of information technologies, the systems were supplemented with resource and cost planning and with means of monitoring the process of works.[5]

Currently, there are many software packages on the market, that are divided into professional and "desktop" (non-professional) The difference between them consists in the complexity in use, because the professional programs requires time-consuming, but they are able to provide more flexible results while the non-professional can be used single. You can obtain enough informative result without spending a lot of time and effort. [2]

In addition to universal programs, the additional software packages became common in the last time. They allow to approach to the project in more individually way. They solve such tasks as:

- Risk analysis, planning the best risk management strategy (PalisadeCorp@RISK);
- Scheduling with accordance with the objectives, calculation of wages (HMSSoftwareTimeControl);
- Scheduling with limited resources (ParsifalSystemInc.BestSchedule for Project);
- The integration of management system into the corporate systems (MarinReseachInc.Project Gateway, Time Line Solutions Corp. Project Management Integrator etc.).

The most common universal professional software packages, which costs more than one thousand dollars, are: Artemis Project View, Open Plan Professional, Primavera Project Planner.

Among non-professional universal software packages the most frequently are: OpenPlanDesktop, Project 98, ProjectScheduler, SuperProject, Time Line.

The result of the choice of a program depends on the outcome, which you want to achieve. Let's consider the main features of individual software packages.

Open Plan Professional belongs to a category of professional software packages and accordingly has powerful tools for resource and cost planning. In this regard it is recommended to use for large projects, which requires detailed planning and integration with other automated system in the organization. The program allows to create the hierarchical structure of resources and allows to perform the automatically assign of resources for the tasks in accordance with their qualification. Also, here is an opportunity to

analyze risks, access their likelihood and consequences according to possible delays in delivery of the materials. Also you can analyze the budget overruns. [3]

TimeLine belongs to the category of “desktop”, but it has a fairly powerful tools of working with resources, including means of alignment of overload resources, the possibility of describing a specific schedule of resource’s work. The program provides the opportunity to add any indicators and thus to set the model of the project in accordance with the required needs. However, TimeLine doesn’t have enough flexibility, because it doesn’t allow to generate the hierarchical structure of resources, in contrast to the professional program, which was described before. [3]

Microsoft Office Project represents the best set of tools to manage the projects. This program is one of the most common on the market today. Microsoft project allows to managers the possibility to control the scheduling and resources in dynamic, monitor the project status and analyze the data. Besides that, with help of integration of this program with Microsoft Exel or Outlook, it is possible to convert tasks into schedules.

Primavera Project Planner is a professional software product. It used for large projects. Besides the ability of the monitoring resources and performance control, the program allows to manage a group of projects, distribute the information in a multiuser environment and manage the complex projects. Also, it is possible to conduct the analysis “what-if”, enter and update data with help of the PERT view and with calendar and network schedules. The program is easy to use, because it involves the integration into any corporate structure. [3]

DefSmetaLight is used in small organizations and prefers the following tasks: drafting or reviewing of estimates on the base of estimate-normative base, which was adopted in two thousand one; also with help of this software product you can perform the operational planning of financial costs and the consumption/supply of resources during the project execution. Besides this program, there are similar software packages.

Microsoft Enterprise Project Management was designed for using in large companies. Due to the fact that the information is stored in a single database, you can link the projects between themselves; plan the supply of resources with giving the fact that they can be used in other projects. Moreover, you can control the implementation of the project with help of this program. Also, it allows to users to enter extra information and allows to manage the document circulation on different levels. Many companies besides the independent software packages produce the scheduling programs, which are implemented only in certain software applications. For example, there is a set of components like TMSPlannerComponents, which let to implement scheduling functions in the applications, which are developed with help of means likeDelphyVCL+VCL.NET. [2]

3 Conclusion

Many companies use tools of scheduling, which are oriented on the work in the internal LAN. One scheduling programs operate with resources, like personnel equipment, the other makes charts. One of these products is a program WelcomHome. It provides interaction of all project participants and helps to plan and control projects in real time.

So, as a result of conducted analysis, the following conclusions can be done:

1. There are many modern ways, methods and means of scheduling, which allow to solve various tasks and which give to the methodology of scheduling the constant growth and improvement (this is an attribute of the dynamic).
2. There are many universal software systems, single programs and applications which have been already designed. They allow to solve general and specific scheduling tasks.
3. Each project has it’s own specific and there is a need to develop algorithms, which can solve specialized tasks with possibility of including them into integrated systems.

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