METHODS OF PROJECT MANAGEMENT FOR THE DEVELOPMENT AND IMPLEMENTATION OF INFORMATION SYSTEMS

Kravtsova V.S.

Belarusian State University of Informatics and Radioelectronics, Minsk, Republic of Belarus

Klokova A.G. – Cand. of Sci., associate professor, head of the department of foreign languages

Alekseev V.F. – Cand. of Sci, associate professor of the department of design of information and computer systems

Annotation. A study was conducted on the application of mathematical methods in project management for the development and implementation of information systems, with an emphasis on their role in improving efficiency, improving decision-making and reducing project execution time.

Keywords: project management, information systems, network planning, mathematical methods

Introduction. The active development of information technologies and their role in modern business make project management in the field of information systems an integral part of a successful corporate strategy. Decisions are often made based on the current situation, based on the experience and intuition of the manager, without paying attention to the optimality of the results obtained. However, in many cases, it is necessary to justify decisions using the means and methods of management science and operations research.

This article is devoted to the study of the application of mathematical models in project management for the development and implementation of information systems, with an emphasis on their role in increasing efficiency, improving decision-making and reducing project execution time.

Main part. Currently, network methods and models are the most effective, on the basis of which network planning and management (SPM) methods have been created. Such systems are designed to manage objects of a special type and complexity, called complexes of interrelated works, commercial operations, and developments that require clear coordination of the interaction of many performers. In such cases, SPM is essentially the only possible method of scientific planning and management for the implementation of large-scale work with a high probability of meeting the specified deadlines for their implementation, which is their main advantage.

A network model or network graph is a model that shows the sequence of all work and their interrelationships. The basis for building a network is based on three basic concepts: work, event and path.

The calculation of the network schedule consists in determining its design parameters: the duration of the critical path; the early start and end of all work, the late start and end of work; time reserves.

Network planning methods are used to optimize the planning and management of complex branched work complexes that require the participation of a large number of performers and the expenditure of limited resources.

The main goal of network planning is to minimize the duration of the project.

The task of network planning is to graphically, visually, at the system level, display and optimize the sequence and interdependence of works, actions or activities that ensure timely and systematic achievement of final goals.

With the help of a network schedule, the head of work or operation has the opportunity to systematically and on a large scale represent the entire course of work or operational activities, manage the process of their implementation, as well as maneuver resources.

Let's consider network planning methods.

In project management, the project evaluation analysis method, or PERT, is used to determine the time required to complete a specific task or action.

It is a system that helps in the proper planning and coordination of all tasks within the project. It also helps to track the progress or lack thereof of the project as a whole.

Knowing the time required to complete a project is crucial because it helps project managers make decisions about other factors such as budget and task delegation. No matter how big or small the project is, estimates may be overly optimistic or pessimistic, but using a PERT chart will help determine realistic estimates.

The result of network planning using the PERT method is a network diagram.

The nodes of the diagram represent events that indicate the beginning or end of actions or tasks. The directive lines indicate the tasks that need to be completed, and the arrows show the sequence of actions.

There are four definitions of time that are used to assess the project's time requirements: optimistic time (O) − the least amount of time that a task can take to complete; pessimistic time (P) − the maximum time required to complete the task; most likely time (M) − assuming there are no problems, the best or most reasonable estimate of how long it will take to complete the task; expected time − if there are problems, the best estimate of the time required to complete the task.

As a rule, three-time estimates (optimistic, pessimistic, and most likely) for each action on the critical path are used to conduct PERT analysis.

Then use these estimates in the formula below to calculate how much time is required for each stage of the project: $CP = (P+4M+O)/6$ (1)

Figure 1 shows an example of a tabular representation of a network graph using the PERT method.

Task	Optimistic (O)	Most Likely (M)	Pessimistic (P)
Task A	2 Wks	4 Wks	5 Wks
Task B	1 Wks	2 Wks	3 Wks
Task C	2 Wks	3 Wks	4 Wks
Task B	3 Wks	5 Wks	8 Wks
Completion	**8 Wks**	**14 Wks**	**20 Wks**

Figure 1 – An example of a three-time schedule

Figure 2 shows an example of a nodal PERT diagram of a critical path (highlighted with a dotted line). For this case, the critical path is 4 days.
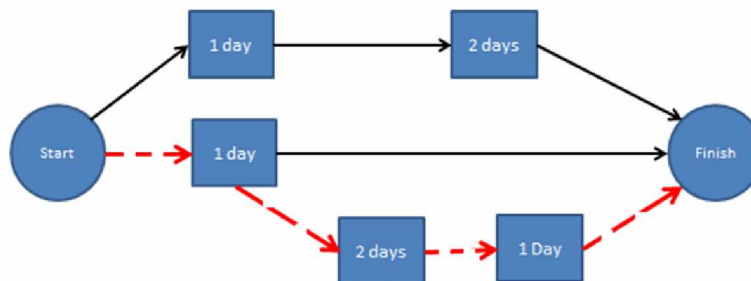

Figure 2 – An example of a nodal PERT diagram of a critical path

Understanding the possibilities regarding the flow of project resources and milestones allows management to achieve the most effective and useful project path.

Gantt Chart – it is a project management tool that helps in planning and scheduling projects of any size, although they are especially useful for simplifying complex projects.

Project management deadlines and tasks are converted into a horizontal bar chart that displays the start and end dates, as well as dependencies, schedule and deadlines, including which part of the task is completed at this stage and who is the owner of the task.

This is useful for tracking tasks when there is a large team and multiple stakeholders when the amount of work changes.

Since the Gantt chart is presented in a histogram format, it provides a visual display: the whole project; deadlines and deadlines for completing all tasks; relationships and dependencies between different types of activities; phases of the project.

Project management solutions that integrate Gantt charts allow managers to see team workloads, as well as current and future availability, which allows for more accurate scheduling of project execution. The basic concept of a Gantt chart is to indicate which tasks can be performed in parallel and which can be performed sequentially.

If you combine this with the resources of the project, you can establish a compromise between volume (doing more or less work), cost (using more or less resources) and the time scale of the project.

By adding additional resources or reducing the volume, the project manager can see the impact on the end date.

To create a diagram, you need to know all the individual tasks required to complete the project, estimate how long each task will take and which tasks depend on others. An example of a Gantt chart is shown in Figure 3.

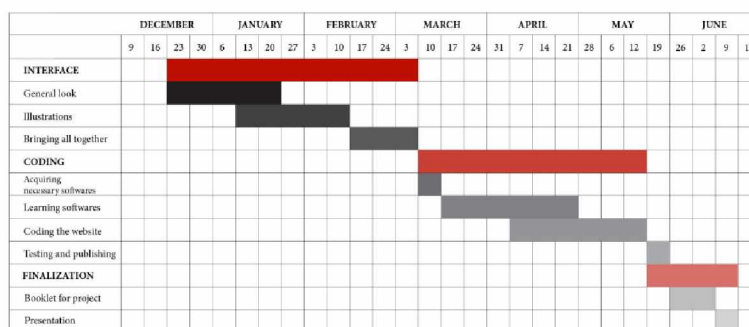		DECEMBER				JANUARY			FEBRUARY			MARCH			APRIL			MAY			JUNE		
	9	16	23	30	6	13	20	27	3	10	17	24	3	10	17	24	31	7	14	21	28	6	12	19	26	2	9	16
INTERFACE																												
General look																												
Illustrations																												
Bringing all together																												
CODING																												
Acquiring necessary softwares																												
Learning softwares																												
Coding the website																												
Testing and publishing																												
FINALIZATION																												
Booklet for project																												
Presentation																												

Figure 3 – Gantt Chart

The very process of collecting this information helps the project manager to focus on the main parts of the project and begin to set a realistic time frame for completion. Since everything is displayed visually, you can immediately see what should have been achieved by a certain date, and if the project is behind schedule, you can take measures to return it to normal.

Conclusion. In the course of the study, various mathematical modeling methods used in project management were considered. CPM/PERT methods allow you to effectively plan the project execution time and identify a critical path. Considering the rapid pace of technology development and constant changes in the field of information systems, the integration of statistical methods, machine learning and data analysis can become a new vector of research in the field of numerical modeling of project management.

References

1. Shelobaev S. I. (2001) Mathematical methods and models in economics, finance, business. 365.

2. Mathematical methods of network planning [Electronic resourse]. - Mode of access: https://spravochnick.ru/ekonomika/matematicheskie_metody_setevogo_planirovaniya/ - Date of access: 10.02.2024.

3. Mathematical methods and models of project management [Electronic resourse]. - Mode of access: https://lib.susu.ru/ftd?base=SUSU_METHOD&key=000558683&dtype=F&etype=.pdf - Date of access: 14.02.2024.