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MODEL OF INDUSTRIAL PROCESS IN IMPLEMENTATION OF IT-PROJECT

An analysis of the IT project management was carried out using the Microsoft Project software package. Acquaintance with the essence and tools of project management, which allows to make qualified decisions on coordination of people, equipment, materials, financial resources and schedules for the execution of a certain project at a given time, within the budget and to the customer's satisfaction, taking into account the specifics of the IT field. The optimization of the IT project implementation time by the critical path method is considered. As a result of the calculation, critical, non-critical project operations and reserves or time stocks for non-critical operations are determined. In addition, the method of optimization of the IT project by time and cost is considered. The cross-linking of network graphs and their further ordering by the zonal and matrix method was studied. Prepared recommendations for application of the developed model in the educational process.

Keywords: production management, critical path method, Microsoft Project software package, time and cost optimization method, industrial marketing, zonal and matrix ordering.

Introduction

The project is a complex management system, without which it is not possible today to develop a firm in today's critical economic conditions.

Each project must have a clearly defined goal and objectives of the project. Project implementation is the achievement of the main goal, from the lower level of sub-targets to the highest level, that is, the main goal.

Planning and implementation of projects requires managers of firms with special skills such as methods for analyzing external and internal factors of the firm, market needs, methods for planning and structuring the project, knowledge of project management standards in each of the groups of management processes.

Staging problems

The main reason for most of the failures of software projects is the ineffective organization of IT project management.

The analysis of the work of implementing tens of thousands of projects related to the development of software, several American corporations, conducted in 2017, showed the following:

- 35% of projects completed in time, did not exceed the planned budget and implemented all the necessary functions and opportunities;
- 46% of projects were completed late, costs exceeded the planned budget, and the necessary functions were not implemented in full;
- The average overrun of terms was 120%, the average cost overrun was 100%, and a large number of functions were usually excluded;
- 19% of the projects completely failed and were canceled before completion.

During the analysis of the IT project development process, important parameters such as certain stages of development, sequence of events for achieving the set goal, project timing, duration, cost, different levels of qualification of specialists, management of work at given resources are determined. Therefore, the risks of ineffective planning are significantly reduced [1].

The purpose of the work

The work describes the effectiveness of managing an IT project at a production company.

In order to achieve the goal, the following tasks are solved:

- Establishment and formalization, as well as choice of method for solving the problem of project cost management;
- A model of the problem of optimal planning of project duration and recommendations for its application in the educational process is developed;
- Linking and further streamlining of network graphics by zonal or matrix methods.

Main part

The process of planning the work is considered on an example of software development for the creation of an online store.

To date, the market has a wide range of software tools for project management, but was selected by Microsoft Project, as it combines the intuitive interface of Microsoft Office and all the necessary tools for managing the plan and resources of the project.

The sequence of works can be represented as the next network graph (fig. 1).

Calculation of the network model of the project being developed is the first step in obtaining a calendar plan that determines the beginning and end of each operation. As a result of the calculation, critical, non-critical project operations and reserves or time stocks for non-critical operations are determined. The calculation of the critical path involves two steps.

The first step is called a straight run, the calculations start from the initial event and continue until the final event of the entire network is reached. Calculations are performed according to the formula:

$$ES_j = \max_i \left(ES_i + D_{ij} \right), \quad (1)$$

where max is taken for all operations that end in the j event.

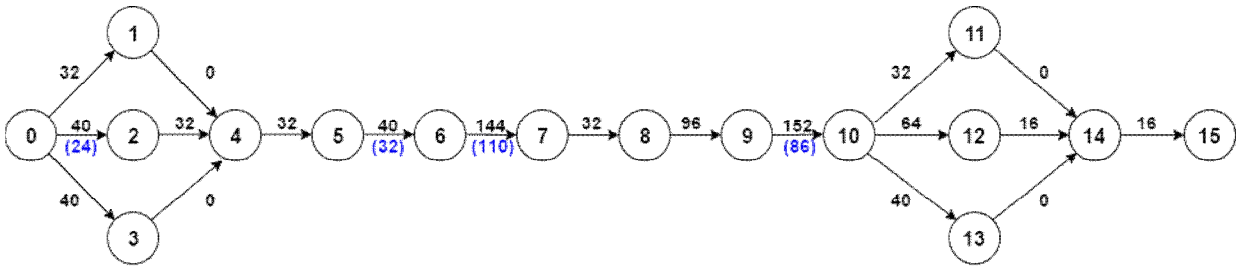

Fig. 1. Network graph for creating an online store

In the second step, which is called back pass, calculations begin with the final network event and continue until the initial event is reached.

Calculations in the back pass are performed according to the formula:

$$LF_i = \min_j \left(LF_j - D_{ij} \right) , \qquad (2)$$

where min is taken for all operations coming out of the i event [2].

The work has optimized the network model in time and cost.

The idea of this method is to choose a compromise ratio between terms and costs and to make a schedule that provides a minimum overall cost for a given project duration.

In fig. 2 shows the dependence of the transaction cost on its duration.

Knowledge of the angle of operations allows managers to compare and select critical operations whose execution time can be reduced. The smaller the angle of the operation, the less the cost of reducing the time period. A steeper incline means that you need more money to reduce one unit of time.

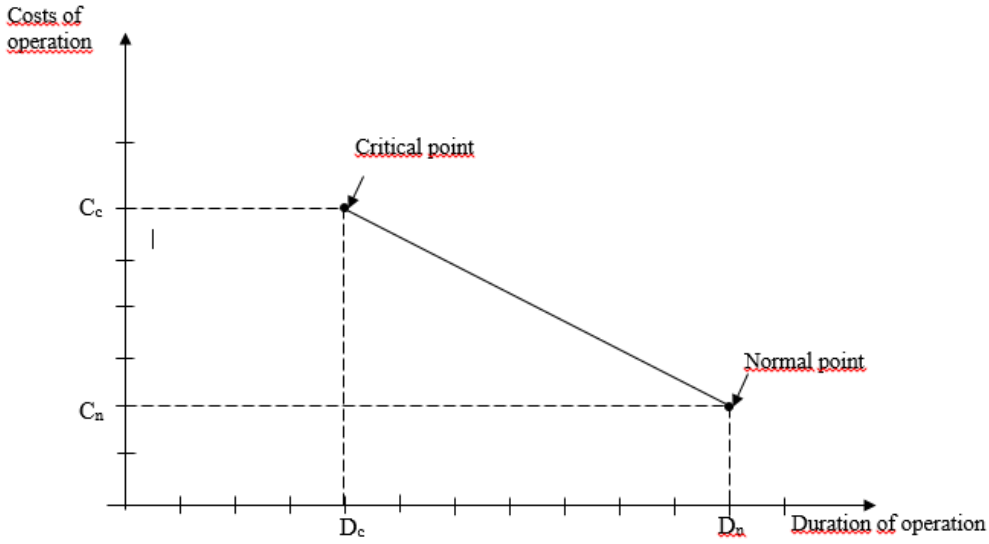

Fig. 2. Scheme of cost dependence on its duration

Moreover, it is calculated by the following formula:

$$a = \frac{C_c - C_n}{D_n - D_c} \qquad (3)$$

Total costs are calculated using the formula below:

$$C_{general} = C_{indirect} + C_{direct} \qquad (4)$$

Based on the obtained results, a graph of dependence of the total cost of the project on its duration was constructed. It helps to determine that the duration of an operation can be reduced by increasing the use of resources, and thus, increasing the cost of the operation [3].

However, there is a limit - the minimum duration of the operation. At the point that corresponds to this limit (the point of maximally intensive mode), the further increase in the intensity of resource use leads only to increased costs without shortening the duration of the operation.

In complex projects to build a comprehensive network schedule for one specialist in a short time is not feasible. Therefore, each executor creates a network schedule for a set of operations assigned to him, while in the network of one unit there are events in which other units are needed. Thus, there is a need to combine primary networks.

When aggregating graphs, all instances of inconsistency between individual sections of the network are detected and eliminated through consultations between responsible executors. In this process, initially set the boundary events, common to the component networks. In addition, partial aggregation of works can be carried out. If one or

another work of one part depends on one or another work of the other part, additional terms of association may appear.

When combining graphs into a general one, a private graphic should not disappear or appear. The combination of private network charts is based on a combination of marginal events. For the convenience of combining in each limiting event, all previous work necessary for its accomplishment, and not only those that are part of the original graph, must be indicated. As a rule, the boundary events in different parts of the graphs denote the same number or an additional graphic symbol.

Here is a simple example. Figure 3 depicts two primary network graphs with two boundary events 0 and 20. Based on a combination of events 0 and 20, we build a third, combined graph. Each event of the combined graph is divided in half: the numerator records the old event number, in the denominator, a new number [4].

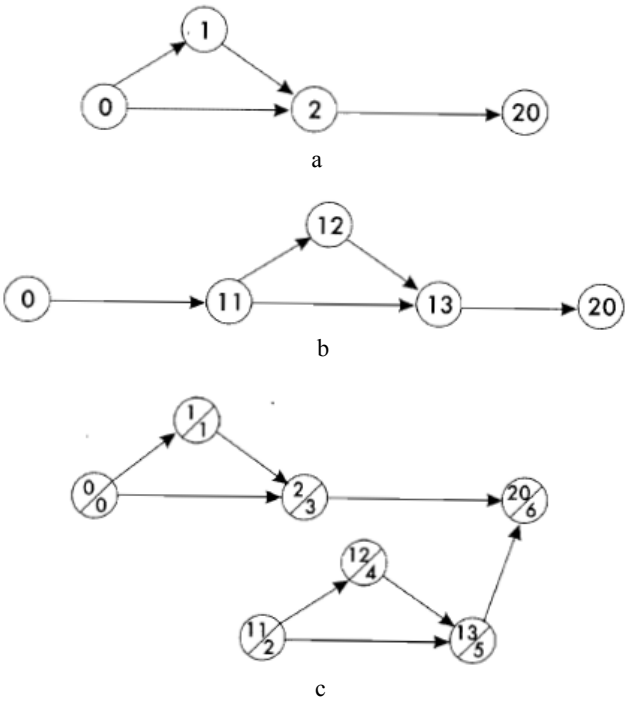

Fig. 3. a, b – primary network graphics; c – network graph received as a result of association

In the procedure of streamlining network graphics, in apparent simplicity, difficulties often arise in its understanding.

As a result, this situation leads to the fact that the initial arrangement of the network graph is not executed, and because of this the result of the planning is not high. Organizing is not only easy and convenient, but also time and labor costs.

The ordering procedure is used in a variety of situations.

When constructing a network graph, as a rule, a sketch network model is first formed, the main purpose of which is to accurately reflect the logic of the relationship between robots. Then, this model is carefully scrutinized for non-compliance with the rules for building networks. After that, the so-called ordering is carried out so that the constructed schedule has a great visibility and simplicity and it was convenient for them to use.

The ordering is to eliminate unnecessary logical connections and events, to change the location of events and works for the visual image, to reduce the number of crossings. It is almost impossible to avoid crossings in network graphics, but you can reduce their number. The smaller the intersections, the more accessible for viewing the network graph [5].

The arrangement procedure can be arranged by the zonal or matrix method [6].

The more complex method is the method of logical zoning in layers. The main mechanism of this method is the conditional breakdown of the entire network graph on the zone - the so-called vertical layers. In each layer, the events are placed in such a way that there is no vertically oriented arrows. In other words, one vertical layer can not get events, between which there is a direct connection, that is, connected by an arrow. The most convenient way of such a breakdown is that the events that are already placed in the layer, mentally struck out of the graph with the works (arrows) that emerge from it. Then the events left without the input arrows will fall into the next layer, and so on until the final event of the network graph. It can move from start to finish (from left to right) by eliminating previous events, and from end to start (from right to left) by excluding the following events.

After placing all the events in the vertical layers, simply change the numbering of the events or move them, if necessary.

Arrangement can also be arranged using a more simple matrix method, which allows topological sorting using the adjacency matrix of vertices, in which, if there is an edge between the vertices, then the corresponding

(intersection of a row and a column) space is a unit, and in the other case it is zero . If the matrix graphs of the network model are represented by vectors V_0, V_1, ... V_n then on the basis of operations with them it is possible to consistently exclude events that have no "descendants" (associated with subsequent events) [7].

Conclusions

Thus, we can do the following conclusions:

1. The optimal plan for developing an IT project allowed to identify:

1) certain stages of development, the sequence of events to achieve the goal, the timing of the project, duration, cost, different levels of qualifications of specialists, the composition of work for the given resources;

2) the only correct critical path and noncritical operations for which it is possible to calculate time reserves;

3) choose a coherent correlation between duration and cost, compile an optimal schedule that provides a minimum overall cost for a given project duration.

2. The developed model, with given direct and indirect costs, the cost of intensification of works, can be used in the management of an IT project in the production company and in the learning process in studying the discipline "Project Management".

3. Considered methods for solving the task of streamlining network graphics involves the implementation of several successive steps, resulting in the partition of the graph on the layers and thus organizes the network graph.

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Модель промислового процесу при впровадженні ІТ-проекту

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Проведений аналіз управління ІТ-проектом з використанням програмного пакету Microsoft Project. Знайомство з сутністю і інструментами проектного менеджменту, що дозволяє кваліфіковано приймати рішення з координування людей, обладнання, матеріалів, фінансових засобів і графіків для виконання певного проекту в заданий час, в межах бюджету і до задоволення замовника, з огляду на специфіку галузі ІТ-технологій. Розглянуто оптимізацію часу реалізації ІТ-проекту методом критичного шляху. У результаті обчислень визначаються критичні, некритичні операції проекту та резерви або запаси часу для некритичних операцій. А також розглянуто метод оптимізації ІТ-проекту за часом і вартістю. Досліджено зшивання мережевих графіків та подальше їх упорядкування зональним та матричним методом. Підготовлені рекомендації щодо застосування розробленої моделі в навчальному процесі.

Ключові слова: управління виробництвом, метод критичного шляху, програмний пакет Microsoft Project, метод оптимізації проекту за часом і вартістю, промисловий маркетинг, зональний та матричний метод упорядкування.

Модель промышленного процесса при осуществлении ИТ-проекта

А. Г. Бердников, Е. В. Шахова

Проведен анализ управления ИТ-проекта с использованием программного пакета Microsoft Project. Знакомство с сущностью и инструментами проектного менеджмента, позволяющего квалифицированно принимать решения по координированию людей, оборудования, материалов, финансовых средств и графиков для выполнения определенного проекта в заданное время, в пределах бюджета и к удовлетворению заказчика, учитывая специфику области ИТ-технологий. Рассмотрена оптимизация времени реализации ИТ-проекта методом критического пути. В результате вычислений определяются критические, некритичные операции проекта и резервы или запасы времени для некритических операций. А также рассмотрен метод оптимизации ИТ-проекта по времени и стоимости. Исследовано сшивание сетевых графиков и дальнейшее их упорядочения зональным и матричным методом. Подготовлены рекомендации по применению разработанной модели в учебном процессе.

Ключевые слова: управление производством, метод критического пути, программный пакет Microsoft Project, метод оптимизации проекта по времени и стоимости, промышленный маркетинг, зональный и матричный метод упорядочения.