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NETWORK PLANNING OF THE PUBLISHING PROCESS FOR THE ISSUE OF THE MAGAZINE

The object of research is the publishing process for the magazine's release. One of the most problematic areas is the difficulty of competition between print publishers and media that provide information services on the web. Therefore, for publishers, it is especially important to ensure consistency of work within the entire publishing process based on its rational organization. In particular, the development of structural diagrams and relationships at different levels of preparation and implementation of publishing projects is relevant.

Network planning methods are used in research.

The obtained results suggest that the proposed structural scheme for managing the publishing process is successful. Due to the presence of the proposed links between the participants in the publishing process, the scheme provides the ability to plan each current issue of the magazine with a guarantee of the announced terms of the magazine's release.

The influence of two scenarios – pessimistic and optimistic – on the deadline is analyzed. It has been established that the pessimistic forecast does not allow for the specified target date if it is 1 time per quarter. The optimistic forecast provides the possibility of a guaranteed quarterly publication of the magazine – the target date for all publishing processes before the start of the finished circulation is 89–92 days. In the case of an optimistic forecast, the network schedule for publishing the magazine showed that all works within the publishing process, before the distribution of the current issue's circulation, have a reserve of time. While in the implementation of the pessimistic scenario, only two works have a reserve of time – the design and approval of the design of the advertisement with the customer.

The peculiarities of the proposed solutions are that the pessimism and optimism of the scenarios are determined in relation to those works for which everything depends only on the performer. In turn, these are exactly the works that do not require external approvals.

Keywords: network schedule, deadline, pessimistic forecast, optimistic forecast, time reserve.

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1. Introduction

The Internet has created big problems for publishers of print magazines. Any information today can be taken from the net. The speed of its distribution through the network is incomparable with the speed of distribution of printed products. Therefore, even the information that is exclusive and is being prepared for publication in printed form does not create waiting queues at the points of sale of periodicals. Readers will most likely wait for it to appear on the Internet, albeit not immediately. This, according to the consumer, is cheaper and easier. An exception can only be created by the target audience of definitely conservative views on the media, accustomed to flipping through the pages, receiving both information and aesthetic pleasure.

Therefore, in order to compete with the media providing information services on the network, magazine publishers are forced to look for different options for attracting and retaining an audience. And for this, it is necessary to carefully prepare the release of each current issue based on the study of the current interests and priorities of society in relation to information. The clarity of the announced release dates, good logistics and quality of printing are also very important. All this requires the coordinated work

of the entire publishing house on the basis of a rational organization of the publishing process. This process receives the attributes of a project that requires coordinated management and debugged communications between all its participants. Therefore, such a process should have the properties of both vertical and horizontal levels of management. As part of planning the implementation of such a project, it is possible to use network planning methods that have been known for a long time, but have not been widely used in relation to managing publishing projects.

Consequently, the development of structural schemes and relationships at different levels of preparation and implementation of publishing projects is relevant. This is seen as one of the keys to successfully competing against electronic media.

2. The object of research and its technological audit

The object of research is the publishing process for the magazine's release. An audit of such a process is based on determining the sequence of all work in the total scope of the project, identifying bottlenecks in the organization of individual work, the actual timing of each work

based on the publisher's experience. If there is no exact data regarding the juices of the performance of individual works, then the known types of forecasts can be used: pessimistic and optimistic. These forecasts allow to assess the chances of a project being completed within a given time frame. When the magazine is published, this period is the declared frequency of each current issue.

The object of research is the network schedules of the publishing process for the magazine's release with a regularity of 1 time per quarter.

3. The aim and objectives of research

The aim of research is to build network diagrams of the publishing process, allowing to choose the timing of work in the volume of the entire period of the magazine issue of a given frequency. This will allow to plan the release of each current issue of the magazine, taking into account potential bottlenecks in the publishing process.

To achieve the aim, the following tasks are set.

1. Build a block diagram for managing the publishing process.
2. Build a network work schedule based on a pessimistic forecast.
3. Build a network work schedule based on an optimistic forecast.

4. Research of existing solutions of the problem

The publishing process has all the features of a project in the general sense of this term. Therefore, it can be assumed that the methods used in solving project management problems are applicable to publishing processes.

Work [1] is devoted to the concepts and practical methods of initiating, planning and budgeting projects. It touches upon such important components in project management as risk analysis, control, project organization and personnel aspects. In the general context of the work, the solutions proposed in it are aimed at achieving the ultimate goal of project management, understood in a generalized sense. And this is achieved by combining and integrating the interests, resources, efforts of all interested parties. These components also take place in publishing processes, in which the risk from incorrect decisions or the occurrence of undesirable events leads to a delay in the release of a publication or a loss in the quality of the magazine. These events should be understood primarily as failures in the organization of the performance of individual works or violations in the chain of their relationships. Such events can be viewed as failures using reliability terms. In this sense, the work [2] is of interest, which proposes an approach to decomposition and a corresponding algorithm that implements such an approach, on the basis of which it is possible to carry out an accurate assessment of the reliability of the project for the managers to make the right management decisions. However, speaking about the accuracy in assessing reliability, one should not forget that many of the initial data for building network diagrams can't be accurately determined. Therefore, it is possible to talk about the presence of uncertainty in the assessment of individual stages of the project, which requires additional research. Some of the results of such studies are contained in [3], where issues are considered related to assessing the impact of design

uncertainty on the process of individual project planning. The authors are the developers of a stochastic program based on the construction of a stochastic dynamic model for practical use. The program allows to assess the value of the project and shows the impact on this value of flexible approaches to design.

Useful in terms of project preparation can be visualization tools for individual stages and their relationships, which is especially important, for example, for construction projects. For such an application, construction schedules can be generated using activity execution workspaces (AEWs). The concept of such management is carried out by integrating workspace management with the current planning process and Building Information Modeling (BIM) data in a 4D/5D environment, providing visualization of the management process [4, 5]. Possible developments of this concept involve the implementation of a system for checking the presence of conflicts in the workspace [6]. The algorithms proposed in this work provide the ability to automatically create workspace models and automatically check workspace conflicts in the 4D simulator. This is especially useful for project managers, as they can identify potential conflicts in advance and minimize the associated risks through rescheduling.

The work [7] presents some options for the use of networks in information management as an environment with which the problems of project management are solved. It is information management, according to the authors of this work, an important function of project management in general. A new approach to research in the field of project management based on a thorough analysis of risk management in IT projects is proposed in [8]. Including, specific solutions for educational institutions are being researched, which leads to better indicators of business processes.

Consequently, the application areas are wide enough, not limited to projects as large in terms of costs and organization as construction. The common thing in project planning is the time frame and the conditions for their attainability when choosing one or another plan option. In [9], on practical examples, the issues of using the network approach are considered, which makes it possible to substantiate the real terms of work within the project and, if necessary, adjust these terms.

A model that allows to eliminate a number of restrictions associated with the choice of priorities for the implementation of individual work on the project is proposed in [10]. It generates solutions that allow to assign priority in a given way to each action within the project and to determine the maximum possible delays for each action, based on the achievement of the maximum probability of completing the entire project within a given time frame.

In [11], a new approach to the reasonable determination of the sequence of development of the components of a project management plan is proposed. This allows to remove a number of difficulties in assessing relationships within the components of the project. The proposed approach, as noted specifically in this paper, is compatible with any project management standard. The results of studies of two different project management standards – PMBOK and PRINCE2 are described in [12]. Within the framework of this research, using network analysis, methods are proposed for determining the main processes in project management. It is concluded that not only the traditional triangle of quality, time and cost control lies at the heart

of project control. In addition to this, it is especially important to control changes and make decisions on corrective actions during the project implementation.

Based on the conclusion that network methods are an effective tool for planning and visualizing the relationship of project stages, and that publishing projects are part of projects in the broad sense of this term, it is possible to assume the following. The use of network methods is effective at the planning stage of the publishing process. However, it should be noted that it is important to choose the criteria by which the quality of planning of such projects will be assessed. This can be substantiated by the results of work [13], which shows that the choice of the optimal parameters of the network schedule depends on the goals that are set at the stage of project planning. For example, it is possible to choose as a goal to reduce uneven workload of project executors. The proposed options for modeling planning outcomes allow to solve this problem by shifting those works that have the maximum time reserves. An alternative could be the choice of such a goal – the need to shift the load of performers from a certain stage of execution to another time interval. This option could be of interest in the case when external personnel are involved in the implementation of the project.

For a sports, as a product of the publishing process, this is especially relevant. This is explained by the fact that this process requires the involvement of people of creative professions – photographers, designers, sometimes artists, and the budget of publications often does not allow them to be on the staff. Therefore, the timing of the involvement of such people should be consistent with other stages of the process of preparing the current issue of the magazine for publication.

When choosing criteria for planning quality, it is very important to remember the following. Accurate adherence to the stated terms of publication of the magazine and the inability to reduce the duration of individual publishing operations without compromising quality require the selection of a criterion, the achievement of which will guarantee the fulfillment of the stated terms of publication. Therefore, the most important in this sense is the deadline.

Based on the analysis of the above works, it is possible to talk about the following. Despite the lack of work devoted to networked methods of planning publishing processes, these methods can provide important information for project management of the publication of specialized sports magazines.

5. Methods of research

The main research method is network planning methods that provide for the following procedures:

- determination of all work required for the publication of the magazine;
- determination of the sequence of their implementation;
- selection of performers for each work;
- setting the deadline for each work;
- assessment of the significance of the work;
- prioritization of works in accordance with their importance;
- calculation of network schedule indicators.

The methodology for calculating the significance of work and indicators of the network schedule is carried out in accordance with [13].

6. Research results

6.1. Structural diagram of managing the publishing process.

13 main directions are involved in the publishing process according to the competence of the staff. The main roles and the relationship between them are shown in Fig. 1.

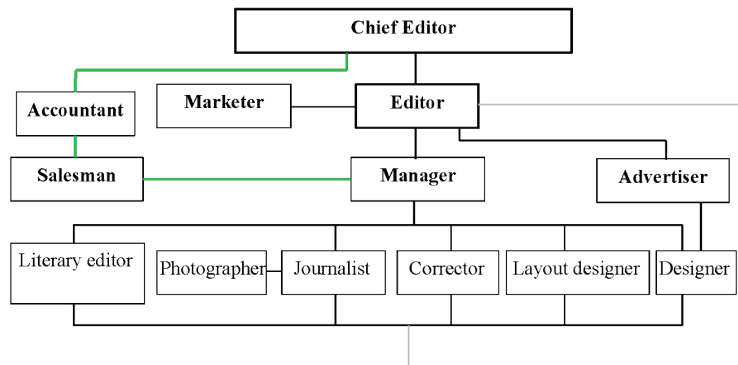


Fig. 1. The hierarchy of relationships between the individual roles of the participants in the publishing process: — — organizational and technological ties; — — financial relations; - - - - executive feedback

The participants in the publishing process and their identifiers (ID) are shown in Table 1, and a diagram of their interaction is shown in Fig. 2.

Table 1

Position in accordance with functional responsibility	Performer ID
Chief Editor	1
Editor	2
Marketer	3
Advertiser	4
Manager	5
Journalist	6
Photographer	7
Literary editor	8
Corrector	9
Designer	10
Layout designer	11
Salesman	12
Accountant	13

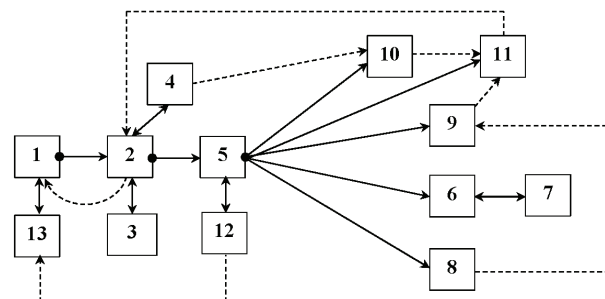


Fig. 2. Scheme of interaction between participants in the publishing process: ● — task for execution; ↔ — joint discussion of tasks; - - - -> — completed task, vertices correspond to performer IDs

The works, their content and performers, provided for by the draft of the magazine publication, are shown in Table 2, and the chronological marks and significance of the works are given in Table 3.

Table 2
Works, their content and performers, provided for by the project of the magazine publication

Work ID	Work content	Performers		Duration, days, τ_k
		Performer ID	Number, people, n	
I	Marketing	3	1	21
II	Search advertising	4	1	21
III	Room planning	2, 3, 4	3	7
IV	Formation of a task for organizing the filling of the number	2, 5	2	2
V	Formation of editorial assignment	5, 6, 8, 9, 10, 11	6	1
VI	Work on filling content within the allocated volume and subject matter	6	3	21
VII	Preparing for an interview – examining input information	6	3	21
VIII	Interview and material processing	6, 7	2	21
IX	Literary editing	8	1	3
X	Proofreading	9	1	1
XI	Design	10	1	21
XII	Ad design approval	4	1	21
XIII	Number layout	11	1	7
XIV	Editor's approval	11, 2	2	1
XV	Editor-in-Chief Approval	1, 2	2	1
XVI	Print run	–	–	10
XVII	Sale of circulation	12	1	60
XVIII	Creating a budget	13, 1	2	5

Table 3
Chronological marks and significance of works in the project of the magazine publication

Work ID	Work content	Chronology of works $i-j$ in relation to a given k		Significance of work, weight units
		Previous	Subsequent	
I	Marketing	–	III, VI	31
II	Search advertising	–	III, XI	26
III	Room planning	I, II	IV	16
IV	Formation of a task for organizing the filling of the number	III	V	15
V	Formation of editorial assignment	IV	VI	14
VI	Establishing contact with interviewees	I, V	VII	13
VII	Preparing for an interview – examining input information	VI	VIII	12
VIII	Interview and material processing	VII	IX	11
IX	Literary editing	VIII	X	10
X	Proofreading	IX	XIII	9
XI	Design	II	XII	8
XII	Ad design approval	XI	XIII	7
XIII	Number layout	X, XII	XIV	6
XIV	Editor's approval	XIII	XV	5
XV	Editor-in-Chief Approval	XIV	XVI	4
XVI	Print run	XV	XVII	3
XVII	Sale of circulation	XVI	XVIII	2
XVIII	Creating a budget	XVII	–	1

6.2. Network schedule of work execution based on a pessimistic forecast. The choice of time periods for the execution of works is carried out empirically, based on the need for a quarterly publication of the magazine. The number of performers was chosen for the same reasons. Pessimism of the forecast is based on the use in the calculations of the maximum possible duration of stages VI and VII, since these stages allow for the possibility of variation according to the principle «everything depends on the performer». This principle is violated in relation to stages I, II, VIII, XI, XII, which have the same duration as VI and VII, but have limited possibilities of variation. This is due to the fact that the implementation of these stages involves external approvals.

The results of calculating the indicators of the network schedule are shown in Table 4.

Table 4

Work ID	Input data				Work chronology indicators			
	n	τ_k	i	j	t'_k	t''_k	$\Delta\tau$	t_k^0
I	1	21	–	III, VI	21	21	0	0
II	1	21	–	III, XI	21	21	0	0
III	3	7	I, II	IV	28	28	0	21
IV	2	2	III	V	30	30	0	28
V	6	1	IV	VI	31	31	0	30
VI	1	21	I, V	VII	52	52	0	31
VII	3	21	VI	VIII	73	73	0	52
VIII	2	21	VII	IX	94	94	0	73
IX	1	3	VIII	X	97	97	0	94
X	1	1	IX	XIII	98	98	0	97
XI	1	21	II	XII	42	77	35	21
XII	1	21	XI	XIII	63	98	35	42
XIII	1	7	X, XII	XIV	105	105	0	98
XIV	2	1	XIII	XV	106	106	0	105
XV	2	1	XIV	XVI	107	107	0	106
XVI	–	10	XV	XVII	117	117	0	107
XVII	1	60	XVI	XVIII	177	177	0	117
XVIII	2	5	XVII	–	182	182	0	177

The network schedule for publishing the magazine in the case of a pessimistic forecast is shown in Fig. 3. Red solid arrows show the sections of the critical path, black solid arrows show work with time reserves, blue solid arrows show displacements within the permissible time limits for performing work with time reserves.

Table 3 shows that only two works have time reserves: XI and XII, and the maximum shift in the start time of their execution is 35 days. This creates good conditions for the work of a designer and preparation of high-quality advertising for the magazine, which is important, since advertising largely forms the budget of the publication.

However, the directive period of the full cycle – from the moment the issue begins to be completed to the financial content for the publication of the next issue is 182 days. This result is unsatisfactory, since the publication frequency is 1 time in three months.

If to count the time interval before the start of the finished circulation, that is, before the start of work XVII and XVIII (in the table, these dates are highlighted in gray), then it will be 117 days, which exceeds the specified time interval by almost a month.

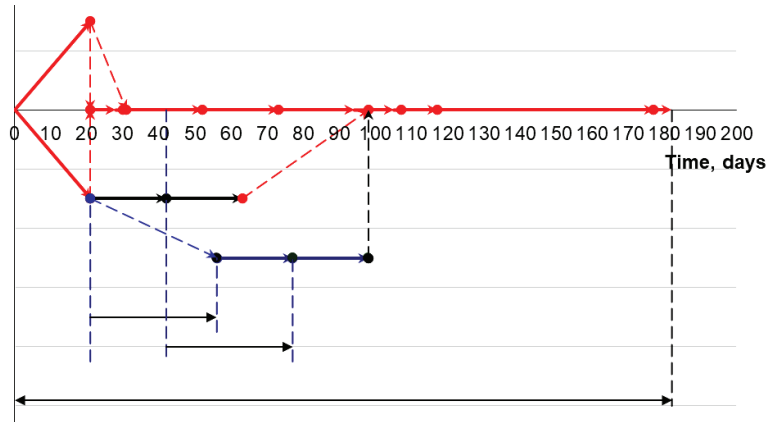


Fig. 3. Network schedule for publishing the magazine in case of a pessimistic forecast: ← — full deadline

Such a result is unacceptable, therefore, it is necessary to make adjustments in the timing of the work, allowing for variation. Such works are VI and VII.

6.3. Network schedule of work performance based on the optimistic forecast. As an acceptable minimum period for works VI and VII, a period of 7 days is chosen. The calculation results of the network schedule indicators are shown in Table 5.

The network schedule for publishing the magazine in the case of an optimistic forecast is shown in Fig. 4.

Table 5 shows that only one work, XVIII, has no time reserve. Works XI and XII have the maximum time reserve, and it is 10 days.

The directive period of the full cycle is reduced from 182 days to 154 days, and the period before the start of the finished circulation is reduced to 89–92 days, depending on whether the time stages for the execution of works XIII–XVI are shifted.

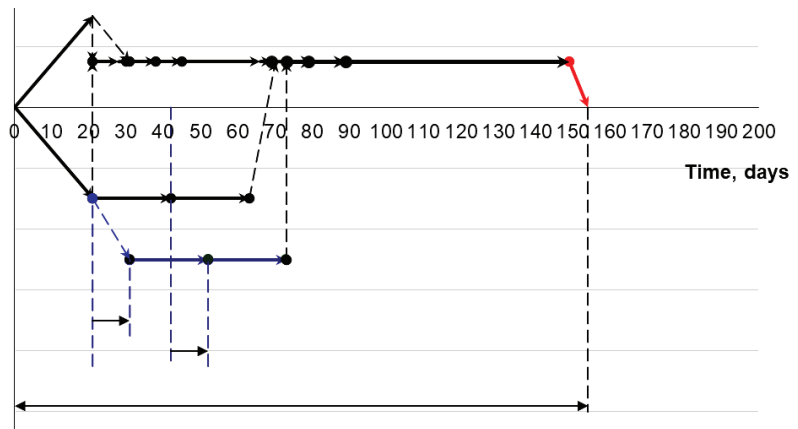


Fig. 4. Network schedule for publishing the magazine in case of an optimistic forecast

This allows to conclude that the quarterly publication of the magazine is guaranteed, since in this case, every 3 months of the year contains 90–92 days.

7. SWOT analysis of research results

Strengths. Among the strengths of this research, it is necessary to note the possibility of using the results obtained for planning magazines similar in subject matter. This also applies to the formation of the structure of the management system of the publishing process, and to the planning of work at all stages of the publishing process.

Weaknesses. The weaknesses of this study are related to the fact that the results are applicable only if the time frame for performing each work and the number of performers approximately correspond to those adopted in this work.

Opportunities. Additional opportunities when using the above results in real projects are associated with the fact that there is a fundamental possibility of adjusting the timing of work within the general directive period. This is possible by varying the duration of the most capacious work within the pessimistic – optimistic forecast, as well as by shifting the timing of work with the maximum time reserves.

Threats. Obvious risks when using the results obtained are associated with the dependence of the implementation time on the budget of each issue and the need to use the services of outsourced performers. At the same time, incomplete satisfaction of the needs of readers, both in terms of the content of each issue and in terms of the quality of printing, can lead to their loss of interest in the further purchase of magazines.

Table 5

Network indicators

Work ID	Input data			Work chronology indicators				
	n	τ_k	i, j	t'_k	t''_k	$\Delta\tau$	ρ_k^0	
I	1	21	–, III, VI	21	24	3	0	
II	1	21	–, III, XI	21	24	3	0	
III	3	7	I, II, IV	28	31	3	21	
IV	2	2	III, V	30	33	3	28	
V	6	1	IV, VI	31	34	3	30	
VI	1	21	I, V, VII	38	41	3	31	
VII	3	21	VI, VIII	45	48	3	38	
VIII	2	21	VII, IX	66	69	3	45	
IX	1	3	VIII, X	69	72	3	66	
X	1	1	IX, XIII	70	73	3	69	
XI	1	21	II, XII	42	52	10	21	
XII	1	21	XI, XIII	63	73	10	42	
XIII	1	7	X, XII, XIV	77	80	3	70	
XIV	2	1	XIII, XV	78	81	3	77	
XV	2	1	XIV, XVI	79	82	3	78	
XVI	–	10	XV, XVII	89	92	3	79	
XVII	1	60	XVI, XVIII	149	152	3	89	
XVIII	2	5	XVII, –	154	154	0	149	

8. Conclusions

1. The proposed structural management scheme, due to the presence of vertical and horizontal links between the participants in the publishing process, provides an opportunity to plan each current issue of the magazine in such a way as to ensure compliance with the stated release dates. This is one of the factors that have a positive effect on the competitive potential of print publishers in comparison with media that specialize in electronic resources.

2. The network schedule of work on the publication of the magazine in the case of a pessimistic forecast showed that only two works have time reserves: design and approval of the advertising design with the customer. This gives a certain freedom in the creativity of the designer and stimulates the preparation of high-quality advertising that fully satisfies the customer. However, a pessimistic forecast for those works for which everything depends only on the contractor does not allow to ensure the fulfillment of the set deadline for the publication of the magazine, if it is 1 time per quarter.

3. The network schedule of work on the publication of the magazine in the case of an optimistic forecast showed that all work within the framework of the publishing process, before the distribution of the circulation of the current issue, has an insignificant reserve of time. At the same time, the same works have the maximum time reserve as in the case of a pessimistic forecast. If for the works in relation to which the optimistic scenario is chosen, let's accept those of them that do not require external approvals, then the period before the start of the finished circulation is 89–92 days. This allows to speak about the guarantee of the quarterly magazine's release.

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