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EDITORIAL POLICY

Analytics in the publishing of a scientific journal

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Abstract: It is shown that the analysis of editorial and publishing processes helps to estimate the time of passing manuscripts in the editorial office of a scientific journal and to control the contractor when performing technical work on literary editing and layout of articles in the journal. For analytics, the apparatus of probability theory and mathematical statistics is used, as well as time series for predicting the dynamics of incoming articles and predicting the prospects for their publication. Based on the results obtained, it is shown that the study of time indicators of the processes of arrival and acceptance of articles for publication, reviewing, literary editing, layout and distribution and receipt of license agreements allows you to plan the work on the filling of articles in journal issues for the year ahead, monitor the work of reviewers on the examination of articles sent to them and manage the contractor preparing issues for publication, when performing technical work. All the considered analytical methods are available for use by the editors of the scientific journal. To simplify the compilation and work with the proposed analytics tools, we recommend software for working with spreadsheets.

Keywords: editorial policy, editorial work, analytical methods, time series, review, literary editing, layout, license agreement

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РЕДАКЦИОННАЯ ПОЛИТИКА

Аналитика редакционно-издательских процессов научного журнала

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Резюме: Показано, что аналитика редакционно-издательских процессов помогает оценивать время прохождения рукописей в редакции научного журнала и контролировать подрядчика при выполнении им технической работы по литературному редактированию и верстке статей для журнала. Для аналитики используется аппарат теории вероятностей и математической статистики, а также и временные ряды для построения прогноза динамики поступающих статей и предсказания перспектив их публикации. На основании полученных результатов показано, что исследование временных показателей процессов прихода и принятия статей к публикации, рецензирования, литературного редактирования, верстки и рассылки и получения лицензионных договоров позволяет планировать работу по наполняемости статьями выпусков журналов на год вперед, контролировать работу рецензентов по экспертизе направляемых им статей и управлять подрядчиком, готовящим выпуски к изданию, при выполнении им технической работы. Все рассматриваемые аналитические методы доступны для применения редакциями научных журналов. Для упрощения составления и работы с предложенными инструментами аналитики рекомендуется программное обеспечение для работы с электронными таблицами.

Ключевые слова: редакционная политика, работа редакции, аналитические методы, временной ряд, рецензирование, литературное редактирование, верстка, лицензионный договор

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Introduction

Planning the work of the editorial office of a scientific journal is necessary to assess the number of manuscripts to be processed and to distribute the workload on reviewers, contractors and authors. The proposed analytical tools for analysing the dynamics of submitted articles and the processes of previously processed articles passing through the editorial office allow for generation of statistical models for arbitrary periods (a year, quarter, month, week), according to which the average time of the processes and the average values of quantities are estimated, and on this basis forecasts are made regarding the workload on reviewers and the editorial board of a scientific journal in the future. The use of analytics allows for high accuracy prediction of the workload on the editorial department of a scientific journal. Analytical tools are easy to use but gaining significant results requires recording the information on journal activities. The analytical tools are based on statistical models and estimates of the probability distributions in relation to the processes occurring in the editorial office of a scientific journal.

It should be noted that the issues regarding the analytics of the editorial and publishing process within scientific publications have not been considered previously in the literature, therefore, the author failed to find information on the study of such processes in either Russian or foreign sources.

The purpose of the study is confirming that it is possible to predict the activities of the editorial office of a scientific journal on the basis of the obtained statistical data.

Research hypothesis is as follows: each process of the submission and passing of an article at the editorial office has its own distribution function with the given computable statistical parameters.

Article flow prediction

To predict the article flow, let us use the well-known model of time series decomposition caused by a seasonal or cyclical component [1]. The essence of the prediction is comprised in collecting historical data on the number of articles submitted over the past years by month and building a forecast using the given data, factoring in the previous seasonal dynamics [1].

Figure 1 shows the dynamics of article submission to the Scientific and technical journal of "Almaz – Antey" Air and Space Defence Corporation over the last 5 years and a predictive model of article submission dynamics, obtained using the time series decomposition accounting for the seasonal component [1]. The model is built on the basis of time series analysis. In the course of its development, additional optimisation was carried out as per the minimum mean square of the predicted data deviation from the actual data.

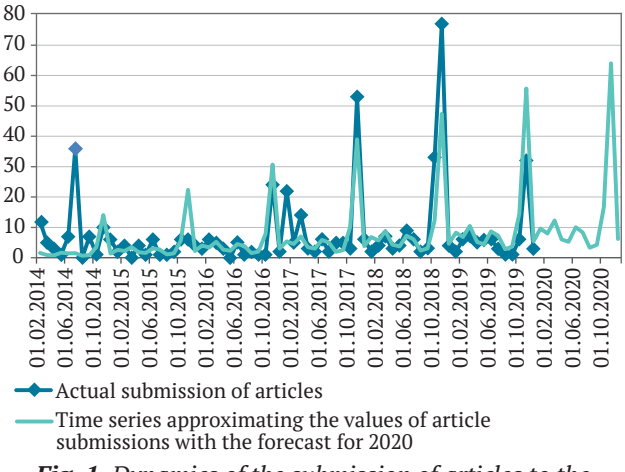


Fig. 1. *Dynamics of the submission of articles to the Scientific and technical journal of "Almaz – Antey" Air and Space Defence Corporation in 2014–2019 and forecast values of the dynamics for 2020 obtained by analysing the time series from 2014 to 2019*

It is worth noting that the outliers in Fig. 1 above 10 articles per month are associated with a large submission of materials following the results of conferences held at Almaz – Antey Air and Space Defence Corporation. Further reasoning on the distribution function and development of the confidence interval takes no account of these outliers since they are insignificant for the actual distribution, as shown in Fig. 2.

As the graph in Fig. 2 shows, frequencies above the value of 8 manuscripts per month are the minimum possible value and are not repeated. Therefore, they can be considered random outliers and not factored in when generating probability distributions [2].

Excluding outliers, the average number of articles submitted to the journal is 3.57, and the root-mean-square error is 2.11. For the purposes of proving this fact, 21 statistical hypotheses were tested using the Pearson Chi-square test on the

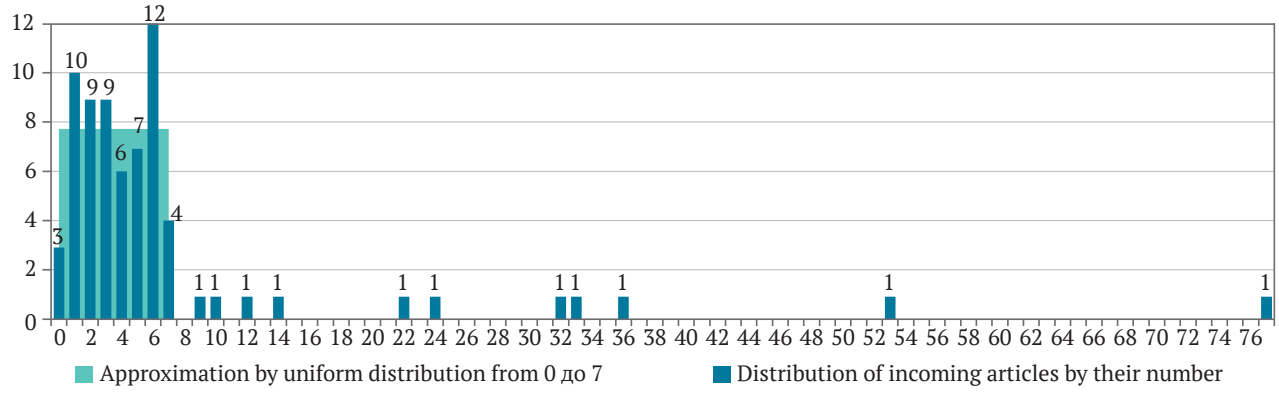


Fig. 2. *Plot of frequency of the number of manuscripts submitted to the journal depending on the number per month and its approximation by uniform distribution*

Table 1

Calculated values of the observed and critical value of the Pearson Chi-square test for uniform distribution with the parameters a = 0 (lower limit of the interval), b = 7 (upper limit of the interval) (see Fig. 2)

2014	2015	2016	2017	2018	2019	Chi² crit.
4.8	8.9	5.4	7.9	6.7	8.1	11.1
2014–2015	**2015–2016**	**2016–2017**	**2017–2018**	**2018–2019**		
5.9	7.6	9.3	8.5	6.9		11.1
2014–2016	**2015–2017**	**2016–2018**	**2017–2019**			
6.5	8.3	7.7	10.6			11.1
2014–2017	**2015–2018**	**2016–2019**				
6.4	7.6	9.8				11.1
2014–2018	**2015–2019**					
5.1	10.7					11.1
2014–2019						
8.6						11.1

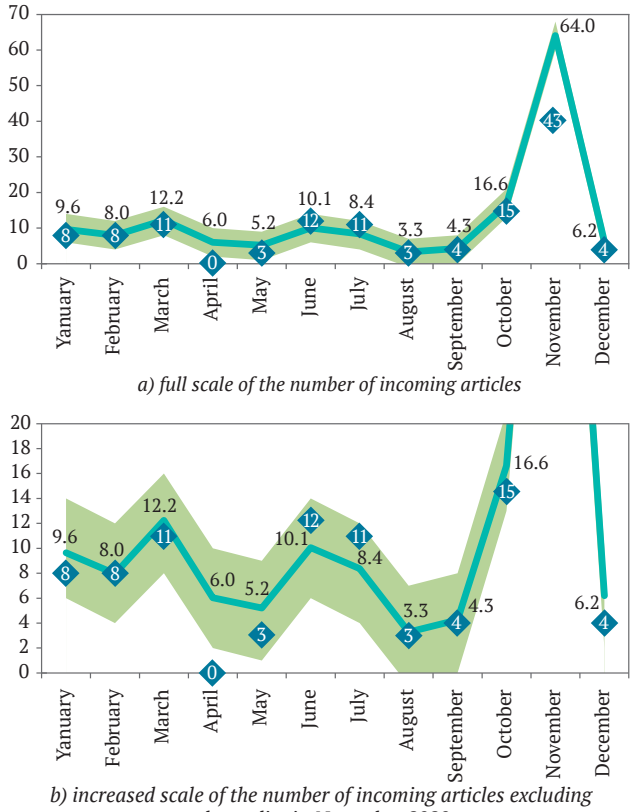
uniform distribution of the incoming articles flow for each year from 2014 to 2019 (six hypotheses separately for each year), 2014–2015, 2015–2016, etc., until 2018–2019 (five hypotheses) and so on up to 2014–2019 (one hypothesis, the frequency distribution of which is given in Fig. 2). All hypotheses were accepted with the 5 % significance level (see Table 1).

As Table 1 shows, all hypotheses converge (none exceeds the critical value) for all sections by year, therefore, the flow of incoming articles can be considered stationary both in "broad" (constant mathematical expectation and variance) and "narrow" (constant distribution law) meanings [2].

Fig. 3 shows predicted values from Fig. 1 for 2020 and the actual number of submitted articles. The diamond shapes with numbers in the centre demonstrate the actual number of submitted articles and the solid line shows the forecast value by months based on the historical data from previous years (2014–2019), presented in Fig. 1.

The solid green area in Fig. 3 shows a possible corridor of deviation in the submission of articles. The given corridor is formulated on the basis of statistical characteristics of the distribution of articles submitted over the past years (the so-called "confidence interval"). Confirmation of the hypothesis regarding the law of uniform distribution of the incoming articles flow essentially allows for estimating the confidence interval with 100 % probability, as was performed in Fig. 3. The corridor was developed based on the estimated number of the submitted articles, obtained by making a forecast for 2014–2019 with the use of formulas for the upper $MX + \sqrt{3DX}$ and lower $MX + \sqrt{3DX}$ limits of the corridor [2], where MX and DX are mathematical expectation and variance, respectively [2]. The MX value on the graph (Fig. 3) is replaced with the predicted value, and the variance is calculated using the well-known formula for a uniform distribution $DX = (b - a)^2 / 12$, where a and b are the boundaries

of the uniform distribution interval (see Fig. 2 and Table 1). However, it should be noted that in 2020 the distribution function has changed as compared to the period of 2014–2019, and the process under investigation in 2020 can no longer be considered stationary either in the "broad" or "narrow" sense (the average value has almost doubled up to 6.5 articles per month, and the root-mean-square error more than doubled up to 4.8). For the editorial team, the increased value of the mathematical expectation is a good result, since more articles are submitted for publication on average.



a) full scale of the number of incoming articles

b) increased scale of the number of incoming articles excluding the outlier in November 2020

Forecast generated by time series analysis

Actual number of articles submitted to the jouenal

Fig. 3. *Dynamics of submitted articles and forecast values for 2020, produced by analysing the time series of submitted articles for 2014–2019, in a full (a) and in an increased scale (b)*

The use of predictive dynamic tools can be applied if quotas for specific sections are practised in the journal. For example, there are two large specific field-oriented sections in the scientific and technical journal of "Almaz – Antey" Air and Space Defence Corporation: Electronics and Radio Engineering, and Space Research and Rocket Science, yet no quotas are practised for the articles of any of the sections. Moreover, the 2018 issue No. 2 offers an example, where not a single article on the field-specific subject of Electronics and Radio Engineering was presented, while the entire volume of the journal was given to the materials on gas dynamics, studies of the properties of ceramics, and mechanical engineering.

The forecast data can be used to plan the editorial process. The results presented by planned versus actual values for the submitted articles are summarized in Table 2.

Table 2

Comparative analysis of the results obtained for the model and for actually submitted articles

Journal issue	Articles assembled by month	Total submitted	
		model prediction	actual
No. 1, 2020	January–March	29.8	27
No. 2, 2020	April–June	21.3	15
No. 3, 2020	July–September	15.9	18
No. 4, 2020	October–December	86.9	62

As Table 2 shows, 122 articles have been actually submitted over the period from January to December 2020, and according to the model data, 153.9 articles should have been submitted over the same period (the model predicts a non-integral number of articles), i.e., the forecast reliability is 79 %. Excluding the data for April, when 0 articles were submitted to the journal due to the coronavirus pandemic, the prediction model gives a result of 147.9 articles when the model and the actual number of submitted articles are compared, i.e., the forecast reliability increases to 82 %, which is a very good result in predicting the overall flow of articles.

It is important to stress that the root-mean-square error between the predicted and actual article submission rates gives similar results both when accounting for the influence of the coronavirus (in April 2020, 0 articles were submitted) and when leaving it aside (Table 3).

Table 3 data indicate that even when accounting for the impact of the coronavirus, the correlation between the time series of the dynamics prediction and the actual data is characterized as very high (over 90 %). In other words, the forecast and actual data have a very high, almost one hundred percent, correlation.

Table 3

Root-mean-square errors and correlation factor of the predicted and actual data on the submission of articles to the journal in 2020

Parameter	Entire data	Excluding data related to the impact of coronavirus pandemic in April 2020
Root-mean-square error (RMSE)	7.95	7.66
Correlation, %	97	98

Estimation of the ratio between the number of articles accepted for publication and the total number of submitted articles

Knowing the future ratio of the number of accepted articles to the number of submitted articles allows planning the editorial office operation with regard to incoming manuscripts processing. The study showed that the ratio of the accepted articles number to the submitted articles number remains approximately the same over a certain period of time. The ratio of the number of articles accepted for publication to the number of submitted articles is hereinafter referred to as "conversion" (from Latin *conversio* meaning conversion, transformation, change) for the purposes of brevity.

The conversion graph for the articles submitted for publication in the Scientific and technical journal of "Almaz – Antey" Air and Space Defence Corporation over the last three years is shown in Fig. 4.

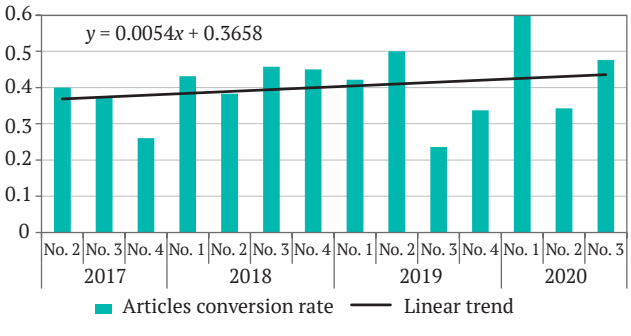


Fig. 4. *Conversion of articles in the Journal of "Almaz – Antey" Air and Space Defence Corporation in 2017–2020 and linear trend*

As Fig. 4 shows, the average conversion of articles over the past three years has hardly changed and averages 40 %, in other words, it can be stated that on average only 2 out of 5 manuscripts submitted to the editorial office are published. A trend plotted by Excel built-in functions revealed that the time-dependant variable component is 70 times less than the constant component. The main goal of the trend in the graph is to demonstrate that the variable component can be neglected, and to state that the conversion is on average a constant as a whole and can be estimated simply by the average value of all the columns of the graph in Fig. 4 (i.e. equal to 40 %).

The probability distribution of conversion according to Fig. 4 data is shown in Fig. 5.

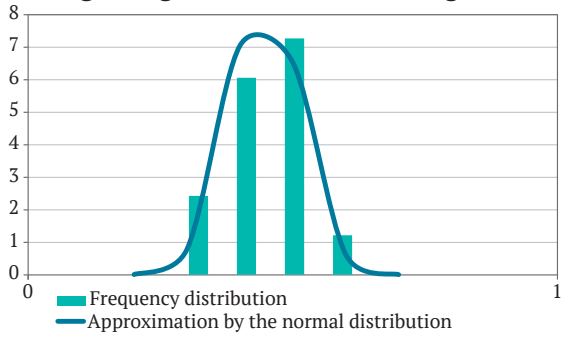


Fig. 5. *Conversion distribution by frequencies*

As Fig. 5 shows, the distribution is close to normal. The hypothesis of normal distribution is tested for splitting shown in Fig. 5. The hypothesis converges according to the Pearson Chi-square test at a significance level of 0.05.

Knowing the distribution of the conversion factor and its average value allows for estimating the annual flow of the articles submitted to be published in the journal.

For example, assuming the conversion factor is constant and equal to 40 %, the required annual flow of articles submitted to the journal can be estimated, given that the previous numbers of published articles are known. Therefore, Fig. 6 shows the values for the number of articles published in the Scientific and technical journal of "Almaz – Antey" Air and Space Defence Corporation from 2015 to 2019.

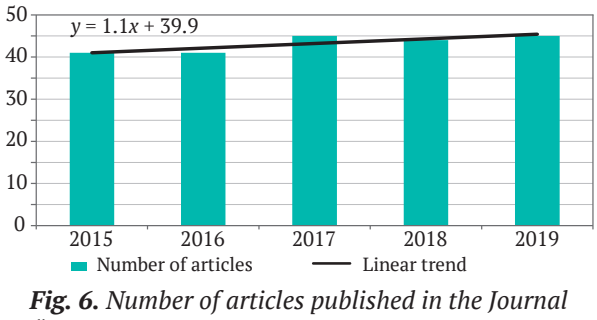


Fig. 6. *Number of articles published in the Journal of "Almaz – Antey" Air and Space Defence Corporation in 2015–2019 and linear trend*

As Fig. 6 shows, the Journal of "Almaz – Antey" Air and Space Defence Corporation publishes about 40 articles per year on average. Considering the publication frequency of the journal (4 issues per year), it can be stated that approximately 10 articles are published in one issue on average, and knowing the conversion factor of 40 % allows estimating the annual number of submitted manuscripts at 100 pieces.

Presentation of stages that articles pass when submitted to a scientific journal

Each stage of work with an article after its submission to the editorial office has its end and its beginning. The time of movement through these stages is presented as a Gantt chart [3] in Fig. 7.

The data presented in Fig. 7 emerge from the analysis of the start date of one process and the end date of the next one (these dates are the same in our editorial process). As the diagram shows, the process of the article passing is divided into seven parts:

1. Review.
2. Author's responses to reviewers' comments (revision by authors).
3. Literary editing.
4. Makeup.
5. Approval by the author.
6. License agreement delivery to the author.
7. Agreement delivery from the author to the publisher.

Fig. 7 does not show the stage of returning articles to authors who received negative statements from the reviewers, since the work with such articles usually ends at the review stage, but they are included in the analytical data upon completion of the review stage.

The starting date is the date of submission of an article to the editorial office. If all reviewers on a given subject are occupied, the review period is increased by the downtime for subsequent analysis and decision-making on increasing the number of reviewers or a smoother distribution of the submitted articles between them.

Review

The approach described in the paper [4] was applied to analyse the statistical distribution of reviewing time. 642 reviews were analysed. The graphs are plotted in Fig. 8 based on the difference in the date of sending and receiving the review.

As the graph in Fig. 8 shows, the distribution is close to exponential. The Pearson Chi-square test was conducted at a significance level of 0.05 in order to prove this hypothesis. The hypothesis converges at a significance level of 0.05. The graph

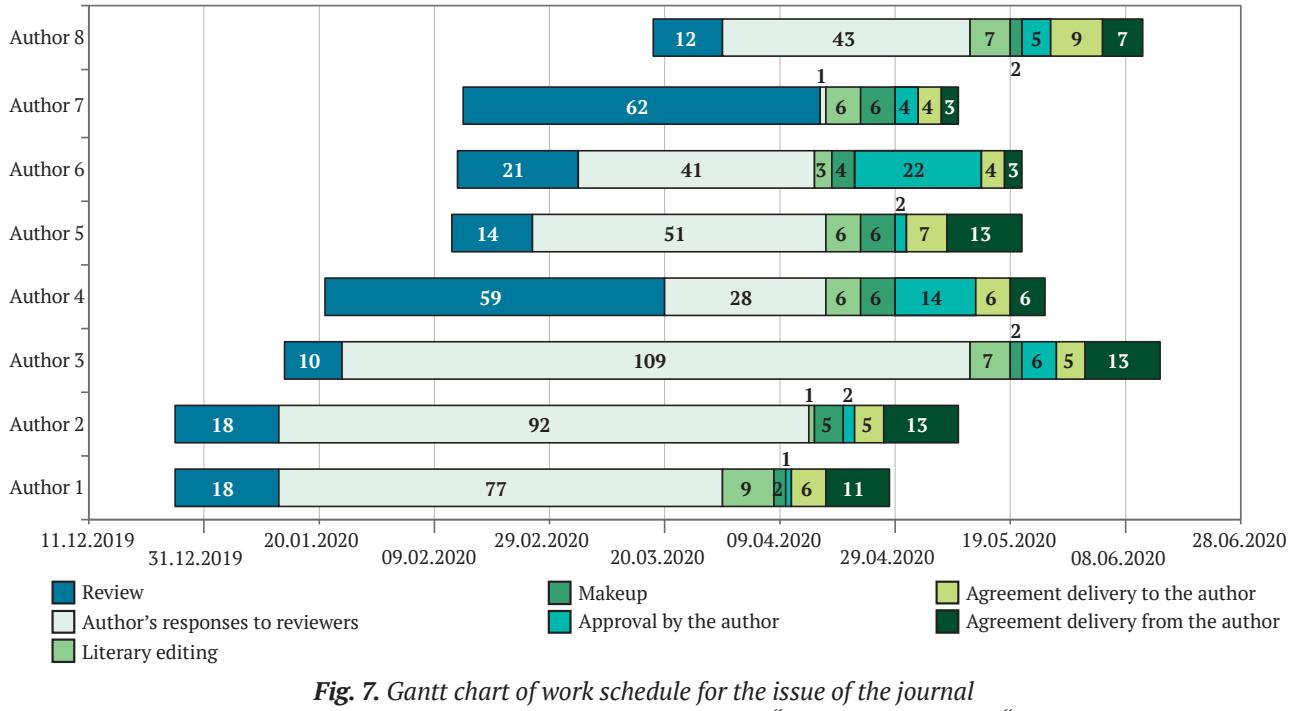


Fig. 7. *Gantt chart of work schedule for the issue of the journal (actual names of the authors are replaced by the serial numbers: "Author 1" stands for "First author", etc.)*

in Fig. 6 clearly shows excellent overlapping of the theoretical and actual laws of distribution of the submitted reviews as well. Besides, the analysis of theoretical distribution points to the following conclusion: the average waiting time for a review in the editorial office of the Journal of "Almaz – Antey" Air and Space Defence Corporation is 10 days (the exact value is 9.965 days).

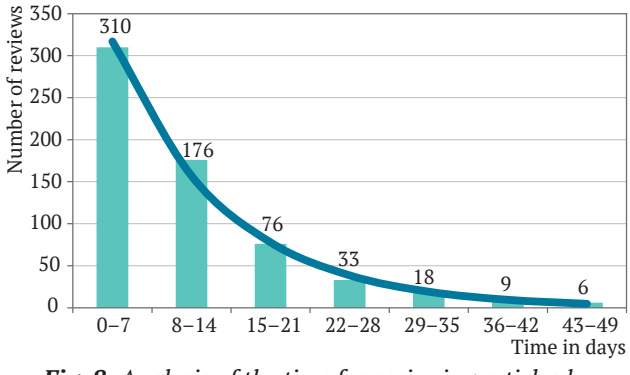


Fig. 8. *Analysis of the time for reviewing articles by reviewers*

In addition to the analysis of all reviews, a graph demonstrating the frequency of responses to articles from two reviewers depending on the number of days is given in Fig. 9.

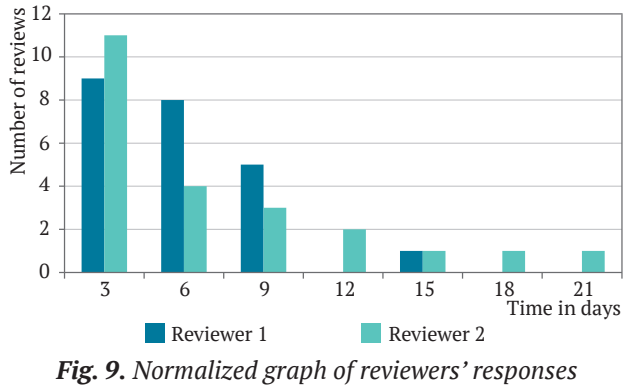


Fig. 9. *Normalized graph of reviewers' responses*

Two conclusions can be drawn based on the graphs in Fig. 9:

1. The graphs have a distribution close to exponential [2] (there is no sufficient data to confirm a hypothesis for each reviewer, all tested hypotheses were rejected).

2. The average value of a reviewer's response time to the submitted article and the maximum delay time on response preparation can be estimated. The average value is the average time it normally takes a reviewer to write a statement on the article, the vertical column of the graph indicates the frequency of the responses by days (for example, the first column is from 1 to 3 days, the second column is from 4 to 6 days, etc.).

It is worth noting that the data on reviewers provided in Fig. 9 refers to the specialists who frequently review articles and can serve as the basis for plotting graphs and calculating statistical characteristics of the distribution. The editorial board of the Journal of "Almaz – Antey" Air and Space Defence Corporation has subject matter experts who are involved in working as reviewers once or twice a year for articles dedicated to the given subject.

For a reviewer, the normal response time is the first few days after receiving the article. Approximately 48 % of the reviewers respond within the first week, over 76 % of them respond within two weeks (see Fig. 7). It is possible to estimate the time spent by the reviewer on an article (both maximum and average) for each article and for each reviewer at the stage of acceptance for publication. It is worth noting that the editorial team should focus on the maximum and average time as a guideline for obtaining a reviewer's statement on the article. This time can be used when planning editorial processes for makeup and literary editing. For example, a "quick" reviewer who responds within 1 to 3 days, or within a week at most, makes it possible to predict the workload for a literary editor one week ahead of time.

For the convenience of further work, data on reviewers are summarized in a table and used when sending articles to them (Table 4).

Table 4

Time spent by some reviewers on article review

Reviewer and review subject	Reviewing, days	
	Average	Maximum
Reviewer No. 1 (radar systems)	2.6	10
Reviewer No. 2 (mechanics)	3.6	15
Reviewer No. 3 (informatics)	14.5	61
Reviewer No. 4 (mechanical engineering)	8.7	18

The data in Table 4 leads to an evident conclusion on the relationship between the average and maximum values. For the purposes of estimating this relation, Fig. 10 shows the ratio of the maximum review value to the average, calculated from 935 pieces of historical data over 6 years (from 2014 to 2020).

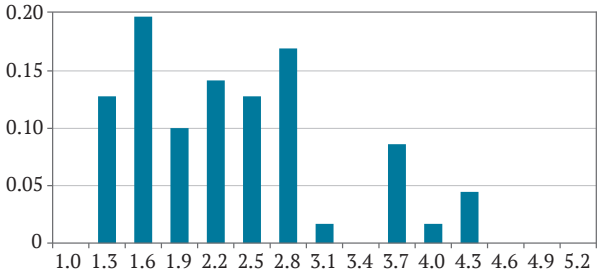


Fig. 10. *The ratio of the maximum review stage passing time to the average time*

The data equal to unity are excluded from Fig. 10 since the maximum value can be equal to the average only in the case of a single value or in the case when the durations of reviewer's response to the articles coincide with the accuracy to the exact number of days. It can be concluded from the obtained data that the maximum review time for an article is three times longer than the average. This basis can be used for communication with reviewers. Time may vary for different subjects. The data in Fig. 10 refer to reviewers in engineering sciences, in which the Journal of "Almaz – Antey" Air and Space Defence Corporation is included into the Higher Attestation Commission list (radar systems, mechanical engineering, aircraft design).

Articles' revision by authors based on comments provided by reviewers

The graphs shown in Fig. 11 are built on the basis of 232 pieces of historical data available over the period of 6 years regarding the time of authors' responses to the reviewers' comments. The graph excludes the data on articles with 0 days of processing since in such case the article was approved by the reviewers without comments and forwarded to literary editing. The article is approved without comments from reviewers in 35 % of cases. However, the editorial team makes an effort to send an article to more than one reviewer. In this case the number of articles approved by all reviewers without comments is reduced to 12 %, i.e. 88 % of articles go through the stage of revision by the authors.

As Fig. 11 shows, 70 % of authors normally take one month to make revisions to the article following the reviewer's comments (the total of the first three columns is 70.3 %). It is important to stress that in some cases the revision of the article takes longer than shown in Fig. 11. The maximum term for revision, recorded in the editorial office of the scientific and technical Journal of "Almaz – Antey" Air and Space Defence Corporation, is one year and four months (these data are excluded from Fig. 11).

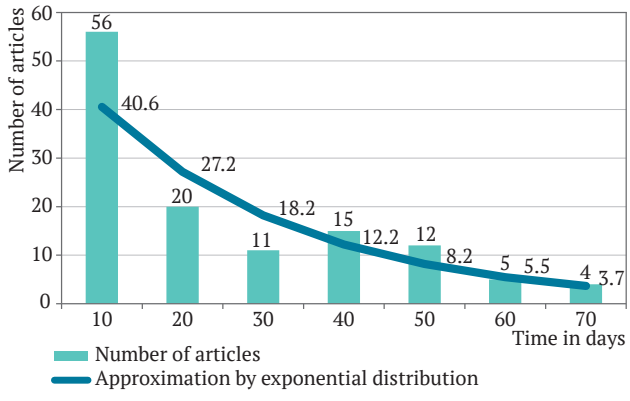


Fig. 11. *Time for author's revision of the article after reviewer's comments*

As with the reviews, the law of distribution was evaluated for the revisions performed by the authors of the articles. The hypothesis of an exponential distribution law was tested, which converges according to the Pearson Chi-square test at a significance level of 0.05. It can be concluded that the average value obtained from the analysis of the theoretical distribution of the authors' responses to the comments provided by reviewers is 25 days.

Publishing house technical work (literary editing and makeup)

The technical work of the publishing house on preparing the journal for distribution consists of two stages: literary editing and makeup. These processes are typically performed by special organizations (contractors), which may also have their own printing house. Fig. 12 shows the average time for technical processing of manuscripts by different contractors.

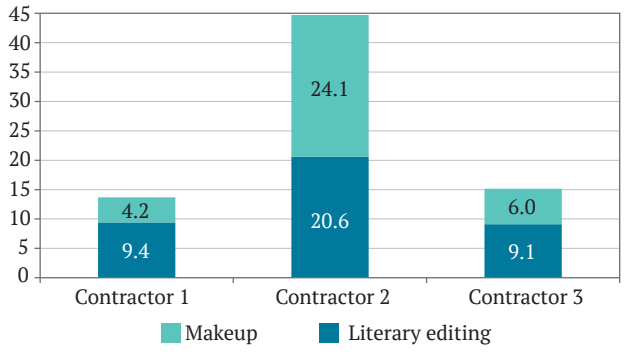


Fig. 12. *Average time a contractor worked on articles*

As Fig. 12 shows, contractor 2 exceeded the average literary editing time more than twofold and the average article makeup time more than fivefold. As a result of analysing the work time duration of contractor 2 over several issues of the journal, it was decided to replace the contractor.

The makeup performance and its approximation by a normal distribution for contractors 1 and 3 are shown in Fig. 13.

Two hypotheses were tested to prove the fact of normal makeup time distribution with the use of the Pearson Chi-square test. Both hypotheses converged at a significance level of 0.05. Application of Fig. 13 allows forecasting the makeup time of any incoming article for a specific contractor. As Fig. 13 shows, contractors roughly coincide in the average time of article makeup, but contractor 3 has a larger spread of values (higher variance value) and, therefore, this contractor is more likely to do the article makeup work over time exceeding the average.

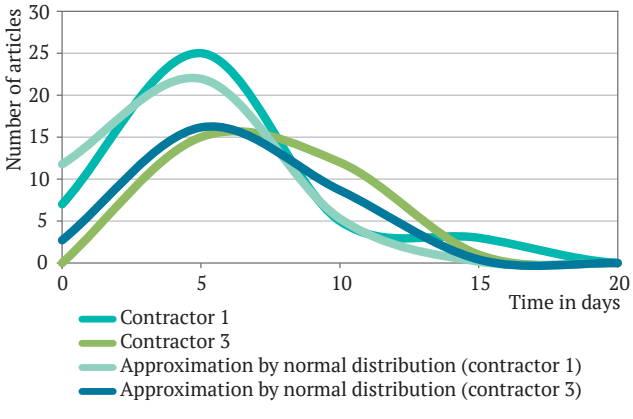


Fig. 13. *Distribution of makeup time for all articles by contractors 1 and 3*

It should be noted that Fig. 13 demonstrates the makeup time can be negative when the distribution of the makeup time is approximated by the normal law. This is the disadvantage of approximation by a continuous distribution law but obtaining the probabilistic characteristics of the process during simulation should be limited to positive values while negative ones should be excluded from the output.

Approval of the resulting article makeup by the authors

Similar to the sections where the reviewing processes and the authors' responses to the reviewers' comments were analysed, Fig. 14 shows a graph of approval of articles by the authors as per 152 pieces of historical data available over the period of 6 years regarding the time of article makeup approval by the authors.

As with reviews and revisions based on comments, the hypothesis about the exponential distribution law of the makeup approval process by the authors was tested. The hypothesis converges according to the Pearson Chi-square test at a significance level of 0.05. It can be concluded that the average value obtained from the analysis of the theoretical distribution of the article makeup approval time by the authors is 3.9 days.

Distribution and collection of license agreements

When distributing license agreements, it is possible to estimate the time of document delivery to the authors and back, and evaluate this data when planning work with authors from particular cities. It is worth noting that major statistical data have been accumulated over the years of the editorial

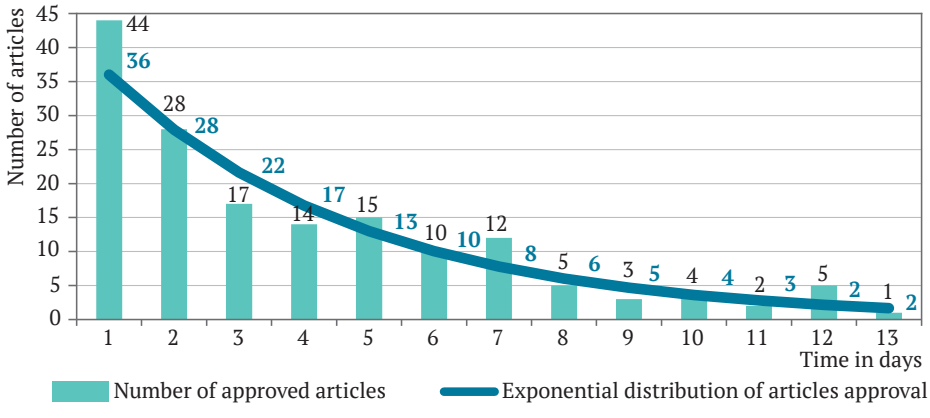


Fig. 14. *Distribution of article makeup approval by the authors in days*

office operation regarding the majority of the large cities in our country.

Fig. 15 shows a graph of overall time of license agreements delivery, generated on the basis of 215 pieces of historical data.

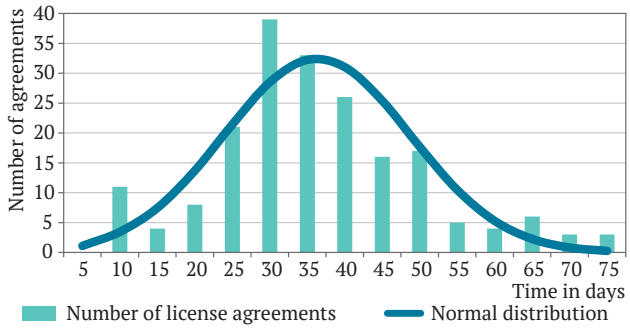


Fig. 15. *Schedule of license agreements delivery*

As the graph in Fig. 15 shows, the distribution of license agreements mailing and collection time roughly corresponds to the normal distribution. The hypothesis on the time distribution according to the normal law was checked as per the Pearson Chi-square test and converges at a significance level of 0.05 [2]. Therefore, the conclusion on the average and maximum time between mailing and collection of a license agreement with an author can be drawn. The average period is 31 days, and the maximum period accounting for the three-sigma rule is 67 days [2]. It is important to stress that the journal considered in the article publishes articles by authors from all over Russia, so the travel time of license agreements can exceed two months. This fact must be considered prior to issuing the journal.

Using analytical data to predict the activities of the editorial office of a scientific journal

It is suggested to consider an example of using the proposed analytical tools to build a schedule for the execution of work on the publication of one issue of the journal. The actual dates of article submission to 2020 issue No. 1 of the Scientific and technical journal of "Almaz – Antey" Air and Space Defence Corporation from the graph in Fig. 7 shall be taken as the initial data. Knowing the probability density functions for each process allows statistical simulation for the purposes of calculating the time required for a particular process [2]. Fig. 16 shows an example of simulated schedule values from the initial data presented in Fig. 6 (process start dates and total number of articles). The simulation was carried out by obtaining numbers subject to certain probability distribution, taking into account the estimates obtained above.

Comparing Fig. 7 and Fig. 16 demonstrates that the actual data on the dates of journal publication basically coincide with the data of the simulation regarding the dates of all works completion. The error is 11 days (the actual completion date is June 9, while the simulation stands for June 20). Consequently, the dates of all works completion

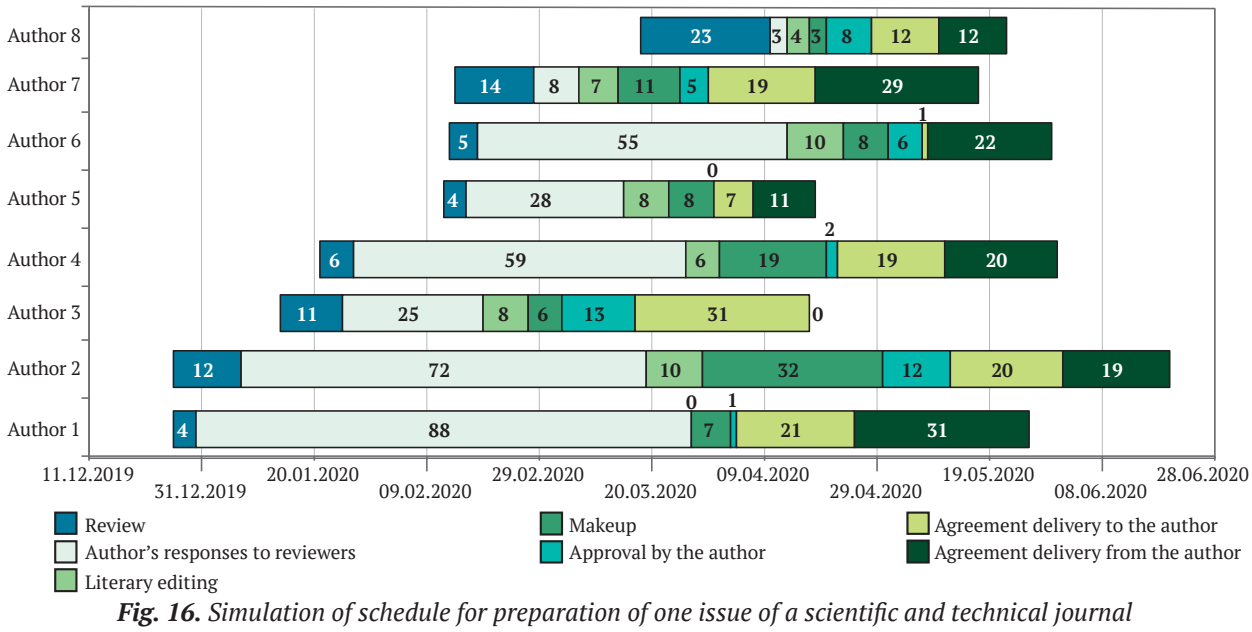


Fig. 16. *Simulation of schedule for preparation of one issue of a scientific and technical journal (the dates of article submission are actual and coincide with submission dates in Fig. 7)*

can be estimated as per the information provided in Fig. 16, and the processes in need of optimisation can be adjusted if necessary.

However, in actual life, it rarely happens that all processes are completed within the average time frame. As Figures 8, 11, 14 show, a fairly high percentage is completed over considerably less time. For example, Fig. 11 shows that the highest percentage of articles is processed within 10 days, i.e., two times faster than the average.

Consequently, it is possible to determine the workload of all participants of the process for the next year with the start and end dates of all processes with a sufficiently high degree of accuracy by analysing the data on the forecast submission of articles to the journal, their conversion, the probabilistic characteristics of reviewing, the editorial and publishing process.

Conclusion

The formulated research hypothesis was fully confirmed. For eight processes, the probability distribution law was confirmed by testing statistical hypotheses (see Table 5).

The main processes taking place in the editorial office of any scientific journal can be approximated by probability distributions based on historical data. This fact helps in planning the editorial office operation. Knowing the number of incoming articles helps determine the workload on reviewers and define the issue press time in advance. The forecast accuracy is rather high, but it does not account for the "black swan" events [5], which occurred in our country in April 2020, when no articles were submitted to the journal due to quarantine. Knowing the probabilistic characteristics of the processes taking place in the editorial office of a journal allows for high accuracy prediction of their finalisation and forecast of the operation of the editorial team, contractors, and authors while the article goes through the stages of editorial processing.

Table 5

Investigation hypothesis

Process	Estimated parameter	Law of distribution
Article flow	Quantity per month, pcs	Uniform
Ration between articles accepted for publication and submitted articles (conversion)	Ration between accepted and submitted articles	Normal
Review	Number of days	Exponential
Author's responses to reviewers	Number of days	Exponential
Literary editing	Number of days	Normal
Makeup	Number of days	Normal
Approval by the author	Number of days	Exponential
Distribution and collection of license agreements	Number of days	Normal

It should be noted that all the data were obtained for the Scientific and technical journal of "Almaz – Antey" Air and Space Defence Corporation but the author of the article has a hypothesis that the obtained distributions will be valid for other scientific journals since the processes in the editorial office of any scientific journal are similar.

REFERENCES

1. Hanke J. E., Reitsch A. G., Wichern D. W. *Business Forecasting*. 7th ed. Moscow: Williams; 2003. (In Russ.)

2. Gmurman V. E. *Probability Theory and Mathematical Statistics*. 9th ed. Moscow: Vysshaya shkola; 2003. (In Russ.)

3. Clark W. *The Gantt Chart: A Working Tool of Management*. Moscow, Leningrad: Tekhnika upravleniya; 1931. (In Russ.)

4. Bolshakov D. Yu. Experience of involving young researchers in reviewing manuscripts submitted to a scientific journal. *Science Editor and Publisher*. 2020;5(1):16–21. (In Russ.) DOI: 10.24069/2542-0267-2020-1-16-21.

5. Taleb N. N. *The Black Swan: The Impact of the Highly Improbable*. 2nd ed. M.: KoLibri, 2020. (In Russ.)

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