

Здійснено аналіз характерних особливостей проектування видавничо-поліграфічних веб-порталів. На основі цих особливостей сформовано ключові етапи методики проектування веб-порталів галузі видавництва та поліграфії. Створено сценарій взаємодії користувача з веб-порталом. За допомогою використання експертного підходу з поєднанням інструментарію кластерного, багатофакторного та дискримінантного аналізу виділено основні розділи видавничо-поліграфічного веб-порталу та сформовано наповнення

Ключові слова: видавничо-поліграфічний веб-портал, видавництво та поліграфія, сценарій взаємодії, методика

Осуществлен анализ характерных особенностей проектирования издательско-полиграфических веб-порталов. На основе этих особенностей сформированы ключевые этапы методики проектирования веб-порталов отрасли издательства и полиграфии. Создан сценарий взаимодействия пользователя с веб-порталом. С помощью использования экспертного подхода с сочетанием инструментария кластерного, многофакторного и дискриминантного анализа выделены основные разделы издательско-полиграфического веб-портала и сформировано их наполнение

Ключевые слова: издательско-полиграфический веб-портал, издательство и полиграфия, сценарий взаимодействия, методика

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ELABORATION OF METHODOLOGY FOR DESIGNING A PUBLISHING AND PRINTING WEB PORTAL

M. Naumenko

PhD, Professor

Department of Management and the military economy

National Academy of the National Guard of Ukraine
Zakhysnykiv Ukrainy sq., 3, Kharkiv, Ukraine, 61001

E-mail: marianaumenko1955@gmail.com

Y. Hrabovskyi

PhD, Associate Professor

Department of Computer Systems and Technologies
Simon Kuznets Kharkiv National

University of Economics

Nauky ave., 9-a, Kharkiv, Ukraine, 61166

E-mail: Yevgen.Hrabovskyi@hneu.net

1. Introduction

Rapid development of information technologies contributes to their extensive penetration into various spheres of social life including publishing and printing practice. In this sense, the problem of introduction of internet technologies is becoming very topical today. Use of these technologies in the printing industry conditions determines improvement of quality and efficiency of production steps, effective use, exchange, and dissemination of information. In addition, internet technologies provide specialist training and retraining and further improvement of their professional skills directly at their workplaces.

Usually, when implementing information support of publishing activities, local versions of catalogues of equipment and printing technologies, advertising pamphlets of suppliers' proposals are used. However, the use of such means is justified only in the case of small printing houses with a clearly defined range of partners and suppliers of technologies and equipment. When trying to go beyond these limits, objective difficulties arise in the attempt of speeding up substantiation of the choice of technology and printing equipment. These difficulties are brought about by the lack of a comprehensive integrated web resource containing all necessary information on the printing industry.

It is expedient to overcome these difficulties by creation of a system of internet support for publishing and printing

processes. The central link of this system is a web portal, which accumulates in its structure basic information resources both on printing technologies and equipment and the technologies of electronic multimedia publishing. Depending on the practical need of introduction and use of internet technologies to support production processes of publishing and printing, scientific task of elaboration of a methodology for designing corresponding publishing and printing web portals gains a great significance.

Creation of such methodology will make it possible to provide an active toolkit for development of information support for publishing and printing. In addition, elaboration of a methodology for designing printing web-portals will create conditions for a well-founded formation of information support for publishing and printing and obtaining certain effects from introduction into production. In particular, productivity of the printing process can be increased and its cost reduced.

2. Literature review and problem statement

Under conditions of intensive introduction of internet technologies into practical activities of high-tech enterprises dealing with scientific studies, attention is paid to the development of web portals. For example, a method for estimating effectiveness of the technology for portal designing is

proposed in [1]. The web portal is considered from the point of view of the object of intellectual property. However, the proposed method does not take into account features of user interaction with web portals as information systems.

Study [2] examines in detail the main stages of the user's work with internet portals. This work pays special attention to the problem of improving efficiency of work with portals under conditions of present-day production processes. However, peculiarities of designing the structure of publishing and printing portals are not considered in this paper.

Paper [3] addresses issues of ensuring quality and productivity of using web portals in production practice. However, this work does not take into consideration specifics of ensuring quality and effectiveness of using the printing portal.

Features of synergetic control of interaction of users of web portals as subjects of social nets including the processes of production activity are considered in work [4]. However, while covering in detail various aspects of using web portals in conditions of a modern high-tech enterprise, this study does not take into account peculiarities of production practice in the publishing and printing industry.

Work [5] has systematized information on the use of integrated web portals as tools for improving enterprise business processes. A large-scale model engineering of interaction of users of web portals based on the experience of WebML and WebRatio is discussed in detail in [6]. Thus, papers [5, 6] provide the possibility of a scientifically substantiated use of web portals in the publication practice of electronic multimedia. However, these works do not contain information as for specifics of creation and use of web portals for printing production processes.

Based on an example of textile printing, study [7] considers peculiarities of creating web portals to support screen printing processes. However, this study does not take into consideration the complex combination of various types of printing and technologies and equipment in modern printing production lines.

An empirical study of the results of use of web portals in the practice of modern high-tech enterprises including the publishing and printing industry is given in [8]. Based on this study, it is possible to draw conclusions regarding the directions of improving information support of the publishing and printing industry. But this paper does not give an empirical substantiation of the printing portal structure.

Peculiarities of the use of integrated information of printing and publishing web-portals in the conditions of creation of adaptive algorithms of image processing for printing are given in the scientific paper [9]. However, this study does not provide comprehensive guidance on the design of publishing and printing web portals.

In study [10], web portals are considered as a structural component of the system of innovative determinants and topical transformations of the modern publishing industry in the Eastern European region. However, the author of this study does not address the issues of development and quality assurance of functioning of publishing and printing web portals.

Work [11] analyzes the practice of using web portals to provide training and advanced training for specialists at their workplaces. However, this study does not take into account the threat to safety of portals in the web and, accordingly, does not contain a mechanism of protecting web portals against information threats.

Thus, this analysis of studies on the issues of creation and use of web portals indicates that there is no comprehensive scientific-based methodology of designing publishing and printing web portals [1–11].

3. The aim and objectives of the study

This work objective was to create a methodology of web support of the publishing and publishing industry based on designing web portals. This will provide an opportunity to improve information support of publishing activities by developing web-portals in the field of publishing and printing taking into consideration the mechanism of implementation of information safety.

To achieve this objective, the following tasks were solved:

- to develop a scenario of user interaction with publishing and printing web portals;
- to design the structure of the publishing and printing web portal;
- to develop a mechanism for implementing information safety of web portals.

4. Development of a methodology of internet support of a publishing and printing enterprise

4.1. Features of designing web portals in the field of publishing and printing

The publishing and printing industry puts forward certain requirements to designing the web portals.

1. Formation of miscellaneous contents of the publishing and printing portal as a complex internet project should envisage phased and complexity conditions resulting in a need of creation of a scenario of user interaction with the web portal.

2. Availability of a wide circle of potential users, diverse in their professional orientation, dictates the need to develop a clear algorithm for choosing structure of the web portal for the publishing and printing industry. For example, people who evaluate quality of printing products, technologists, specialists in operation of printing equipment, web designers, makers-up, etc. act as regular users of printing and publishing portals.

3. Publishing and printing portals should contain information miscellaneous from a functional point of view. Such information may include knowledge of technologies and equipment for publishing and printing, printed product design, prepress information processing, technologies for creation of electronic multimedia editions and web design. Because of heterogeneity of such information, the design process should take into account the multitude of functions of the publishing and printing web-portal and logical interrelations.

4. Cause-effect relations between the main functions of the web portals in the field of publishing and printing should provide structuring of site sections in order to distinguish and separate certain information blocks.

5. The publishing and printing industry dictates strict requirements regarding protection of sites and portals against information threats. Thus, implementation of information safety mechanism is necessary during designing publishing and printing web portals.

Thus, the methodology of designing publishing and printing web portals involves the following main stages:

- 1) development of a scenario of user interaction with the publishing and printing web portal;
- 2) development of structure and definition of functional features of the publishing and printing web portal;
- 3) formation of a set of functions of the publishing and printing web portal;
- 4) structuring the web portal based on cluster analysis methods;
- 5) development of the mechanism for implementing information safety of the web portal.

4.2. Development of a scenario of user interaction with the publishing and printing web portal

The scenario of user interaction with the publishing and printing web portal should be a targeted, personality-centered, and methodically-constructed sequence of stages to achieve the assigned goals and methods. When planning the use of one or another internet technology, it is important to clearly imagine the scenario of user interaction that can be deployed with the help of this technology. Creation of the scenario of user interaction with the publishing and printing web portal should include the following steps.

The first stage is a clear definition of capabilities of the publishing and printing web portal. The portal should provide the following possibilities:

1. Integration of theoretical, practical, and statistical electronic resources of the printing subject matters, catalogues of printing equipment and promotional offers of printing materials into a single information space.
2. Cataloging electronic resources in the field of printing production and technologies of electronic multimedia publishing.
3. Structured representation of electronic resources of the publishing and printing subject matters. This implies presentation of heterogeneous information by subject matter catalogs and collections of electronic resources in accordance with certain categories of users of the information web space.
4. Ensuring easy and quick access to available electronic resources. Organization of an effective navigation should provide the user with a possibility of finding the most interesting information with the greatest completeness and accuracy at the least effort. In addition, this navigation should provide a correct representation of logical structure of the publishing information space.
5. Provide the user with a possibility of fast and complete multicriterial full-text search for the requested information within the given information space with the help of advanced search tools.
6. Support of user's activity. This includes provision the users with a possibility of distributing and adding (publishing) their own electronic resources in the information space of the portal as well as their further modification and update.
7. Giving users of the publishing and printing portal a personal virtual space. The virtual personal space refers to some information space that contains integrated, structured, adapted, and heterogeneous information presented in accordance with the user interests and requirements. In addition, this space should have means of organizing and maintaining the user's activity within the web space.
8. Organization and support of an interactive communication environment. Within this framework, users of the publishing and printing portal are provided with the means of interactive communication both in asynchronous and in

synchronous modes. In addition, it is envisaged to create network communities, conduct a variety of subject matter polls, and provide an opportunity for joint and group work in this environment.

The second stage is correlation of concrete practical problems of the publishing and printing practice and the possibilities of using the publishing and printing web portal. The tasks in this case relate to the formation of concrete results on the issue of publishing products and formation of a positive image of the publishing and printing enterprise. Practical tasks based on the capabilities of the publishing and printing web portal are as follows:

1. Creation of an own information space of the publishing and printing activities.
2. Information search skills.
3. Use of various methods of targeted acquisition of information necessary for the management of the publishing and printing enterprise to solve important publishing tasks.
4. Reveal the information sources that will be important in accordance with the set production objectives.
5. Work with the news stream to find important information.
6. Interpersonal interaction through electronic communication channels.
7. Creation of own information resources of publishing and printing orientation.

The third stage is the definition of specific forms of activity. It is important to answer the question of what exactly users will do within the framework of the system being developed. The basic forms of user's activity on the publishing and printing web portal are as follows.

1. The work with catalogs and separately with certain types of printing equipment.
2. The work with texts of articles of the publishing and printing orientation.
3. The work with web resources including links to electronic libraries and catalogs of articles of the publishing and printing orientation.
4. The work with resources that include general and subject matter sources, such as trends in the development of special printing types, pricing policies for publishing technologies and equipment, the latest methods, procedures, and standards of estimating quality of publishing activities, statistical information in the publishing and printing industry, software for publishing and printing processes.
5. Interaction with partners and customers of publishing products in a "question and answer" form.
6. Feedback by participating in polls.
7. Use of such applications as glossary, polygraph calculator, etc.

Let us consider a specific example of a scenario of user interaction with a publishing and printing web portal during a label design. Each user can pass this path in an individual trajectory but the overall approach remains the same for all participants.

The diagram in Fig. 1 presents an example of a graphical implementation of the scenario of user's search for the required information on the publishing and printing web portal during the label design. The block diagram of the user's activity here involves the ability to selecting at least four trajectories which allows management to solve various practical tasks and enables the users to effectively and independently solve the set task.

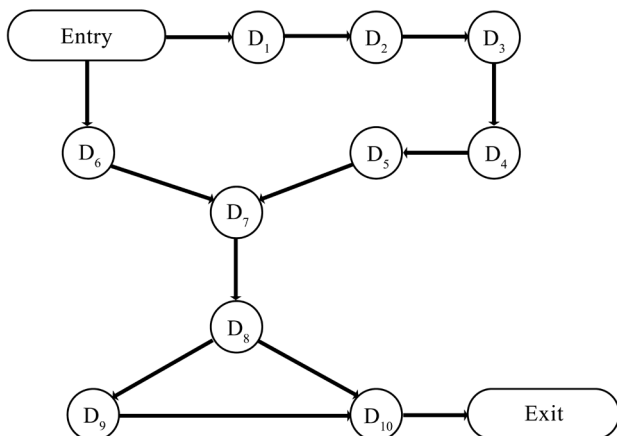


Fig. 1. Diagram of the search system at the publishing and printing web portal

Conventions used in Fig. 1:

- D₁: acquaintance with the working process of the publishing and printing web portal;
- D₂: acquaintance with the contents of the publishing and printing web portal;
- D₃: development of the design scheme;
- D₄: search for information and exchange with links;
- D₅: choice of materials for printing the label;
- D₆: preparatory work for printing;
- D₇: execution of technological printing operations;
- D₈: post-printing processing;
- D₉: receiving feedback from customers;
- D₁₀: correction of the technological process in accordance with the requirements and wishes of customers.

4.3. Developing the structure of the publishing and printing web portal

The main task of the portal is to ensure a steady growth of the number of visitors. Functioning is aimed at transforming the available potential into a real state. In doing this, an important task is creation of a convenient and understandable interface. According to the hypothesis, the interdependent functions performed by the printing portal can be classified into several groups. Next, on the basis of these groups, it is possible to develop the portal functionality and create a convenient navigation menu.

Let us present the system model of creating the portal structure in a form of a tuple:

$$W = \langle F, L, K, S \rangle,$$

where F is the set of functions of the publishing and printing web portal; L is logical interrelations of functions of the publishing and printing web portal; K is the set of sections of the web portal; S is the set of undivided structural units of the portal of the lowest rank.

Stages of the algorithm of selecting the structure of the publishing and printing portal are shown in Fig. 2. During realization of this algorithm, the following is expected:

- identification of the main goal of the web portal creation;
- selection of decision making experts;
- interviewing of the experts' opinion;
- collection and analysis of the obtained data;
- interpretation of calculation results.

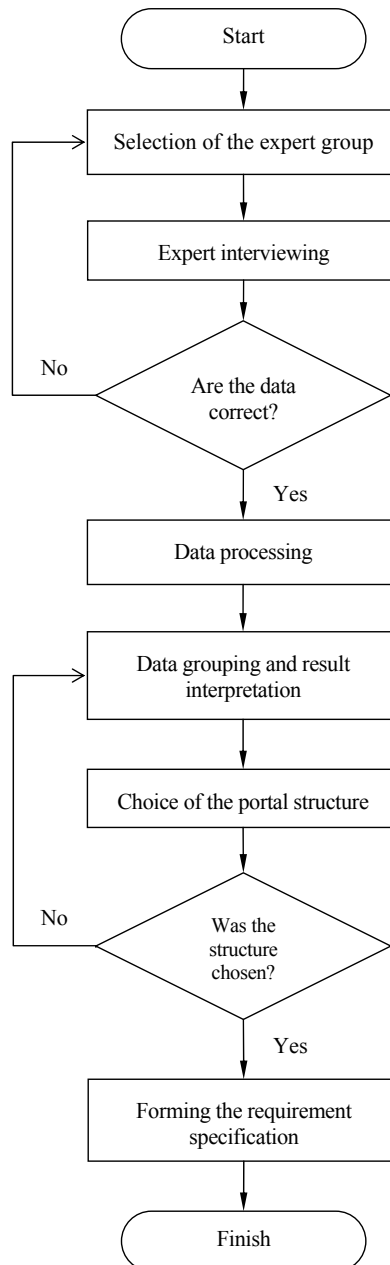


Fig. 2. Algorithm of choosing structure of the publishing and printing web portal

Since the input information on the task of structuring the printing and publishing web portal is of a qualitative nature, an expert approach with a combination of cluster, multivariate and discriminant analysis tools should be used to determine the number and fullness of internal pages of the portal.

As experts, technologists of such Kharkiv leading publishing and printing companies as Knyzhkova Fabryka Globus LLC, Folio Publishing House LLC, Balans-print LLC were selected. In agreement with the experts, a basic set of F functions (Table 1) was established. These functions can be implemented at the end of the n -th stage of creation of the publishing and printing web portal.

The functions performed by the portal are interrelated in some way. Analysis of such interrelations has allowed us to construct a factor matrix of logical interrelations of L functions.

Table 1

Functions of the publishing and printing portal

Function symbol	Function name
f_1	Identification function
f_2	Acquaintance function
f_3	Reference function
f_4	Appearance function
f_5	Calculation function
f_6	Notification
f_7	Data exchange
f_8	Providing actual news
f_9	Continuous data access
f_{10}	Production process support
f_{11}	Communication process support
f_{12}	Integration of applications
f_{13}	Expansion of the production process field limits
f_{14}	Systematization of the materials

The following symbols were used in the matrix:

“0”: functions closely related to each other in their implementation;

“1”: weak logical relation between functions;

“2”: functions with no interrelations.

The factor matrix of logical interrelations presented as Table 2 allows us to investigate the cause-effect relations of the main functions performed by the publishing and printing portal. Based on the data of cause-effect relations, it is possible to structure the resource sections.

In order to create a structured description of the publishing and printing web portal, an analysis of the set of functions should be carried out as for the “interrelation-implementation” parameter.

The functions are grouped into certain groups interpreting the number and nature of the portal sections whose implementation interdependence is determined by ranking distances from the formed groups to the space origin E. For the usual Euclidean metric, the distance between the elements of the sets i and i' by the $\| \cdot \|$ norm is determined by formula (2):

$$d(i, i') = \|i_j - i'_j\|^2 = \sum_{j \in J} (i_j - i'_j)^2. \tag{2}$$

Then the distance from the formed groups to the set of independent functions b is determined by the method of complete association (far-off neighbor) by formula (3):

$$\delta(a, b) = \max\{d(i, i'), i \in a, i' \in b\}. \tag{3}$$

Thus, as a result of calculations, the structure of relations between groups of functions was obtained which characterizes the portal structure. The web page on which the finite set of types of the portal activities are united by a single topic and purpose is expected to use as the smallest structural unit of the sections.

Table 2

Matrix of logical interrelation between functions of the publishing and printing portal

	f_1	f_2	f_3	f_4	f_5	f_6	f_7	f_8	f_9	f_{10}	f_{11}	f_{12}	f_{13}	f_{14}
f_1	0	0	1	0	1	2	1	2	1	0	1	1	1	0
f_2	0	0	0	0	0	1	1	0	0	0	1	2	0	2
f_3	1	0	0	1	2	1	1	1	0	0	2	1	0	1
f_4	0	0	1	0	2	2	2	1	0	0	2	2	1	1
f_5	1	0	2	2	0	2	2	2	1	1	2	0	1	0
f_6	2	1	1	2	2	0	0	1	1	0	1	2	0	1
f_7	1	1	1	2	2	0	0	1	1	1	0	2	2	2
f_8	2	0	1	1	2	1	1	0	2	2	2	1	1	1
f_9	1	0	0	0	1	1	1	2	0	0	2	2	0	0
f_{10}	0	0	0	0	1	0	1	2	0	0	1	1	0	0
f_{11}	1	1	2	2	2	1	0	2	2	1	0	1	2	1
f_{12}	1	2	1	2	0	2	2	1	2	1	1	0	1	2
f_{13}	1	0	0	1	1	0	2	1	0	0	2	1	0	1
f_{14}	0	2	1	1	0	1	2	1	0	0	1	2	1	0

5. Results obtained in the study of elaboration of a methodology for designing a publishing and printing web portal

The groups of functions of the publishing and printing portal were identified using a method of the main components of the multivariate analysis. To automate this task, we used the Python object-oriented language. The covariance matrix Σ was formed with the help of `numpy.cov(X)` function where X is an n -dimensional random vector (n is the number of lines). For entry, this function takes a list of all signs of the random variable (in our case, the functions of the publishing and printing portal) and returns its covariance matrix. The program results of calculations and comparison with the values of the library function are shown in Fig. 3.

Thus, a number of factors were identified by the method of main components of factor analysis which has allowed us to represent graphically functions of the publishing and printing web portal in the cartesian plane in corresponding groups. Based on the matrix of the logical relationship between portal functions (Table 2), variances of main components and coefficients of correlation of attributes with main components, i. e. functions of the publishing and printing portal were obtained.

```
print 'Mean vector', pca.mean_, m
print 'Projection', pca.components_, v
print 'Explained variance ratio:', pca.explained_variance_ratio_, 1[1]/sum(1)

OUT:
Mean vector: [5.5      10.31439392] (5.5, 10.314393916)
Projection: [[ 0.43774316  0.89910006] (0.43774316434772387, 0.899100062321675)
Explained variance: [ 41.39455058] 45.9939450918
Explained variance ratio: [ 0.99058588] 0.990585881238
```

Fig. 3. Program results of forming a covariance matrix

To find the best solution, grouping of effective data is made for various values of the M number of possible groups and the decision is chosen at which improvement of the quality functional is achieved, i. e. similarity measure of the objects within the groups. When choosing the number of groups, one should be guided by a compromise between homogeneity of the formed groups and the desire to reduce data volume.

As a criterion for evaluating quality of the solution as for grouping of functions, minimum total variance is taken. It is determined by formula (4):

$$Q(X, C) = \sum_{r=1}^M \sum_{x \in c_r} \|x - c_r\|^2, \quad c_r = \frac{1}{n_r} \sum_{x \in c_r} x. \quad (4)$$

According to the extent of variance, the degree of homogeneity of the groups is determined: the less variance the higher the similarity of the objects within given group. Minimum of the target function (4) is achieved at the number of groups $M=4$. The value of F -statistics in solution with the number of groups 1–14 is greater than the critical value ($F > F_{crit.}$), i. e. the selected groups are heterogeneous. When choosing a solution from 4 groups, the total variance (4) is minimal $Q(X, C) = 2.760 \text{ E} - 17$. According to the analysis results, groups with rather high selection quality indicators were formed (Fig. 4).

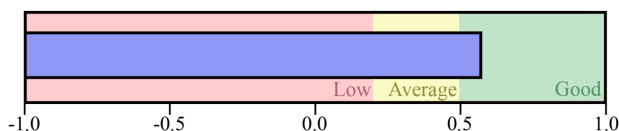


Fig. 4. Silhouetted measure of coherence and division of groups

Therefore, it is advisable to split all internal portal pages into four sections accordingly ($K=4$). Analytical interpretation of the results allows us to distinguish the following sections of the publishing and printing web-portal:

- 1) reference section;
- 2) communicative section;
- 3) additional section;
- 4) informational section.

The reference section combines all internal resources of the publishing and printing company according to the main areas of activity. The communicative section should be aimed at communication of the portal users, in particular, it concerns “executor-customer” communication. Various useful additions of printing subject matter create the additional section of the portal. In turn, the information section is internal and external subject matter resources which do not belong directly to the main field of activity.

Belonging of any new function to a particular section of the publishing and printing portal should be determined by means of combining the methods of cluster analysis of K -means and the discriminant analysis.

Use of the clustering method according to the K -mean scheme for the specified task should be done using the following algorithm:

- 1) choosing a certain number K of information points as group centers to completion of the change of centers;
- 2) comparison of each information point with a group being at a minimal distance to the center;

3) checking for at least one point in the group. To this effect, each empty group is supplemented with an arbitrary point located far from the group center;

4) replacement of the center of each group by the average of the group elements.

Next, a discriminant analysis is used which, based on the training samples, makes it possible to convert a multidimensional array of new group elements into a one-dimensional indicator to predict belonging of these data to groups, that is, sections of the publishing and printing portal.

Reliable functioning of the publishing and printing web portal is impossible without designing and implementing a mechanism for protection against information threats.

Based on the authors' studies [4, 6, 8], the following list of factors influencing safety of web-portals was formed:

1. Reliable hosting with technical support.
 2. Data back-up.
 3. Restricting the users' right of access to files and folders.
 4. Configuring the server using the .htaccess file to enhance the portal safety.
 5. Use of dedicated IP address of the portal.
 6. Removal of the files of configuring the content management system beyond the public_html directory.
 7. Use of SSH access to the portal for administrators.
 8. Use of the SSL certificate.
 9. Creation of the portal copy on another server.
 10. Logging.
 11. Regular update of the content management system and third-party extensions to the latest versions.
 12. Change of the standard path of access to the portal control panel.
 13. Restriction of access to the administrative panel of the portal, FTP and the hosting control panel using the IP-address.
 14. Deletion of the signs indicating which content management system was used for the portal creation.
 15. Use of extensions to protect the portal against SQL, PHP, LFI, XSS injections and DDoS attacks in real time.
 16. Use of secure passwords.
 17. Keeping passwords and other confidential data in an encrypted form.
 18. Use of the token for authentication on the portal.
 19. Use of a unique prefix for the portal database tables.
 20. Use of the SEF link.
 21. Organization of round-the-clock technical support of the portal.
 22. Differentiation of access rights for users and groups of users.
 23. Organization of e-mail and phone notification of the portal administrator on important (in terms of safety) events at the portal.
 24. Minimize the use of third-party extensions (modules).
 25. Use of captcha and automatic spam filtering systems.
 26. Ensuring protection of the files downloaded by users.
 27. Providing information safety for all computers having access to the administrative part of the portal.
 28. Regular auditing of the portal safety.
- In the course of the study, essence of the factors influencing safety of the publishing and printing portal was analyzed. As a result of this analysis, difficulties and disadvantages peculiar to these factors have been identified. For

the future, it is rational to consider the found drawbacks as analytical and theoretical data (D_i at $i = \overline{1, k}$) necessary for an expert estimation of complexity of implementation of the factors.

Determining the degree of influence of the factors on immunity of the publishing and printing portal to burglary starts from processing of the set of factors of influence of F_V at $v = \overline{1, 28}$, using the method of analysis of hierarchies. This processing results in finding weight coefficients of each factor of influence. The factors having the smallest weight coefficients are cut off from being further considered as having a small contribution to safety of the publishing and printing portal.

The factors influencing improvement of the portal safety and their corresponding weight coefficients enabling choice of just the most significant analyzed factors are given in Table 3.

Given the fact that the software market is developing very quickly, the list of criteria can be corrected and supplemented by new data depending on the need.

To determine the significant factors that will participate in the ranking process, the following steps should be taken.

1. Construct a matrix of pairwise comparison of the safety factors $F = \|f_{ij}\|$, $i, j = \overline{1, n}$). The comparison procedure is based on the question: “How much one factor increases safety of the

publishing and printing portal more significantly than the other?” The process of construction is as follows: a matrix is constructed, the selected factors are located in the headings of the rows (i) and columns (j), value “1” is set diagonally because each factor’s significance is compared not only with other factors but with itself as well. To determine numerical value of the degree of importance of the pairwise compared factors, the scale of relativity (the scale of the degree of significance of actions) is used.

For example, when comparing the f_5 factor (secure hosting with technical support) with the f_7 factor (impossibility of users’ access to files and folders), the following is determined. The f_5 factor is 2 times more significant than the f_7 factor when improving the portal safety. Thus, significance of the f_7 factor is 0.25.

A fragment of the calculation matrix is given as expression (5):

$$F = \|f_{ij}\| = \begin{pmatrix} & f_1 & f_2 & f_3 & \dots & f_{28} \\ f_1 & 1 & 0.25 & 6 & \dots & 0.12 \\ f_2 & 4 & 1 & 3 & \dots & 4 \\ f_3 & 0.16 & 0.33 & 1 & \dots & 0.25 \\ \dots & \dots & \dots & \dots & \dots & \dots \\ f_{28} & 8 & 0.25 & 4 & \dots & 1 \end{pmatrix}. \tag{5}$$

Table 3

Factors influencing improvement of safety of the publishing and printing portal

Symbol	Factor Name	Weight coefficient $\mu_i^u(F_i)$
f_1	Use of SSL certificate	0.050
f_2	Use of token for authentication	0.050
f_3	Use of SSH access	0.003
f_4	Limitation of access to the portal administration panel, FTP and the panel of hosting control using the IP address	0.020
f_5	Safe hosting with a good technical support	0.100
f_6	Saving passwords and other confidential data in an encrypted form	0.010
f_7	Limitation of users’ access to files and folders	0.050
f_8	Minimizing the use of third-party extensions (modules)	0.026
f_9	Regular update of the content control system and third-party extensions to the newest versions	0.100
f_{10}	Configuring the server using the .htaccess file to enhance the portal safety	0.030
f_{11}	Ensuring safety of the files downloaded and uploaded by the portal users	0.003
f_{12}	Use of extensions for real-time protection of the portal against SQL, PHP, LFI, XSS injections and attacks	0.046
f_{13}	Deletion of the signs indicating which content management system was used for the portal creation	0.020
f_{14}	Use of SEF link	0.050
f_{15}	Change of the standard path of access to the portal control panel	0.010
f_{16}	Use of captcha and automatic spam filtering systems	0.002
f_{17}	Use of the unique prefix for the portal database tables	0.002
f_{18}	Regular audit of the portal safety	0.090
f_{19}	Copying the portal on an other server	0.050
f_{20}	Data back up	0.050
f_{21}	Use of safe passwords	0.050
f_{22}	Use of a dedicated IP address of the portal	0.070
f_{23}	Differentiation of access rights for users and user groups	0.010
f_{24}	Logging	0.003
f_{25}	Removal of the files of configuring the content management system beyond the public_html directory	0.002
f_{26}	Round-the-clock technical support of the portal	0.050
f_{27}	Providing information safety for all computers having access to the administrative part of the portal	0.050
f_{28}	Organization of e-mail and phone notification of the portal administrator on important (in terms of safety) events at the portal	0.003

2. Calculate elements of the matrix of weight coefficients (according to (6)):

$$\mu_i^u(F_i) = \frac{f_{ij}}{\sum_{i=1}^n f_{ij}}, \quad (6)$$

where $\mu_i^u(F_i)$ are the values of weight coefficients of the i -th factors within the u -th range at $u \in \{0,1\}$.

Further, weight coefficients of factors are determined based on calculations for each F_i of the $\sum_{j=1}^n \mu_i^u(F_i)$ form. This enables a reasonable choice when comparing the factors affecting the portal safety with each other. For example, the weight coefficient of criterion f_1 is $\mu_1^u(F_1) = 0,05$. Weight coefficients calculated for each factor are given above (Table 3).

It is worth noting that the calculated sum of all weight coefficients should be equal to 1 (7):

$$\sum_{i=1}^n \mu_i^u(F_i) = 1; \quad (7)$$

3. Identify the most important (significant) factors that affect safety of the publishing and printing portal. The value of 90 % of the total set of criteria (factors) is absolutely sufficient for further consideration, analysis and drawing relevant conclusions [9]. In this study, this makes it possible to form the following relationships:

a) as for significance, the sum of $f_4, f_{13}, f_6, f_{15}, f_{23}, f_3, f_{11}, f_{24}, f_{28}, f_{16}, f_{17}, f_{25}$ factors was less than 10 %. Consequently, they can be excluded from the consideration process;

b) the sum of $f_5, f_9, f_{18}, f_{22}, f_1, f_2, f_7, f_{14}, f_{19}, f_{20}, f_{21}, f_{26}, f_{27}, f_{12}, f_{10}, f_8$ factors amounted to more than 90 %. It is advisable to use them to improve safety of the publishing and printing portal.

6. Discussion of the results of elaboration of the methodology for designing publishing and printing web portals

Within the scope of this study, a methodology for designing publishing and printing web portals has been developed taking into account the mechanism for implementing information safety. The proposed methodology is a continuation of the authors' study in the development of methodological foundations of information support for publishing activities. Possible fields of practical application of the proposed methodology are as follows:

- management of the publishing processes;
- management of the printing process;
- informational support of the publishing activities;
- retraining and advanced training of publishing and printing specialists directly at their workplace.

Based on the study results, the following conclusions can be drawn regarding the potential practical application of publishing and printing web portals taking into account the proposed methodology.

1. The printing and publishing information has a multi-level structure (for example, a multitude of technologies and equipment for publishing and printing, computer animation techniques, vector graphics, technologies of design and post-print processing). As a result, a clear hierarchy of sections and subsections occupies an important place in

the design. It facilitates navigation through publishing and printing portals.

2. When designing, one should bear in mind dynamic development of new publishing and printing technologies which means that the content of the publishing and printing portal should be constantly updated and supplemented.

3. Since according to the proposed methodology, publishing and printing portals feature a saturated content of the reference, communicative, additional and informative sections; it is important to simplify the interface as much as possible, visualize some part of information and ensure a convenient search.

4. The issue of advertising new technologies and equipment for publishing and printing, software products and other innovations of the publishing sector concerns the economic side of portal creation, namely the choice of paid or free hosting. In absence of allocated resources for placement and maintenance of resources, the problem of hosting choice should be solved depending on the situation.

5. Replenishment of the communicative and informative sections of the publishing and printing portal is the most effective on the basis of providing the user communications. For this purpose, it is important to develop feedback and integration of news or articles in social nets. This approach will increase the number of visitors and interest in the publishing and printing web portal.

Advantages of the proposed methodology for creating publishing and printing web portals are as follows:

- taking into account opinions of leading technologists and chief executive officers of the leading publishing and printing enterprises, Kharkiv, concerning the design of this resource;

- use of capabilities of the publishing and printing web portal interpreted into corresponding portal functions in the developed methodology;

- availability of a mechanism for protecting the publishing and printing portal against information threats.

Shortcomings of the developed methodology include the fact that the use of the methods of expert estimates in formation of the basic set of portal functions (Table 1) can lead to subjectivity of the obtained results.

In the process of using the proposed results, the following restrictions of subjective nature may be imposed:

- personal preferences of the user can lead to a change in configuration of the matrix of logical relationship between functions of the publishing and printing portal (Table 2);

- in the process of filling the information section of the publishing and printing web portal, its overloading may occur with extra internal and external subject matter resources which do not relate directly to the main field of activity. As a result, the level of comfort of the user's work with the resource may decrease.

Further study lines may include the following:

- assessment of efficiency of the publishing and printing portal in the issue of publishing products;

- design of an ontological interface of the publishing and printing portal;

- development of a methodology for assessing quality of the publishing process on the basis of use of the publishing and printing portal.

In the process of realization of these studies, the following difficulties may arise.

For example, in the course of assessment of effectiveness of a publishing and printing portal for implementation of

publishing technologies, it may be difficult to determine the integral indicator of such efficiency and quantify each component of the given indicator.

Design of an ontological interface for a publishing and printing portal may face the problem of a rapid aging of such design tools.

In elaboration of the methodology for assessing quality of the publishing process based on the use of the publishing and printing portal, it may be difficult to identify the factors of usability of this portal in the printing and publishing practice.

6. Conclusions

1. Analysis and systematization of features of the design of publishing and printing web portals were made which makes it possible to determine the main stages of the portal design methodology. These stages were as follows:

- development of a scenario of user interaction with the publishing and printing web portal;
- working out structure and definition of functional features of the publishing and printing web portal;
- formation of a set of functions of the publishing and printing web portal;
- structuring the web portal based on cluster analysis methods;
- development of the mechanism for implementation of information safety of the web portal.

2. The scenario of interaction of the user with the publishing and printing web portal which provides the possibility of forming an individual trajectory of the user's work with the portal was developed. This has resulted in the following scenario elements:

- a clear definition of capabilities of the publishing and printing web portal;
- correlation of specific practical tasks of the publishing practice and the possibilities of using the publishing and printing web portal;
- definition of specific forms of activity.

3. The structure of the publishing and printing web portal was developed based on the use of an expert approach with a combination of methods of multifactorial, cluster and discriminant analyses which provides the possibility of defining main sections of the portal. As a result, structure of the sections of the publishing and printing web-portal including reference, communicative, supplementary and informative sections was formed.

4. The mechanism of implementation of safety of publishing and printing web portals was proposed which provides a reliable protection of the portal against information threats. To determine this mechanism, the following items were defined:

- factors influencing safety improvement for the publishing and printing portal;
 - a matrix of pairwise comparisons of safety factors;
 - a matrix of weight coefficients of safety factors.
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