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SUPPORT OF DECISIONS, REGARDING THE CHOICE OF SOFTWARE – HARDWARE FACILITIES OF EDITION LAYOUT

In the given paper we propose tooling, that enables to realize the reasoning choice of software and hardware facilities of edition layout based on revealing and analysis of the character of factors, influencing the given process. The suggested oriented graph allows to study the connection among the influencing factors and take a decision regarding the choice of the software for layout.

Key words: *process of edition layout, original – model, original manuscript, software for edition layout,designer, publishing office.*

Nowadays a great number of various layout programs can be found on the market of information technologies, the most frquently used are the following programs: Adobe PageMaker, QuarkXPress, LaTex, Adobe InDesign, Corel Ventura Publisher, FrameMaker, Scribus, Ridero etc. The given software refers to specialized layout programs, besides which, for creation of layout originals of simpler editions text (for instance, Microsoft Word) and graphic editors (Adobe Photoshop, Adobe Illustrator, CorelDraw) are often used, that greatly enlarges the number of alternative variants. All alternatives of layout process software have their peculiarities and are considered to be optimal in various cases.

Analysis of publishing offices activity showed [1; 2; 6] that till now the choice of layout software was performed by publishing office or layout designer in each specific case, depending on the type of layout (type of edition, being layouted) and convenience of using this or that software product. This occurs because there is no substantial methodical support regarding the selection of software tooling for the layout [3, 4] and rapid rate of technological development of the given segment of the market of information products and services [4].

The correct choice of software product for layout provides high quality (due to availability of the necessary software – hardware tooling for realization of prepress processing of original manuscript) and short terms (on condition of taking into account other circumstances) of camera – ready copy layout.

This, in its turn, optimizes the expenses for the development of camera ready copy and provides coordination of layout process with other processes of prepress processing of the edition.

Thus, optimal choice of software tooling for layout of camera-ready copy will influence the activity of publishing office on the whole and provide a number of competitive advantages, namely: simplify and accelerate the processing of the original manuscript, reduce the time of camera-ready copy formation and improve its quality.

In other case, if we select the format (PDF, EPS, etc.) the incorrect choice of the layout program may be partially compensated. However, the quality of such camera-ready copy will not be high, because in the given case some important parameters of layout may not be partially or completely realized, or realized incorrectly in the software, in which camera-ready copy was formed and processed.

The above-mentioned circumstances stipulated the aim of the given research, that is determination of the totality of factors, influencing the layout process and evaluation of their corresponding impact, as the basis for further construction of the system for decision-making support regarding the selection of software-hardware methods of the layout.

Decision – making, regarding the selection of the specific software to perform layout of the edition is complex, low formalized task, for its solution additional information is required:

information, regarding the layout of specific types of editions (is given by layout designer);

information, regarding the functional possibilities of the software for layout;

information, regarding the most important parameters of layout for native editions;

information about the most important layout parameters for the leaders of the market of professional software for layout, that operates with PDF and EPS formats.

To provide the correct and rational choice of software - hardware facilities for layout it is necessary to take into account the totality of factors, influencing the layout process and stipulate its efficiency. From this position, the author of the paper suggests to consider the layout problem as the part of the process of edition preparation, taking into consideration the peculiarities\properties of the parameters, immanent to printing and post-printing stages of manufacturing process.

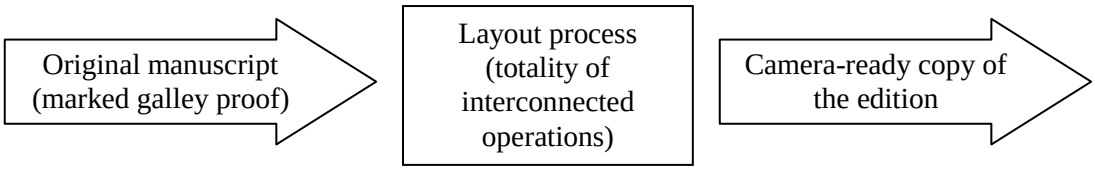

Fig. 1. Logic diagram of layout process

Process approach allows to determine input, output, owner and external conditions of layout process, considering it as a totality of interconnected operations. In accordance with the fundamentals of process approach further study of layout process in order to develop tooling, regarding optimal selection of the necessary software is based on the following hypothesis: parameters, that determine the characteristics of layout process components (input, output, owner, external conditions), stipulate the composition and efficiency of its operations and, hence, determine the choice of the software, necessary for edition layout. Such principal position allows: on one hand –to consider layout as an of inalienable part of the integral process of edition production, and on the other hand – to provide the completeness of the account of all the factors that determine composition and efficiency of layout process, i.e. completely and thoroughly determine element base.

The owner of layout process in the given case is considered to be layout designer but not a publishing office due to the actuality of such trends as separation of camera- ready copy production process from the information activity of publishing offices and printing houses and its determination as separate kind of business [3; 4], as well as rapid development of self-edition [1; 4]. Taking into account that, parameters, characterizing the edition, are determine by external conditions of layout process.

Analysis of layout process, based on process approaches enabled to determine that its content, as the totality of operations and their efficiency, is defined by the factors of four groups (Gn, if n = $\overline{1,4}$), that constitute element base:

factors, characterizing the state of the original manuscript, as input element of the layout process G_2;

factors, characterizing layout designer, as the owner of the layout process G_3;

factors, characterizing publishing office, as the resource of the layout process G_3;

factors, characterizing camera – ready copy, as the result of the layout process (G_4).

Each of the above – mentioned group of factors is defined by the set of parameters. Factors, characterizing the state of original manuscript as an input element of the layout process (G_1) include: form of manuscript presentation (Fr); level of preprocessing of the manuscript (Rpo); style of material presentation by the author (Savt); volume of the material (Om); illustration of the edition (Il); availability and share of the formulas (CHf); availability and share of the tables (CHt).

Factors, characterizing the layout designer as the owner of layout process (G_2) include: competence level ($K(Z,V)$): knowledge (Z) and skills (layout experience) (V); layout specialization (S): books,, , magazines, newspapers , or rapid printing editions; readiness to participate in layout process ($Got\,(M, Rvl, CHv)$) due to motivation to realize this (M), understanding of own role in this process (Rvl) and available free time (CHv).

Group of factors, characterizing the publishing office as a resource of the layout G_3 includes: technological possibilities of layout workstation (T(Os, Zp, Vk, Op, CHsh): type of operation system (Os), frequency of central processor (Zp), type of video card (Vk),volume of hard disks (Op), operation of frequency of system bus (CHsh), characteristics of the device for the output of screen colour --- (PVe), characteristics of the devices for the output of printed ------ (PVd), availability and type of publishing – editing system, applied in publishing office (RVs), status of layout designer in publishing office or the form of labour relations between them (Tv), form of the interaction of layout designer with other participants of preprinting processing of the edition stage (Vz),organization – methodical support of original manuscript (Sao (Vs, Mak, Iv)): publishing specification (Vs),camera – ready – copy of the issue (Mak), other information, specifying the parameters of edition layout (Iv).

A group of factors, characterizing camera – ready copy, as a result of layout process (G_4) contains: type of edition (Tv), type of printing (Ed), format of the edition (Fv), format of text columns and margins size (Fsn), number of columns (Kk), availability of folios and running titles (Kct), level of headings (Rz), variety of dropped heads of type – setting (Vssn),electronic drop of heads (Ess), transparency effects (Epr) chromaticity of the edition (Kol) output formal (Vf), availability of interactive elements (Ie), cover parameters (Po), jacket parameters (Pf), parameters of flyleaves(Pf), inserts parameters (Pvk).

We distinguish 55 factors, stipulating operation – wise composition and efficiency of layout press and define the selection of the necessary software. Each of the factors takes certain values. For instance, possibility values of the factors Rpo are described by the subset:

$$\mathrm{Rpo} = \{\mathrm{rpo}_{\mathrm{m}}^{\mathrm{n}}\}, \quad (1)$$

where upper index (n = $\overline{1, 4}$) shows the membership to certain group of factors (G_n) of element base and lower index (m = $\overline{1, s}$) – indicates ordinal number within the context of the corresponding group (rpo_1^1 – without preprocessing, rpo_2^1 – after the first proof and editing (marked galley proof), …, rpo_s^1 – after the last proof and editing.

Interactions between these factors, influencing the technology, and efficiency of layout process as the totality of interconnected operations are known in general form and proceed from technological requirements regarding the order and rules of preparation for issuing camera – ready copies of electronic and printed editions.

In order to formalize and structure the element base the system of determined factors and their interconnections are presented in the form of oriented graph. The connection between nodes of the graph-- its arcs is determined on the base of the necessity of "availability of one object for manifestation of another object" [10], that is one of the methods of determining the causality (its ontological aspect – ascertainment of the fact of producing) between two objects.

Thus, the connection between these factors, influencing the technology and efficiency of layout process as the totality of interconnected operations is determined, proceeding from the following operation "Is it possible (without doing over again) to take into account correctly in the process of layout operation the parameters of one factor, without information regarding the values of other factor parameters?". Edges between nodes signify the absence of such possibility and vice versa.

The given statement is not reciprocal and depends on the sequence of layout designer operations.

For instance, at the beginning of the work over the camera – ready copy, at other constant circumstances, layout designer can set in layout program the size of pages – format of the edition (Fv), not knowing at the moment the format of the strips of typesetting (Fsn) but cannot do inversely. Hence, on the base of separation of functional connections between factors, influencing the technology and efficiency of layout process as the totality of interconnected operations, using the program "Graph analyzer", oriented graph is constructed (Fig. 2).

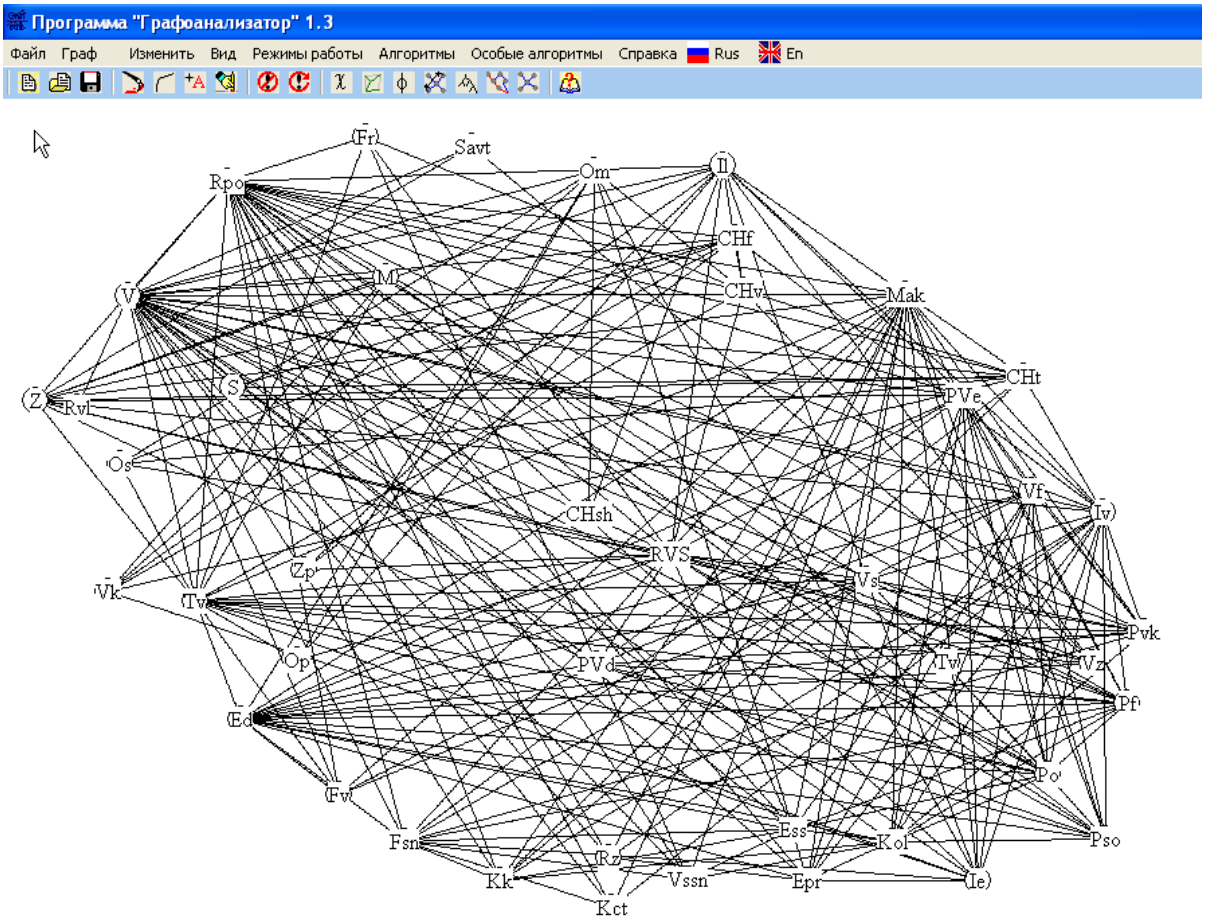

Fig. 2 Graph of interconnections between the factors of layout process, developed in the program “Graph analyzer”

Graph of 55 th order is connected: nodes – factors are closely interconnected. It makes impossible its study in order to compare the impact of each of nodes-factors on layout process with the help of means of empiric data collection and application of objective methods of correlation – regressive analysis.

Proceeding from this reason, within the limits of the given research the importance of factors impact on layout progress is established on the base of application of deductive (subjective) approach, i.e., practical experience of layout designers, namely, on the base expert poll method.

In accordance with general methodical statements of expert methods [8] the following features are determined to be the criteria of experts selection, that provide their competence, regarding the object of the given study: specialization at various types of layout, experience (at least 2 years) of layout, progress of candidates (by indices of opportunities and quality of the results obtained, and satisfaction of the executor).

By maximum values of the determined selection criteria 20 layout designers (workers of leading publishing offices of Kharkiv and freelancers specialized in various (five per each types of the edition) on average 3 years, have extensive portfolio of prepared works(layout editions) Expert group composition and quantity of experts, determined in such a way is optimal for obtaining reliable expert information [8, 9].

Such examination is one-round procedure of obtaining expert evaluations that was performed by specific expert separately and independently (with communication) from other members of expert group in order to eliminate interinfluence.

In order to determine impact of factors on layout process, experts were suggested to compare in pairs the groups (Gn) of factors from the point of view of their utility as accumulating measure of

value. In this case the value of factors is characterized by their ability to influence the composition (technology, as the sequence of operations) and efficiency of layout process.

At the beginning of the survey the experts obtained all the necessary information for minimization of the discrepancy of their concepts (according to [8]), regarding the composition of groups and their interconnection, as well as, the aim of the survey and the importance of individual information for the results of further research.

After formalization of the obtained experts' answers, expert information will take the form of metric multiplicative relations of the advantage of linear order between elements, being compared and it is presented in the form of matrices of pair comparison (according to [9]):

$$A^{(k)} = \left[a_{ij}\right]^{k}_{n\times n}, \tag{2}$$

where k – number of experts, k=20; n – number of groups of factors, compared in pairs, n=4;

a_{ij} – relation of the advantage among the groups of factors, $a_{ij} = 0$ if $i = j$.

If $i \neq j$:

$$a_{ij}^{k} = \begin{cases} 1, \text{ if } the\ expert\ prefers\ object\ \mathrm{X_i} \text{ to object } \mathrm{X_j}; \\ 0, if\ the\ expert\ prefers\ object\ \mathrm{X_j}\ to\ object\ \mathrm{X_i}; \\ 1/2, if\ the\ expert\ considers\ objects\ \mathrm{X_i} \text{ and } \mathrm{X_j}\ to\ be\ of\ equal\ value. \end{cases} \tag{3}$$

By the values of elements of total matrix of experts judgments $P = \left[p_{ij}\right]_{n\times n}$, where:

$$p_{ij} = \sum_{k=1}^{m} a_{ij}^{k} \tag{4}$$

by means of the method of row sums (according to[8]) it was determined that, as compared with others:

- the greatest impact on layout process perform factors, characterizing camera-ready copy of the edition (almost all the experts agree with this);
- impact of factors, characterizing layout designers and factors, characterizing publishing office impact on the layout process is almost the same;
- factors, characterizing original manuscript, have the lowest level of impact on layout process.

Lawfulness of expert survey results in application in the process of further study of layout process proves the importance of dispersion in each case of comparison, that is determined to be not lower than 0.3 that shows the normal distribution of expert information and coordination of experts answers [9].

Information, obtained from the experts makes oriented graph, constructed in Fig. 2 strained by the values of groups rank to which node-factor belongs to.

Determination of the impact of each of the factors belonging to corresponding groups on the layout process is proposed to perform on the base of establishing a number of direct and indirect connections of each of the nodes with other nodes of the graph, i.e., by the number of routes (including loops), in the structure of which it participates. Hence, the solution of the problem of transitive closing of the oriented graph takes place. The value of the graph reachable matrix (Fig. 2) that serves as the base for determination of routes between nodes, are corrected according to the values of group ranks, this factor, determined by the experts , belongs to.

The given analysis of the oriented graph (Fig. 2) relatively each of the node, enabled to distinguish four groups of factors by the level of their impact on the content and efficiency of layout process and on the selection of the required software.

Table 1

Factors, influencing the layout process

№ and value of the group of factors by the impact on layout process	Factors, influencing the layout process, determining its technology and efficiency
1	2
Factors, influencing essentially the layout process (1st group)	Illustrativeness of the edition(Il) Skill (experience of layout) (V) motivation (M) available free time (CHv) characteristics of the devices for output of screen color proof (PVe) camera ready copy of the edition (Mak) other information, specifying the parameters of edition layout (Iv) format of text columns and margins size (Fsn) number of columns (Kk) availability of folio and running headlines (Kct) levels of headlines(Rz) varieties of impositions of the type (Vssn) electronic imposition (Ess) transparency effecst (Epr) coloration of the edition (Kol) availability of interactive elements (Ie)
Factors of average influence on the layout process (2 group)	knowledge (Z) specialization on the layout (S) understanding of own personal role (Rvl) type of video card (Vk) volume of hard disks (Op) characteristics of the devices for output of printed color proof (PVd) edition specification (Vs) format of the edition (Fv) output format (Vf)
Factors of low influence on the layout process (3rd group)	level of preprocessing of the manuscript (Rpo) style of material presentation by the author (Savt volume of material (Om) frequency of the central processor (Zp) operation frequency of system bus (CHsh) form of interaction of layout designer with other participants of preprinting stage, of edition processing (Vz) type of printing (Ed) parameters of the cover (Po) parameters of the jacket (Pso) parameters of fly leaf (Pf) parameters of the inserts (Pvk)
Factors of minor influence on the layout process (4th group)	form of manuscript presentation (Fr) availability and the portion of formulas (CHf) availability and the portion of Tables (CHt) type of operation system (Os) availability and type of publishing – editing system, applied in the Publishing Office (RVs) employment status of layout designers in the Publishing Office or the form of employment relations between them (Tv) type of edition (Tv)

Conclusions

Thus, within the frame of the given research groups and factors of the impact on layout process to be taken into account while selection of hardware – software facilities for edition layout were determined.

The direction of further research of the author is the development of decision-making system, base of knowledge and data base of which will be based on the constructed oriented graph of the interaction between factors, influencing the layout process and further support of the given system in order to include new alternative programs for layout and determination of their parameters interaction with the parameters of layout process.

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