

## Multi-Criteria Methods of Making Decisions in Editorial Processes

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Decisions made while editing a publication involve a necessity to choose layout parameters which influence both a number and aesthetics of printed pages. The former of the aforesaid factors influences the amount of paper necessary for producing a given printing run, thus determining the cost of publishing a book, and is calculated using proper formulas. The latter of the factors, i.e. aesthetics, is liable to purely subjective assessment and, by that reason, is hardly measured to a publisher due to being dependant on fancies and preferences of readers. Multi-criteria decision analysis methods (AHP and DEMATEL) proposed herein deliver a preference ranking based on pair-wise comparison findings. As a consequence the optimum values for layout parameters are obtained which allows to achieve high aesthetics and readability of a published text with simultaneously optimum costs of publishing.

This paper is about using the multi-criteria decision analysis methods in editorial processes while choosing layout parameters for book purposes. Whenever planning a publication, the publisher has to choose between the cost of publishing a book and its aesthetics. Hence, the major problem is setting the balance between these factors

### Introduction

In editorial processes (here in this paper seen as a process of preparing a book for printing), the stage of planning the publications layout is one of the factors, which has a great impact on the amount of the used paper and in consequence the cost of publishing.

Every publisher who plans to publish a book has to face an issue of book's layout which is of crucial meaning for aesthetics and readability of the book's text and, moreover, significantly determines a given publication in terms of its economic efficiency. A key problem is to achieve a compromise between the aesthetics, meaning an aspect subjectively estimated by readers, and the cost of publishing referred to as an objective economical criterion calculated in consideration of the amount of materials used for printing a book. In order to establish the proper balance between economical and aesthetic factors it is essential to find out which of the two aforementioned factors is more important.

Finding the proper balance is very important for every book containing only text or only a small number of illustrations. It can be either fiction or popular science books especially publication of the significantly large size, such as ency-

clopaedias or dictionaries. In such publications cost share of paper is relatively high as compared to the total costs of printing. Even though when using the automatic page make-up for publications such as Yellow Pages, it is important to make the decision concerning the typesetting, which highly influences the number of pages therefore the cost of publishing, earlier.

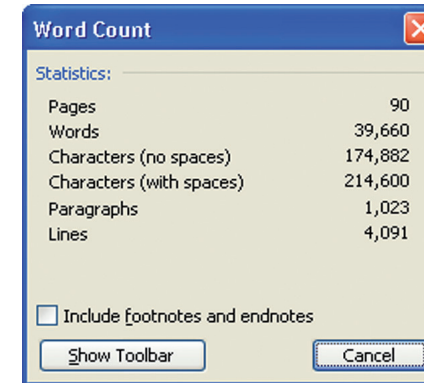
Thus, a publisher who needs to reduce the cost of printing basically tries to limit a number of printing sheets on which a desired amount of text is to be placed. A graphic designer follows guidelines given before and uses a wide range of techniques allowing to reduce a number of pages. This, however, often leads to lowering of readability and aesthetical values of the project. Therefore, a compromise between the said criteria should be achieved.

### Layout parameters

There is a number of layout parameters which influence the future book's look:

- 1) publication size,
- 2) size of composed page, and for multiple column page: number of columns, width of each column and space between them,
- 3) typeface and its modifications – especially width of characters,
- 4) type size,
- 5) line spacing,
- 6) ways of text accentuation, e.g. title of chapter or entries in dictionary,
- 7) methods of typesetting fragments of text (parts, chapters, paragraphs),
- 8) illustration arrangement.

Figure 1:  
Word Count tool available in Microsoft Word text editor



Most of those parameters have impact on a given book both in terms of its aesthetic value and economical aspect. Moreover, the two aforementioned factors are inversely related to each other, i.e. the more economical typesetting of a book is, the less its aesthetic value shall be.

Another difficulty is how the two said factors are assessed. Aesthetic value is estimated subjectively by readers, i.e. people who frequently have no knowledge of typesetting standards and principles, the only thing which is taken into consideration during this process is whether a given book or its pages look attractive or not. Assessment like this is made also while considering text's legibility, where such legibility is also related to determination of simplicity of finding a required information (e.g. entries in dictionaries or encyclopaedias) and, by that reason, publication functionality is also concerned. However, the economical can be estimated quite precisely using the number of materials, especially paper, used while printing.

### Estimation of the publication's cost

Estimation of publication's cost involves a necessity to assess a number of book pages required for the text to be printed according to strictly determined typesetting parameters. This shall require the following factors to be specified: total number of characters to be used in the entire publication, size of composed page (its width and height), type size and line spacing, where the last two parameters depend significantly on a typeface and width of each particular character. Subsequently, using the below specified formulas a number of pages of the publication can be calculated:

1. Number of characters in publication (NC) can be obtained using a statistics tool available in text editing software packages, whereas it is essential that the word spacing must be taken into account (Figure 1).
2. Number of characters in one line (NCL) can be achieved by dividing a page width by an average width of a single character for a given typeface, where for regular width typeface it is equal half the type size (for condensed or extended modification of typeface the said coefficient should be adequately verified):

$$NCL = \frac{C}{\frac{1}{2} \cdot T} \cdot W = 2 \cdot \frac{C}{T} \cdot \frac{W}{S} \quad (1)$$

where:

CW – column width,  
TS – type size.

3. Number of lines on one page (NLP) can be achieved by dividing a column height by line spacing:

$$NLP = \frac{C}{L} \cdot \frac{H}{S} \quad (2)$$

where:

CH – column height,  
LS – line spacing.

4. Number of characters on one page (NCP) of a given publication size can be achieved by multiplying a number of characters in one line (NCL) by a number of lines on one page (NLP) of the publication:

$$NCP = NCL \cdot NLP \quad (3)$$

5. Number of pages (NP) of a publication can be achieved by dividing a number of all characters (NC) of the publication by a number of characters on one page (NCP) of the said publication:

$$NP = \frac{NC}{NCP} \quad (4)$$

The illustrations included in the publications are assessed separately per a number of pages, depending on the way of placing them in the book and the space that they use.

The next step is to calculate the amount of paper needed for producing a required printing run. The following formula must be used for the sheet-fed printing purposes:

$$P S = \frac{R}{F s} \cdot N F s \quad (5)$$

where:

PS – number of printed sheets required for printing run,  
R – a number of printing runs,  
Fs – number of folded signatures printed out of one sheet,  
NFs – number of folded signatures in the publication.

A quantity of paper required for setting up a printing machine and finishing processes should be added to the product obtained in such a way.

## Results and discussion:

### 1. Change in number of book's pages versus amount of paper necessary for printing the book

Modifying any of layout parameters results in changing the number book's pages being published which, in turn, increases or decreases the amount of paper needed for producing a required printing run (Table 1). In case of printing a small size book even a 10% increase in a number of published pages means producing 2 extra printed sheets for every copy of book which, while printing for instance 3000 copies, results in increasing the amount of paper by 6000 printed sheets. In case of printing a book of significantly large size, such as multi-volume

dictionaries or encyclopaedias a 25% increase in a number of pages leads to creating an extra volume which involves a high increase in the cost of publishing.

### 2. Book layout parameters versus number of printed pages

The most widely spread DTP software offers a plethora of typefaces and ways of accentuating any selected fragments of text, which makes determining the optimum values of book layout parameter rather time-consuming. Each of the parameters can be widely modified which results in numerous layout variations for a single publication. Even that a number of possible values assumed by each of the parameters is limited to 2 or 3, a number of so obtained variations is high – over 5 thousand (Table 2).

A kind of analysis is conducted to find an answer to a question how the change of each parameter influences an amount of paper needed for a book and, as a consequence, how it influences a cost of publishing a book. To do that, a series of layout parameters have been defined for an exemplary dictionary. Modification of only one of the layout parameters at a time has been made to observe how the number of pages is influenced. Changes with respect to a number of pages have been observed with each particular modification. Findings have been disclosed in percentage values (Table 3). For example: enlargement of type size (+1 p.) causes a 35% increase in the number of pages.

According to the data from Table 3 one should be aware that some of the layout parameters related to phrases accentuation only insignificantly influence a number of actually printed pages. As appears from examples presented in Figure 2 and Fi-

Table 1:  
Change in number of pages of a book versus amount of paper necessary for printing the book

| Increase in number of pages | Light literature<br>A5 size<br>360 pages<br>(23 sheets of A2 size) | Dictionary<br>B5 size<br>800 pages<br>(50 sheets of B2 size) | 4-volume encyclopaedia<br>A4 size<br>4x1000 = 4000 pages<br>(250 sheets of A1 size) |
|-----------------------------|--|--|---|
| 5%                          | 378 pages<br>24 sheets of A2 size                                  | 840 pages<br>53 sheets of B2 size                            | 4200 pages<br>263 sheets of A1 size   |
| 10%                         | 396 pages<br>25 sheets of A2 size                                  | 880 pages<br>55 sheets of B2 size                            | 4400 pages<br>275 sheet of A1 size  |
| 25%                         | 450 pages<br>29 sheets of A2 size                                  | 1000 pages<br>63 sheets of B2 size                           | 5000 pages (+1 volume)<br>313 sheets of A1 size                                     |

Table 2:  
Variations of dictionary typesetting (exemplary)

| Layout parameters   | Possible to use   | Chosen for calculation purposes                           | Number of variations |
|---|---|---|----------------------|
| Publication size  | B4, A4, B5, A5, B6, A6  | A4 or B5  | 2                    |
| Size of composed page<br>- number of columns<br>- space between columns         | plenty<br>2, 3 or 4<br>min. 6 p., more often 12 p.              | smaller and bigger size<br>2 or 3<br>minimum and optimum  | 6                    |
| Typeface<br>- modification of typeface  | plenty<br>regular or narrow                                     | 3 typefaces – modification:<br>regular and narrow         | 6                    |
| Type size   | 6, 7, 8, 9 p.   | 7 or 8 p.   | 2                    |
| Line spacing  | 0, 1, 2 p.  | 0 or 1 p.   | 2                    |
| Beginning of group of catchword   | one below another,<br>from the new column                       | one below another,<br>from the new column                 | 2                    |
| Ways of paragraphs accentuation   | nothing, indentation,<br>space between 1-2p.                    | nothing, indentation,<br>space between 2p.                | 3                    |
| Ways of entries accentuation  | bold / semi-bold /<br>caps / small caps /<br>different typeface | semi-bold,<br>semi-bold + caps,<br>semi-bold + small caps | 3                    |
| Together (result of multiplication of numbers of possible partial combinations) |   |   | 5 184                |

Table 3:  
Book layout parameters versus number of printed pages

| Changing parameter   | Increase in number of pages                 | Publication of B5 size<br>960 pages, 60 sheets of B2 size  |
|--|---|--|
| Enlargement of type size +1p.  | ≈ 35%                                       | 1296 pages, 81 sheets of B2 size   |
| Enlargement of line spacing +1p.   | ≈ 15%                                       | 1104 pages, 69 sheets of B2 size   |
| Reduction of size of composed page   | max 20%                                     | 1152 pages, 72 sheets of B2 size   |
| Changing typeface and its modification<br>(condensed → regular)  | 5÷25% ≈ 15%                                 | 1104 pages, 69 sheets of B2 size   |
| Ways of text accentuation:<br>- space between paragraphs +1 p.<br>- paragraphs indentation = 1 em quad<br>- hanging indentation = 1 em quad<br>- phrases accentuation:<br>semibold / caps / small caps | ≈ 2,5%<br>≈ 0,5%<br>≈ 3,5%<br>0,5÷1,5% ≈ 1% | 984 pages, 62 sheets of B2 size<br>965 pages, 61 sheets of B2 size<br>994 pages, 63 sheets of B2 size<br>970 pages, 61 sheets of B2 size |

Figure 2:  
The influence of dictionary entries' accentuation for readability and legibility

| semi-bold   | semi-bold + small caps  | semi-bold + caps  |
|---|---|---|
| DALEKOPIS aparat telegraficzny (składający się z nadajnika i odbiornika), odtwarzający odpowiednio nadane i odebrane impulsy elektryczne na znaki literowe, maszynowo pisane na taśmie lub arkuszu papieru. [LC]<br>DANE ogólne określenie informacji tekstowej do publikacji lub cyfrowej do przetwarzania, w komputerach. [IR]<br>DANE wydawnicze informacja o wykonawcach publikacji wydawniczej, zawierająca również metryczkę techniczną, tzn. m.in. o miejscu wydania i drukowania, danych produkcyjnych poligraficznych, objętości, umieszczona na końcu wydawnictwa lub na odwrocie strony tytułowej. [LC]<br>DATA PODPISANIA DO DRUKOWANIA data ostatecznej akceptacji publikacji i przekazania do drukowania. [LC]<br>DATA WYDANIA rok lub data opublikowania pozycji wydawniczej. [LC] | DALEKOPIS aparat telegraficzny (składający się z nadajnika i odbiornika), odtwarzający odpowiednio nadane i odebrane impulsy elektryczne na znaki literowe, maszynowo pisane na taśmie lub arkuszu papieru. [LC]<br>DANE ogólne określenie informacji tekstowej do publikacji lub cyfrowej do przetwarzania, w komputerach. [IR]<br>DANE WYDawnicze informacja o wykonawcach publikacji wydawniczej, zawierająca również metryczkę techniczną, tzn. m.in. o miejscu wydania i drukowania, danych produkcyjnych poligraficznych, objętości, umieszczona na końcu wydawnictwa lub na odwrocie strony tytułowej. [LC]<br>DATA PODPISANIA DO DRUKOWANIA data ostatecznej akceptacji publikacji i przekazania do drukowania. [LC]<br>DATA WYDANIA rok lub data opublikowania pozycji wydawniczej. [LC] | DALEKOPIS aparat telegraficzny (składający się z nadajnika i odbiornika), odtwarzający odpowiednio nadane i odebrane impulsy elektryczne na znaki literowe, maszynowo pisane na taśmie lub arkuszu papieru. [LC]<br>DANE ogólne określenie informacji tekstowej do publikacji lub cyfrowej do przetwarzania, w komputerach. [IR]<br>DANE WYDawnicze informacja o wykonawcach publikacji wydawniczej, zawierająca również metryczkę techniczną, tzn. m.in. o miejscu wydania i drukowania, danych produkcyjnych poligraficznych, objętości, umieszczona na końcu wydawnictwa lub na odwrocie strony tytułowej. [LC]<br>DATA PODPISANIA DO DRUKOWANIA data ostatecznej akceptacji publikacji i przekazania do drukowania. [LC]<br>DATA WYDANIA rok lub data opublikowania pozycji wydawniczej. [LC] |

### Typesetting without indentation

Dalekopis aparat telegraficzny (składający się z nadajnika i odbiornika), odtwarzający odpowiednio nadane i odebrane impulsy elektryczne na znaki literowe, maszynowo pisane na taśmie lub arkuszu papieru. [LC]

Dane ogólne określenie informacji tekstowej do publikacji lub cyfrowej do przetwarzania, w komputerach. [IR]

Dane wydawnicze informacja o wykonawcach publikacji wydawniczej, zawierająca również metryczkę techniczną, tzn. m.in. o miejscu wydania i drukowania, danych produkcji poligraficznej, objętości, umieszczona na końcu wydawnictwa lub na odwrocie strony tytułowej. [LC]

Data podpisania do drukowania data ostatecznej akceptacji publikacji i przekazania do drukowania. [LC]

Data wydania rok lub data opublikowania pozycji wydawniczej. [LC]

### Typesetting with paragraph indentation

Dalekopis aparat telegraficzny (składający się z nadajnika i odbiornika), odtwarzający odpowiednio nadane i odebrane impulsy elektryczne na znaki literowe, maszynowo pisane na taśmie lub arkuszu papieru. [LC]

Dane ogólne określenie informacji tekstowej do publikacji lub cyfrowej do przetwarzania, w komputerach. [IR]

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Data wydania rok lub data opublikowania pozycji wydawniczej. [LC]

### Typesetting with hanging indentation

Dalekopis aparat telegraficzny (składający się z nadajnika i odbiornika), odtwarzający odpowiednio nadane i odebrane impulsy elektryczne na znaki literowe, maszynowo pisane na taśmie lub arkuszu papieru. [LC]

Dane ogólne określenie informacji tekstowej do publikacji lub cyfrowej do przetwarzania, w komputerach. [IR]

Dane wydawnicze informacja o wykonawcach publikacji wydawniczej, zawierająca również metryczkę techniczną, tzn. m.in. o miejscu wydania i drukowania, danych produkcji poligraficznej, objętości, umieszczona na końcu wydawnictwa lub na odwrocie strony tytułowej. [LC]

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Data wydania rok lub data opublikowania pozycji wydawniczej. [LC]

Figure 3:  
Dictionary paragraphs accentuation  
versus readability  
and legibility

### 3. MCDA methods

In order to choose optimum layout parameters two multi-criteria decision analysis (MCDA) approaches have been applied, namely AHP (Analytic Hierarchy Process) and DEMATEL (DEcision MAKing Trial and Evaluation Laboratory). Each of them allows to scrutinise aesthetics of book layout, however doing it may be rather difficult because aesthetical aspects of layout are subjectively estimated by readers whose habits and tastes fail sometimes to correspond with the knowledge of professional editors and graphic designers.

Firstly it is essential to decide which of the aforementioned two factors (aesthetic or economical) is more important with respect to a given publication. Interrelation of the said factors shall differ depending on a kind and application of a book being designed (Table 4).

Another step consist of defining a range of values for layout parameters, where such values make an aesthetical factor be prevailing over the economical one or the other way around with respect to a designed book.

Pair-wise comparison of various possible layouts allows to choose the one which is both cost-effective and preferable by readers. Furthermore, the comparison process allows to eliminate layouts that negatively influence readability and proper comprehension of the text. However, the pair-wise comparison of various possible layouts should be made by readers and experts independently.

Based on findings of pair-wise comparison we can create judgement matrix (AHP) or normalised matrix of direct influence (DEMATEL) and estimate priorities according to a selected criterion. It allows to choose a layout which is preferable by readers and, at the same time, does not generate any extra costs of publishing.

#### Conclusions:

The research which was described above allows to support a hypothesis that layout components which highly improve the readability and aesthetics and only slightly increase the number of pages truly exist.

While planning the printing of book it is essential to determine, at the beginning, its kind and application, next define a proper balance between the aesthetical and economical factors. To do so one of the MCDA methods can be applied.

Another step is to estimate the amount of paper required for the printing run and in calculating the costs of publishing the book.

As a result the desired parameters are obtained. They are needed for the book layout to be relatively cheap without compromising its aesthetics and legibility.

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Table 4:  
Significance of aesthetic  
and economical factors  
for various kinds of books

|   |                                 |
|---|---------------------------------|
| Quality books                           | aesthetics > cost of publishing |
| Low-quality books                       | aesthetics < cost of publishing |
| Books for specialists and professionals | aesthetics = cost of publishing |
| Albums                                  | aesthetics > cost of publishing |
| Encyclopaedias and dictionaries         | aesthetics < cost of publishing |