

## **Influence of Readability on Popularization of Internet Resources**

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**Abstract.** the article analyzes the influence of readability of the content on the popularization of Internet resource. The analysis of known methods for content readability determination, as additional component of popularization has been carried out. In researching, an algorithm for determining the basic level of readability has been developed, and recommendations for its application have been provided in order to enter the TOP results query. The question of determining the parameters of graphic design of the content is considered and recommendations on their application in the process of designing the Internet resource are provided. The research conducted creates the preconditions for further study of the subject and formation of mathematical support for automatic content rewriting depending on the required level of readability.

**Keywords:** readability; Internet resource; popularization; relevance; search engines.

### **1 Introduction**

At the current stage of the development of digital technologies, there is a need to create effective websites, forums, and social networking pages that promote the product or company and attract new customers. Every day, more and more research market experts view the online resource as both mobile office and exhibition space, which requires their popularization in order to enhance the visibility of the company in the global network. As known [1,2], in the popularization process of the Internet resource the optimization of text content for search queries is one of the criteria for success. At the same time, "specialized texts" are created, which are optimized for the keywords and phrases-copywriting, which is divided into copywriting and SEO copywriting [3,4].

The objective of copywriting is to write genuine author's texts, and few special requirements are put forward to SEO-copywriting. Namely, texts should be not only original and unique, but also understandable to the target audience, properly structured and contain the necessary number of keywords. In addition, the number of keywords should clearly meet the requirements of search engines and readability

criteria, in order to avoid filtering [5]. SEO-copywriting plays an important role in the process of ranking an online resource. However, in practice, most of the texts placed on the pages are often written exclusively for search engines, which negatively affect company as well as goods and services that it provides. Considering that users observing high resource ratings are forced to look for less "popular", but more "valuable" sites for them.

Change of this situation is in the application of a variety of methods by SEO experts: increase of usability, reducing the time to load the resource, adding advertising, etc. However, the content and ways of submitting it was the main problem, which directly affects the ease of texts reading - readability. Readability is the feature of a text material that characterizes the ease of perception by a person [6,7]. Readability is a complex indicator, which includes: a clear match of keywords to the subject of the online resource and aesthetic design (from the background of the document to typography). Therefore, the actual task is to analyze the methods of assessing the readability of the content and determine their influence on the process of popularizing the Internet resource.

## 1.1 Analysis of recent researches and publications

The analysis of well-known statistical information services (Google Analytics, LiveInternet, HotLog, Open-Stat) showed that if the average time to browse the Internet resource page is less than ten seconds, then the latter does not meet the requirements of the user [8]. The main reason for this fact is the irrelevance of information about the user's request, that is, the web robot during the analysis made an error while analyzing the content of the Internet page. In order to identify possible causes, a well-known analysis of known types of relevance was carried out. Search engines are constantly implementing special algorithms to improve the quality of search results and display relevant information to the user. In this case, the extent to which search results match the task set in the search query is understood as the relevance of SEO, that is, the set of keywords or phrases contained in the text of the web site and their relevance, from the standpoint of the search engine, to user queries is determined [9-17]. The conducted analysis of literary sources showed that today the following types of relevance are distinguished as follows: formal, content-related and pertinent [18-31].

*Formal* - the main type, on which until recently mechanisms for ranking search engines were built. It algorithmically compares the search query model with the model of the document that was staged by the search engine. Namely, the "higher frequency" of the query text is found in the document of the given web site and rarer it occurs in other documents, the higher the weight of this resource on a separate request. It can be concluded that the words from the query should be inserted into the text of the page; the inadmissibility of excessive density of key phrases so that the resource does not enter into the search engine filters; minimizing rarely used phrases.

*Content-related* - relevance, which is determined by the non-formal approach and used by search engines for the assessment of the search quality. Namely, specialists of the search engine (assessors) form a conclusion regarding the compliance of user's

query information found by the search engine. Basically, this type of relevancy is used to enforce restrictions when accessing the plurality of "unwanted" resources.

*Pertinent* – is a degree of satisfaction with the results of search retrieval on the part of the user, that is, the degree of satisfaction with the information received by the expectations of the resource visitor. This type is the highest level of relevancy, more and more search engines are trying to provide it every day. In pertinent relevance, not only keywords or usability of the resource, but actual relevancy and readability of the information play an important role. The latter indicator is often left out of the attention of the developers of online re-source, although it creates the first impression and preconditions for the abandonment of the resource [32-45].

The conducted analysis shows that since the relevance of information is a subjective factor that dynamically varies depending on the subject area, special attention should be paid to the actual readability of the content. This parameter has a key value when determining the affinity relevancy. Therefore, the actual task is to analyze the impact of readability on the popularization of Internet resources in the Global Internet [11-26, 46-51].

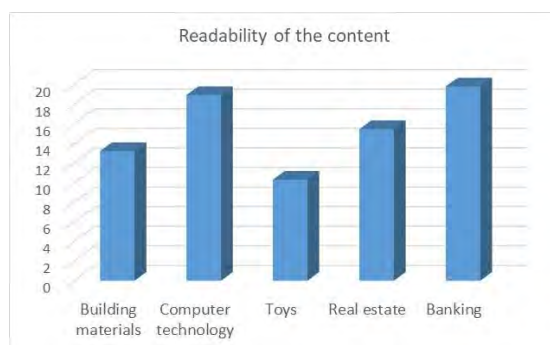
## **1.2 Formulation of the problem**

In general, the readability index does not fit into any analytic web metric of search engine. However, the latter is able to record both the failure rate and time spent on the page and depth of viewing (scrolling). The information obtained is used to assess the informativeness and readability of the content. In view of this, the purpose of the study is to analyze the methods that determine the readability of the content and determine their efficiency in the process of content evaluation. In order to achieve the goal set it is necessary: to carry out an analysis of known approaches to the definition of readability; develop a general algorithm for readability evaluating; formulate recommendations on the design of the text content of the Internet resource. The solution of the tasks set will provide the necessary tool for creating high-quality content and displaying it for the end user, and thus increasing the rating of the resource in results query.

## **2 Major research results**

In the process of creating and publishing Internet resources, the most labor-intensive process is to write content that is mainly targeted to certain results queries. At the same time, most SEO-optimizers do not pay much attention to such a concept as "readability", since it is believed that if the page is in the top of the results query, then it is provided with "continuous flow of visitors". However, this situation may change after the next upgrade of search engine algorithms. Since the global transition to pertinent relevance is avoidless. Given that, taking into account the level of readability of the audience the number of visitors can be significantly increased and Internet resource in the global network can be popularized. The importance of determining the level of readability is confirmed by the study of excellent subjects of

Internet resources with the help of free readability.io service. This resource enables getting general information (readability index) of a separate network site. The following five most popular subjects in Ukraine were chosen to be studied: building materials, computer technology, toys, real estate, banking. The analysis consists in exploration of the most popular resources that form the TOP 5 in Google's search and averaging results to determine the level of readability. The results of the analysis are shown in Fig.1



**Fig.1.** Readability of the content depending on the subject area

As can be seen from Fig.1, the readability of content is directly related to the topic, namely, the more complex it is, the higher the level of readability is needed, and therefore the resource that pretends to be in the TOP positions should correspond to the baseline. In order to conduct a comprehensive study of readability, five most popular methods were analyzed [6]: Flesch Reading Ease Scale; Canning Fog Index; Coleman-Liau Index; SMOG grade; Automated Readability Index.

Each of the methods pays considerable attention to the of parameters set in determining the readability of the content, so their detailed analysis was carried out in order to create a common approach that could be used in the process of popularizing Internet resources among relevant topics.

*Flesch Reading Ease Scale* is the scale of distribution of each particular index element, thus the higher the value the simpler text for perception is [6]. Namely, 80 – 100 - primitive level, 60-79 - simple texts, usually periodicals, 50-59 - fiction, 30-49 - level of business literature, professional and industry publications, up to 30 - level of scientific literature. The dependence based on which the index is determined for the Slavic languages has the following form:

$$FRE = 206.835 - (1.3 \cdot ASL) - (60.1 \cdot ASW), \quad (1)$$

where, *ASL* is average sentence length; *ASW* is average number of syllables per word. For correct work it is necessary to analyze the text fragment consisting of a minimum of 100 words.

*Canning Fog Index* – is used as an indicator in determining the level of readability required by the audience to understand the content. For Slavic languages it is characterized by the following dependence:

$$FI = 0.4(0.78 \cdot NWS) + (100 \cdot NWT), \quad (2)$$

where,  $NWS$  is the average number of words in a sentence;  $NWT$  is average number of words with length of syllables more than four;  $0.78$  is correction ratio for Cyrillic text.

*Coleman-Liau Index* is used in the process of mechanical assessment of the complexity of texts. Unlike the previous indicators, as parameters, not the number of syllables, but the actual letters, which can greatly simplify the process of counting them is used. Dependence has the following form:

$$CLI = 0.0588 \cdot L - 0.29 \cdot S - 15.8, \quad (3)$$

where,  $L$  is average number of letters per 100 words;  $S$  is average number of sentences per 100 words.

*SMOG grade*. The basic idea is that the complexity of the text increases with the raise in the number of complex words (words with three or more syllables) included in it. In general, it is an estimate of the dependence of complex words on the number of sentences and has the following form of dependence:

$$SMOG = 1.0430 \sqrt{NP \cdot \frac{30}{NS}} + 3.1291, \quad (4)$$

where,  $NP$  is number of polysyllables;  $NS$  is number of sentences.

*Automated Readability Index* is measure of determining the complexity of the perception of text by the reader. According to this method, all texts are divided into 14 levels of readability (from the simplest to the more complex), which is determined according to the following dependence:

$$ARI = (4.71 \cdot CS) + (0.5 \cdot WS) - 21.43, \quad (5)$$

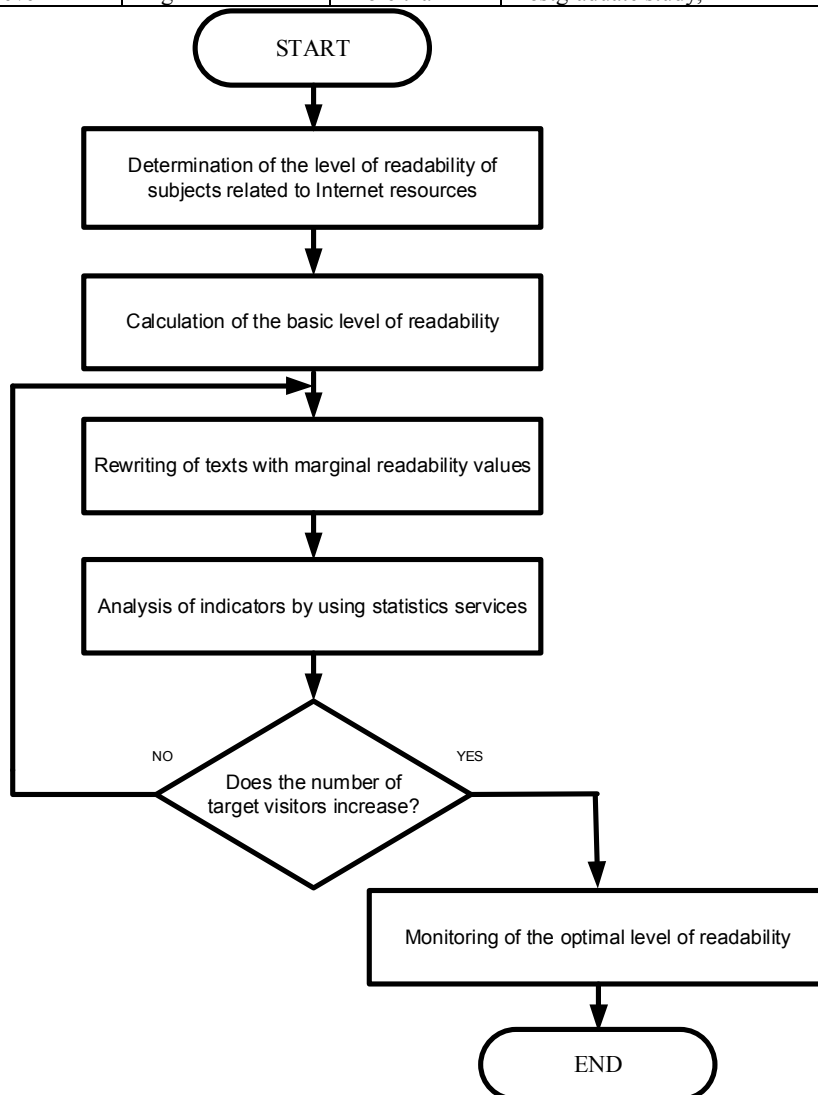
where,  $CS$  is the ratio of the number of letters to the number of words in the text;  $WS$  – the ratio of the number of words to the number of sentences in the text.

Conducted analysis of methods allowed developing a comprehensive algorithm for determining the level of readability with the use of statistics services. The block diagram of the algorithm is depicted in Fig. 2.

*Step 1. Determination of the level of readability of subjects related to Internet resources*. As it was shown, content readability should be commensurate with the audience of the users for which it is designed. In order to determine the required level of content, the comparison of the resources of the leading Ukrainian higher education institutions (in regions) according to the Google search engine rankings was made. The comparison was carried out by using the Readable.io service applied by developers to evaluate the readability of the content. The compliance with the readability level required for the preparation of respondents applied in Readable.io. is introduced in table 1.

**Table 1.** Meaning of readability levels

Readability level	Level of preparation	Readability	Level of respondent
A Level	Initial	Up to 10	High school (1-4 grades)
B Level	Below average	Up to 16	Average harm (5-10 grades)
C Level	Average	Up to 20	Average harm (11-12 grades)
D Level	Above average	Up to 24	High school
E Level	High	More than 24	Postgraduate study, PhD



**Fig.2.** Algorithm for determining the level of readability

The analysis of resources of higher educational institutions showed the following results: Ivan Franko National University of Lviv ([www.lnu.edu.ua](http://www.lnu.edu.ua)), average readability - 16.3; Kyiv Taras Shevchenko National University of Kyiv (<http://www.univ.kiev.ua>), average readability - 25.7; National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute" (<http://kpi.ua>), average readability - 22.5; National Technical University "Kharkiv Polytechnic Institute" (<http://www.kpi.kharkov.ua>), average level of readability - 23,8; Kharkiv National University of Radio Electronics (<http://nure.ua>), the average level of readability - 18.3.

*Step 2. Calculation of the basic level of readability (RBL).* It is defined as the average result among other resources of the subject. Consequently, the baseline for this subject is determined as the arithmetic mean of the following indices, that is:  $RBL=21,32$ .

*Step 3. Rewriting texts with marginal readability values.* This stage lies in the processing of the text content of the Internet resource, with the maintenance of the content load, placed on the boundary of the base level. For comparison, the resource of the Lviv Polytechnic National University (<http://lp.edu.ua>) was analyzed, which received the following indicators: Flesch Reading Ease Scale (21,4); Canning Fog Index (24.6); Coleman-Liau Index (18.3); SMOG grade (20); Automated Readability Index (17.8). The average readability level is 20.4. As it is seen from the analysis, resource readability rating is defined as D, which is associated with the content of above the average complexity and necessary training of respondents at the level of higher school. The average level ranges within 5% of the basic level of the industry, which is the best indicator. Hence, the resource fully meets the criterion of readability in this topic. If the index has a deviation of more than 10%, then further manipulations are necessary, namely, "adjusting readability to the base level".

*Step 4. Analysis of indicators by using statistics services.* Even if the resource meets to the base level, it is necessary to increase the readability index and analyze the dynamics of time spent by users on the resource as well as interaction with it. If trends are positive, then there is an increase in readability, otherwise - on the contrary.

*Step 5. Monitoring of the optimal level of readability.* Based on the data of the previous step, the optimal level of readability for the visitors, which is supported by the writing of new texts, is optimally found on the experimental path.

## **2.1 Content graphic design guidelines**

As the study showed, readability of content is important in the process of popularization. However, there is a situation when the text completion is executed according to all the rules, but when switch to the resource, the user still leaves it and the case relates to graphic design. The analysis of popular internet resources made it possible to determine the parameters and formulate recommendations that have to be followed in the process of popularization:

*Font face and point size of the stick.* It has the greatest impact on the readability of the text, and therefore requires the use of fonts without serifs, in particular Arial, Verdana, Tahoma and others. Because these types of fonts are correctly displayed on

all types of devices that run on popular operating systems. Optimum in terms of readability is the point size of 12pt. Fonts of greater or lesser size slow down reading and increase the fatigue of visitors.

*Text justification and strings length.* The conducted analysis showed that it is advisable to justify texts on the left edge, since right edge raggedness help users to focus their eyes by increasing both the speed of reading and improving perceptions of information. As to the length of the lines, it is experimentally proved that text columns having a width of more than 50-70 characters are difficult to read due to the variety of output means. As proof of this recommendation, one can consider the resources of the popular online editions: Ukrainska Pravda (<https://www.pravda.com.ua>), Lvivskaja Gazeta (<http://gazeta.lviv.ua>), Vysokiy Zamok (<https://wz.lviv.ua>) and others.

*Use of uppercase.* It is necessary to minimize the use of text paragraphs in uppercase. The studies show that this text is much more difficult to read on the one hand, and on the other hand, the upper case in Internet communities determines an increase in the tone of the presentation of the material.

*Underlying in the text.* One should not do underlying in regular text, since this indentation is reserved for hyperlinks.

*Contrast between text and background.* There is a direct relationship between the contrast between text and background and readability. Namely, the high contrast of the latter increases the readability. In particular, for surfaces that reflect light (paper), the best combination is black text and white background. Although for surfaces emitting light the dependence is the opposite. However, due to polygraphy, dark text on the background became actually the standard for computer display. As an alternative, soft blend between text and background can be used, herewith the contrast between font and background should not to exceed 4:1.

The detailed analysis of both the methods for assessing readability and the content design parameters has shown that in order to enter the TOP of the search engine, in addition to the set of factors (relevancy, backlinks, domain, authority, etc.), it is necessary to follow the rules of texts writing. Namely, meet the expectations of users above all, concerning the requirements of readability and relevancy. This further will provide additional resource potential, both from users and search engines.

### **3 Conclusion**

As a result of the research, direct dependence between the content readability and subject area was determined and the need for scientific research in this field was shown. The analysis of methods for determining readability has shown that each of them has its own peculiarities in application, and as to Slavic languages, the use of several methods with subsequent averaging of the results is the best tool. In view of this, an algorithm for determining the level of readability of the content of the Internet resource and method for its application was developed. The formation of recommendations for the graphic design of content, as an integral part of readability became the final stage of the study. The use of the described mechanisms will provide



additional means for popularizing the Internet resource and, accordingly, increasing the percentage of "satisfied" users.

Further research will be focused on the software development of intellectual content analysis for promoting online resources.

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