The Use of Information and Communication Technologies as a Means of Analyzing Public Interest in Historical Events in Wikipedia Regarding Documenting the Social and Cultural Sphere

Tetiana Bilushchak[a], Viktoriia Dobrovolska[b], Iryna Ivanochko[a] and Nataliia Boiko[b]

[a] *Lviv Polytechnic National University, 12, S. Bandery str., Lviv, 79013, Ukraine*
[b] *National Academy of Managerial Staff of Culture and Arts, 9, Lavrska str., Kyiv, 01015, Ukraine*

Abstract

The work presents a study of the global public information service Wikipedia, which is intended to reflect social and cultural events of both global and national scale. All threats and conflicts of social, informational and legal nature as an important factor in public projects are determined. Two historical events of the Orange Revolution and the Revolution of Dignity have been studied in the context of the information presented in Wikipedia. The engagement and number of edits of these pages are evaluated. A study using Spearman's rank correlation coefficient was conducted to determine the relationship between the amount of engagement and number of page edits. The rank correlation between qualitative characteristics is determined. The information about the event was researched in the available statistical period and the event was considered in the context of comparing visits to the event pages presented in Wikipedia in three languages. The analysis was performed by two parameters, namely the number of visits and the corresponding date of the year. There were studied the regularities obtained as a result of the analysis of statistical data presented in Wikipedia on the visits to the analyzed event in three languages and the impact of other events on it.

Keywords 1

Wikipedia, public documentation, page view, online service, Internet, social environments, historical events.

1. Introduction

The information possibilities of modern times give rise to social activity of members of society: the use and posting of the necessary information, the possibility of analysis, thus, the electronic way of recording information becomes the leading one.

In an age of active development of society, as of today from the technical point of view the main ways of the presentation of documental materials in the sphere of culture are their posting on the global Internet (in the appropriate, traditional for this environment formats of hypertext and multimedia). It is needed to dwell on the issue of main channels and services, which provide their own processes for both documenting and presenting documents online.

It should be noted that although in the early stages of the Internet and the World Wide Web, operating on its infrastructure, (from the late 60's to the early 2000s) were considered as an

environment of one-way information dissemination, hence we can only speak of its representative role. That is, it acted as a kind of an archive of materials posted in it on a particular topic.

At this stage, in addition to the representational function, the function of the formation of documentation of social and cultural processes has become significant.

The representative function is traditionally carried out through WWW sites of various scales – from the simplest to the world's largest services. In contrast, the formation is carried out mainly only on leading interactive services. Documentation can:
- be of basic nature of recording cultural events
- have collaborative formation of analytical, consolidated, and abstract documents.

Documentation of the first type is mainly carried out in services such as Twitter, Instagram, YouTube and in the environment of universal social networks such as Facebook. In such services, users post reports in various formats on the events of cultural life, document the activities of certain institutions, and more. Documentation in such environments plays a more communicative function, which is to inform stakeholders, get feedback and so on. Available materials are not guaranteed with permanent storage, version history, protection against edits, verification. There is a high probability of infringement of copyright and other laws. Thus, the main function in terms of documenting events is communicative, which manifests itself in the organization of prompt interaction between organizers and participants of events; the value of materials as documents is achieved only if they are transferred to other problem-oriented platforms.

The second type of systems is designed to provide more adequate electronic documentation of various aspects of human activity, in particular in the sphere of culture. Systems of this class include various electronic archives, individual e-government systems and more. Among the systems of this type, the leading position is currently occupied by the Wikipedia project.

The aim of the work is to study the engagement in the Wikipedia page of a certain historical event and the impact of other related events on its visits by means of information and communication technologies.

To achieve this goal, the following tasks must be performed:
- to analyse modern research papers on the study of Wikipedia as an indicator of public interest
- to identify documentary aspects of Wikipedia materials
- to analyse public interest in historical events on Wikipedia as a tool for documenting phenomena of the social and cultural sphere.

The research methodology was performed using the correlation analysis method with the help of Spearman's rank correlation coefficient to determine the relationship between the number of views and the number of edits of a historical event on a Wikipedia page. The method of analytical grouping was used to determine the effect of the date parameter on the annual page visits to Wikipedia. To solve the tasks set in the work, a theoretical analysis of the scientific literature was also conducted as well as a review-analytical monitoring of engagement rates based on internal statistics of the Wikipedia page was used. Methods of analysis and synthesis were also used to generalize and draw conclusions.

2. Related Works

Analysis of recent research and publications shows that the use of Wikipedia in certain areas of activity has been studied through various topics by many scientists.

The important part in the study of military-historical events on Wikipedia pages is a transparent vision of the social origin of the editors, who put the correct information, which further affects the presentation and understanding of this historical event [1]. The modern vision of history and the presentation of historical research on Wikipedia requires historians to abandon popular theories of truth and present all materials on historical events as public heritage [2]. Modern historians, studying a certain event and presenting its vision, always face such a phenomenon as another vision of researchers of this event. Therefore, as a result, we receive a unique event processed by historians, where we obtain the most truthful historical information [3]. A certain event on Wikipedia can be represented by several information pages, which can be grouped or contain some part of the event information, i.e. to present a certain aspect of the event [4]. Studies of Wikipedia and social media

platforms as an additional source of information in the study of various subjects by students and as a tool for the formation of the information society were considered in [5, 6, 7]. In the publication [8], a study on selective entropy by algorithm (sMSE) was conducted as well as the relevance of analyzing temporal changes in complexity in certain topics. The researchers of the article [9] evaluate the values of historical essence through the aspect of time and location, i.e. showing how one object affects another, taking into account the place and time of creation.

However, a number of important aspects of this problem remain uncovered. Thus, there is a need to study the public documentation of historical events in Wikipedia and the mutual impact of the other historical and notable events on the interest in it.

3. Risks and perspectives of the development of Wikipedia in Ukraine

Taken into account the influence of Wikipedia on the cultural and information sphere of Ukraine, one cannot ignore the fact that the principles of its content generation are partially vulnerable to purposeful influences, and the State does not have effective tools to protect Wikipedia from harmful interference in its community. Such influences are carried out both for the purpose of political and cultural-historical propaganda, and for purely commercial purposes. This can lead to deterioration of the quality of materials, obsolescence of their documentary value. To minimize this phenomenon, the Wikipedia administration implements tools of various classes, which allow strengthening control over new content and changes in it, however, this approach yet bears a number of risks, the most important of which is the risk of destroying the community of enthusiasts who strive to develop the project.

In addition, the active use of a promotional approach to the emergence of new materials leads to the rapid emergence of new articles as a batch, which then eventually become obsolete, lose their accuracy as an up-to-date document (or rather retain accuracy as a historical document).

A separate issue that arises in the Wikipedia project both in Ukraine and in other countries is the difficulties in interaction with public authorities and important social organizations (such as free trade zones, scientific and library institutions, large commercial organizations and political bodies). There are two clear areas of such problematic interaction:
- legal conflicts regarding materials posted on Wikipedia
- information conflicts caused by conflicts of interest

Conflicts of the first type usually arise between Wikipedia and public authorities on the ground of violations of legal regulations and are more typical for totalitarian states (in which case they almost certainly cover the cultural spheres of state life), but can also occur in the sphere of democratic legislation (for example, certain materials on drugs, etc.). In addition, conflicts of this type are sometimes associated with possible infringements of copyright and intellectual property laws.

Conflicts of the second type are based on systemic contradictions between the interests of certain socially significant organisations that build the information field of the state. Such organisations often consider Wikipedia as a convenient and effective platform for information and advertising activities, which contradicts the principles of Wikipedia. It should be noted that articles of cultural and historical content are among the most controversial in Wikipedia; their discussions are platforms for intensive discussions with elements of communication conflicts. In some cases, there are signs of purposeful information wars.

The situation is complicated by the fundamental openness of Wikipedia for edits by anyone (with further verification). An obvious option, which is often implemented within Wikipedia, is to complicate the procedures for making changes and their validation by reputable members. However, such a relatively "elitist" approach inevitably slows down the development of the project. The alternative is to find mutually beneficial forms of cooperation with socially significant organisations. As both Ukrainian and international experience shows, such cooperation is successful firstly with library institutions (given a certain basic readiness of libraries and librarians to prepare objective, documentary proven materials) and research and educational institutions (under the condition of reaching compromises on the system of motivation and requirements for documentary evidence of materials).

It should be noted that the scale, integrity and motivation of the team of enthusiasts that ensure the updating and development of Wikipedia is a key factor in its success. After all, similar and related

projects, around which the community of editors was not formed or disintegrated, or do not develop or simply ceased to exist (as at one time leading Internet directory Open Directory Project).

3.1. Evaluation of social significance of Wikipedia

Wikipedia is formally presented as a universal online encyclopedia with open editing content. On a number of features, some researchers question its encyclopedic nature, in particular due to the lack of such traditional features for encyclopedias as consistent content, unified style of articles, and the presence of reputable authorship.

However, these shortcomings relate to the terminological aspects of the project and do not diminish the importance of Wikipedia as a huge archive of abstract documents of encyclopedic style, many of which reflect the processes in the sphere of culture. It should be noted that the generation of the content of Wikipedia is collaborative in nature, it can be technically joined by anyone. However, significant changes and additions can only appear as a result of discussions and verification by the community. There are certain non-formal rules in the community (apart from formal ones); the participants differ in authority and status.

Wikipedia today is divided into separate, almost autonomous instances based on language. The content of each of them can be significantly different, up to a completely opposite interpretation of the same events.

In the case of the Ukrainian Wikipedia, we are dealing with an array of 800,000 articles, the great part of which documents cultural phenomena. Some significant articles are in fact the phenomenon itself, the process of generation of which is documented in the discussion of the article.

We have the right to claim the significance of certain Wikipedia articles as a cultural phenomenon, based in particular on the undoubted dominance of Wikipedia as a starting point in the process of navigating the WWW, whose users are interested in obtaining certain background information. This is ensured by a number of factors, including the unconditional inclusion in the first search results for relevant search queries by leading search engines, such as Google (or even a separate presentation of information from the rest of the search hits).

According to statistics, Ukrainian Wikipedia has been the most popular Ukrainianphone site for the last five years, with a size of the audience surpassing that one of other sites. The popularity and social significance of Wikipedia is also traced in the processes of social communication on the Internet, in particular in discussion forums and communities, whereas links to Wikipedia articles are often used as an important argument in discussions. In fact, no other resource is systematically used in discussions as a source of objective data.

Taken into account the polylingualism of Ukrainian society, in addition to the Ukrainian Wikipedia, the Russian Wikipedia is also important for the society, which is much larger than the Ukrainian one in terms of volume of content; in some regions Polish, Hungarian and other Wikipedias are significant.

Unconditional authority (especially in scientific and educational circles) as a source of abstract knowledge belongs to also the Anglophone Wikipedia as the most complete and up-to-date one.

The total amount of reference information posted on Wikipedia has already exceeded all available reference resources of the encyclopedic type, both in specific and general topics. The total number of articles in the Ukrainian Wikipedia is approaching one million, the number of active participants in the project is measured in thousands.

All this actualizes the task of updating and filling Wikipedia (both Ukrainian and other specified) with documents that reflect the processes in the sphere of culture. Up to now, such activities are coordinated by a number of public organizations (primarily the Wikipedia Foundation and Wikimedia Ukraine). Government and cultural organisations are still showing insufficient interest in these processes, which in the long run may lead not so much to a slowdown in Wikipedia's growth as to the de-actualization of certain scientific and cultural organisations that will not pay enough attention to new forms of activity.

3.2. Documentational aspects of Wikipedia materials

An important aspect that allows us to consider Wikipedia material as a document is:
- availability of additional details
- version history of articles
- documented processes of articles generation

The presence of additional details of Wikipedia articles allows documenting the chronological aspects, aspects of authorship, the general structure and type of the article, the availability of additional links and resources. This brings the Wikipedia article closer to a traditional analytical document.

The version history of articles allows tracking changes made in chronological order to the article, and, more importantly, to address (and, accordingly, refer to) not the current, but the fixed-in-time version of the article. Unfortunately, this extremely important feature of Wikipedia is rarely used in practice, although it is extremely important for cultural events, as it eliminates the effect of "forgetting" the event, thus gaining full-fledged documentary characteristics.

For in-depth analysis of the article in its chronological and content aspects, there is a publicly available discussion of the article. In practice, for socially significant articles, all significant changes are discussed on the connected page Discussions. Thus, the content of the article as a document has not only formal characteristics, such as the author who made the changes, but also additional information support – the presence of consensus on changes, arguments in favor or against changes, and so on.

One more important aspect of documenting is the availability of a separate repository of verified multimedia information – Wiki storage at commons.wikimedia.org. Unlike Wikipedia itself, Wikimedia Commons does not have a linguistic-national division, and it is a single resource. Today, Wikimedia Commons stores over 50 million images and other multimedia files (audio, video).

In terms of capacity, these repositories are significantly inferior to a number of leading multimedia services, such as YouTube and Instagram. However, the value of the repository is high due to the fact that the materials from it can be freely used and distributed under the condition of adherence to liberal license of Wikipedia, including in batch mode. This, in particular, reduces the risks of losing the accumulated information, which is typical of such services. After all, recent examples of the closure of the projects as Panoramio (Geographic Location Photo Database) and Knoll (Google's online encyclopedia) projects show non-zero probability of these scenarios, even for high-end projects.

4. The result of a comparative analysis of the visits to Wikipedia pages of similar historical events and the impact of public interest in clarifying the information of this event

We will study the visits and edits of the pages of two historical events that eventually led to the same situation. The fateful events in Ukraine at the beginning of the 21st century show the vision of the Ukrainian people and the public documentation of this struggle, represented by the commonly accessible and freely edited two important Wikipedia pages, namely the Orange Revolution and the Revolution of Dignity.

Thus, let us look at the visits to the pages of the Orange Revolution and the Revolution of Dignity, which led to the same situation, which is the change of government in the country. In Fig.1 visits to the Ukrainianphone pages of the Orange Revolution and the Revolution of Dignity from 2016 to 2020 were demonstrated. Here the rhombus indicates the visits to the Orange Revolution page, and the square indicates the number of visits to the Revolution of Dignity page for the corresponding year.

During the study period, the ratio of the number of visits to the Revolution of Dignity page $V_{\text{Revolution of Dignity}}$ to the Orange Revolution $V_{\text{Orange Revolution}}$ decreased linearly until 2019, and in 2020 this ratio increased slightly. That is, the visits ratio in 2016 was $\dfrac{V_{\text{Revolution of Dignity}_{2016}}}{V_{\text{Orange Revolution}_{2016}}} = 2{,}35$ and

until 2019 it was the following $\frac{V_{\text{Revolution of Dignity}_{2019}}}{V_{\text{Orange Revolution}_{2019}}} = 1,47$, however, the engagement rate of the Revolution of Dignity in relation to the Orange Revolution increased slightly and amounted to $\frac{V_{\text{Revolution of Dignity}_{2020}}}{V_{\text{Orange Revolution}_{2020}}} = 1,7$.
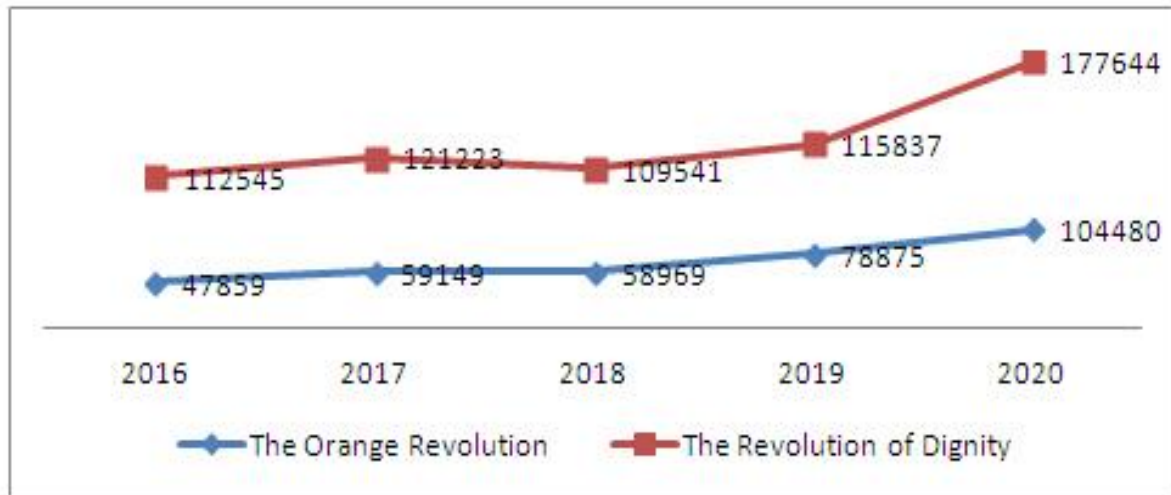

Figure 1: Visits to Wikipedia pages of historical events of the Orange Revolution and the Revolution of Dignity from 2016 to 2020

Based on Wikipedia's internal data, we make a hypothesis: if the growing number of views on the Revolution of Dignity page each year affects its editing. To determine the relationship between the number of views and the number of edits, we will perform a correlation analysis using Spearman's rank correlation coefficient [10]. Input data: X (number of views per year), Y (number of page edits that year) (Table 1).

Table 1
Represented values of characteristics of X and Y

X (number of views)	Y (number of edits)
177644	23
115837	9
109541	43
121223	67
112545	61

Let us assign the ranks of the characteristics of Y and factor X and build a scatterplot between the rows X and Y (Fig. 2).
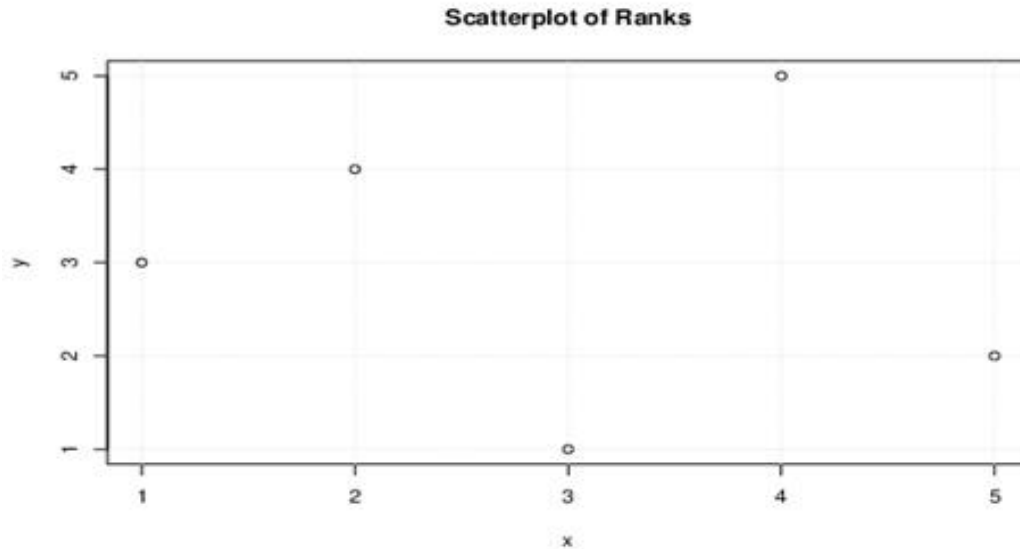
Scatterplot of Ranks

Figure 2: Scatterplot between X and Y rows

Figure 2 illustrates the result of ranking the data X and Y in the form of a scattering graph. When using the rank correlation coefficients conditionally assess the closeness of the relationship between the characteristics. Here, rank 1 for variable X corresponds to the value in table 1 – 109541, rank 2 – 112545, rank 3 – 115837, rank 4 – 121223 and rank 5 – 177644. Accordingly, for variable Y ranks are as follows: 1–9, 2–23, 3–43, 4–61 and 5–67.

Let us create matrix of ranks (Table 2).

Table 2

Matrix of ranks

Rank X, d_x	Rank Y, d_y	$(d_x - d_y)^2$
5	2	9
3	1	4
1	3	4
4	5	1
2	4	4
15	15	22

Checking the correctness of the matrix based on the calculation of the checksum

$$\sum_{xij} \frac{(1+n)*n}{2} = \frac{(1+5)*5}{2} = 15. \tag{1}$$

The sum of the columns of the matrix is equal to each other and the checksum, so the matrix is composed correctly. Using the formula, we calculate the Spearman's rank correlation coefficient.

$$p = 1 - 6 * \frac{\sum d^2}{n^3 - n}, \tag{2}$$

$$p = 1 - 6 * \frac{22}{5^3 - 5} = -0,1. \tag{3}$$

Therefore, as a result of calculating the Spearman's rank correlation coefficient, a very low, negative correlation with the value of Rs (-0.1) was obtained. The relationship between characteristic Y and factor X is low and inverse. Thus, we must accept the null hypothesis of no correlation.

When applying the Spearman's rank correlation coefficient, the closeness of the relationship between the characteristic is conditionally estimated on the Chaddock scale and according to this scale, it is low (Table 3).

Table 3
Gradation of the closeness of the relationship between phenomena

	Medium		Strong		
Closeness of the relationship characteristic	Low	Medium	Visible	High	Very high
Correlation coefficient values	0,1 – 0,3	0,3 – 0,5	0,5 – 0,7	0,7 – 0,9	0,9 – 1,0

Estimation of Spearman's rank correlation coefficient. Significance of Spearman's rank correlation coefficient. In order to test the null hypothesis under the equal significance of α about the equality to zero of the general Spearman's rank correlation coefficient for the competing hypothesis H_i. p ≠ 0, it is necessary to calculate the critical point:

$$T_{kp} = t(\alpha, k) * \sqrt{\frac{1 - p^2}{n - 2}},$$

(4)

where n is the sample size; p is the sample Spearman's rank correlation coefficient: t (α, к) is the critical point of the two-sided critical area, which is found in the table of critical points of the Student's distribution by the level of significance α and the number of degrees of freedom k = n-2. If $|p| < T_{kp}$, there is no reason to reject the null hypothesis. The rank correlation between qualitative characteristics is not significant. If $|p| > T_{kp}$, the null hypothesis is rejected. There is a significant rank correlation between qualitative characteristics.

According to Student's table, we find t (α / 2, k) = (0,05 / 2; 3) = 4,177.

$$T_{kp} = 4,177 * \sqrt{\frac{1 - 0,1^2}{5 - 2}} = 2,4.$$

(5)

Since T_{kp}> p, we accept the hypothesis of equality of 0 of the Spearman's rank correlation coefficient. That is, the rank correlation coefficient is not statistically significant and the rank correlation between the scores on the two tests is insignificant.

That is, the generated information about a certain event, which was generated over a period of time and which had many edits at the beginning, ultimately leads to a smaller number of edits. That is, the edited information is complete and contributes to more views, thus the information is widely represented on this topic.

5. The result of the analysis of a historical event and the mutual influence on its interest of other historical and remarkable events

A historical event such as the Revolution of Dignity is studied. We analyze three pages of Wikipedia, namely the Ukrainianphone *the Revolution of Dignity* (https://uk.wikipedia.org/-wiki/Революція_гідності), Anglophone *2014 Ukrainian revolution* (https://en.wikipedia.org/wiki/-2014_Ukrainian_revolution) and Russianphone pages *Change of power in Ukraine in February 2014* (https://ru.wikipedia.org/wiki/Смена_власти_на_Украине_в_феврале_2014_года)**.** All these pages are united by one historical event, but each of them has a different vision of that time. Here, a study of these pages on their visits was carried out as well as a comparative impact with other events that affected visits, i.e. encouraged to visit a page to establish, mention certain data of this event.

The research will be conducted during the event itself, i.e. from the beginning to the end of the Revolution of Dignity. The page (https://uk.wikipedia.org/wiki/Революція_гідності) states that the Revolution of Dignity (also knows as Kyiv Maidan, Maidan in Kyiv, Euromaidan and

Eurorevolution) are political and social changes in Ukraine happened from 30th November 2013 to February 2014. The statistics of visits to Ukrainianphone, Anglophone and Russianphone Wikipedias contain information on visits: Ukrainianphone and Anglophone ones since July 2015 and Russianphone since 26th October 2017.

The studied period from 1st October to 31st March of each year in 2015-2021 for Ukrainian and English pages is considered. A similar interval from 2017 to 2021 for the Russian page is also considered. The studied interval and in addition for the months before and after the revolution was taken into account.

Figures 3, 4 and 5 show the statistics of visits to the Ukrainianphone *the Revolution of Dignity* , Anglophone *2014 Ukrainian revolution* and Russianphone pages *Change of power in Ukraine in February 2014* respectively**.**
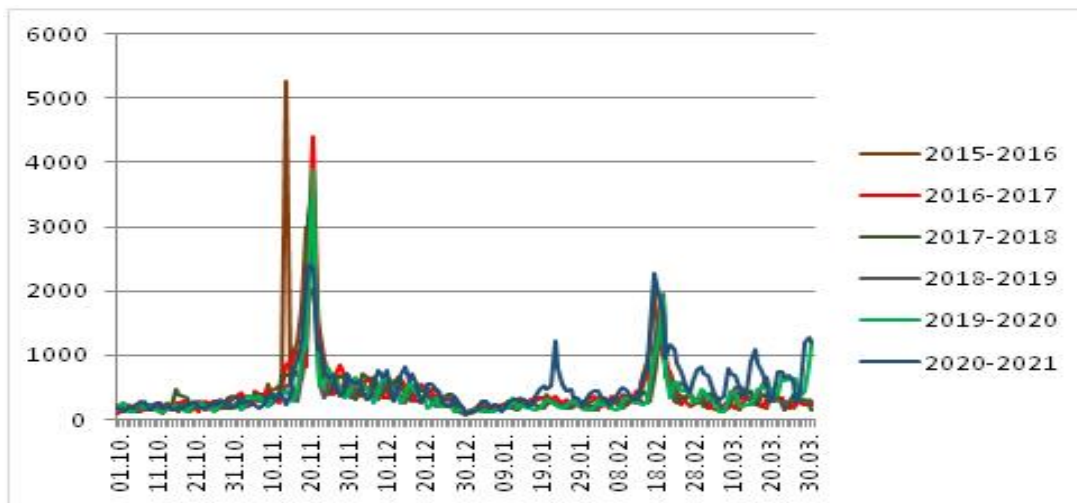

Figure 3: Ukrainianphone page the Revolution of Dignity
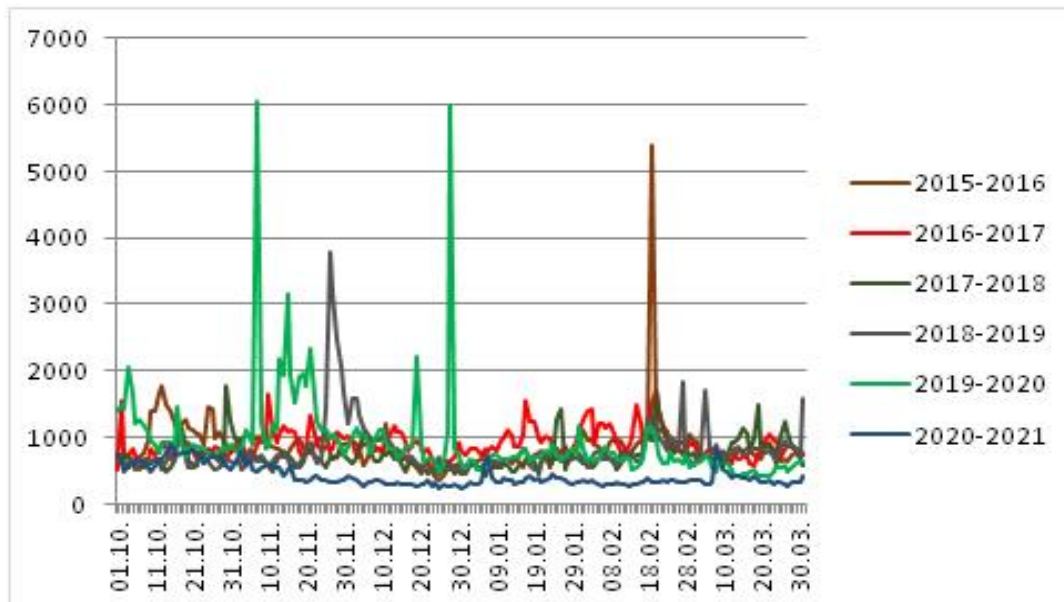

Figure 4: Anglophone page 2014 Ukrainian revolution
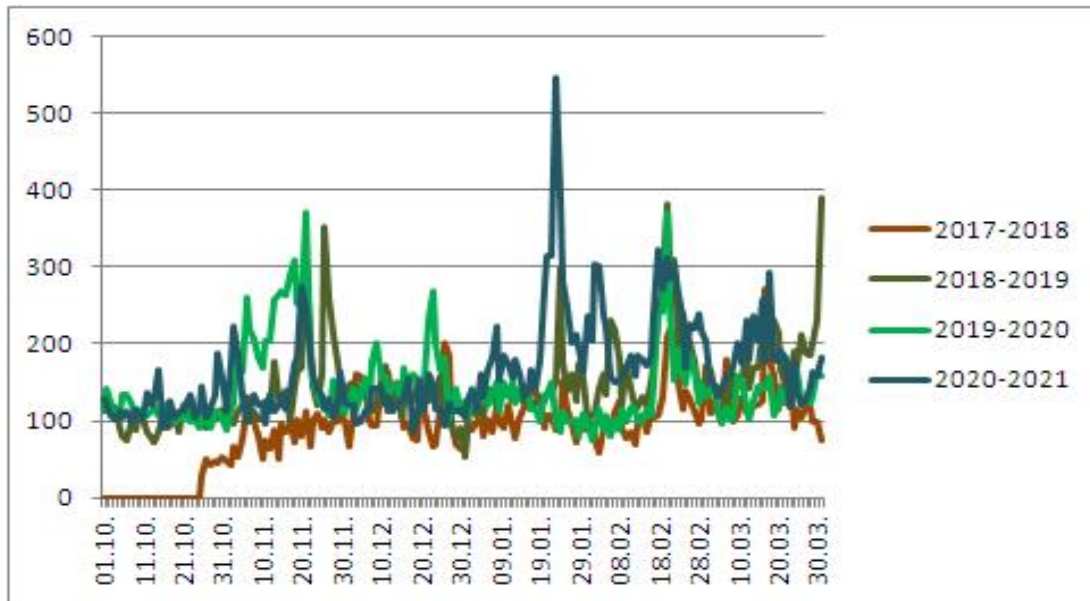
Figure 5: Russianphone page Change of power in Ukraine in February 2014

The events directly related to this revolution are listed: 14th October is the Day of the Defender of Ukraine, which is a holiday celebrated in Ukraine on 14th October on the day of the Holy Intercession of the Theotokos at the same time as the Day of the Ukrainian Cossacks and since 2015 is a national holiday the Orange revolution of 22nd November 2004 – 26th December 2004 is celebrated on 22nd November. Because each of the events mentioned in the context of the Revolution of Dignity is its predecessor, or consequence. Thus, the Day of the Defender of Ukraine, which has been a national holiday since 2015 and on this day it is customary to honor the Heroes of Ukraine, influences the visit to the Ukrainianphone page *the Revolution of Dignity* where we can find links to the Heroes of Ukraine, namely heroes of Nebesna Sotnya (Heaveanly Hundred). Also, the events of the Orange Revolution, which the same as the Revolution of Dignity led to a change of government, have an impact on visits to the Revolution of Dignity page**.** As we see in Fig. 3, these two events form the interval of interest in the visiting of the historical event under study from 11th November to 25th November. Also, the increase in visits to the page Revolution of Dignity occurs in the annual time interval from 16th to 22nd February (see Fig.3). Such interest in the page is caused by the bloody events during the Revolution of Dignity and the annual commemoration of the Heroes of the Nebesna Sotnya (Heaveanly Hundred).

Considering the Anglophone page *2014 Ukrainian revolution* in Fig. 4, we can say that each year the interest is different and in 2015-2016 the highest number of visits was on 19th February 2016 and amounted to 5,375 visits, which is four times more than in subsequent years on the same day.

Visits to the Russianphone pages of the Revolution of Dignity *The change of power in Ukraine in February 2014* every year is different and it is difficult to single out any consistent annual interval (see Fig. 5). We can say that this page was the most visited in 2021 and the number of visits was 546, which is 5 times more than in previous years for this page.

Figure 6 shows the visit to all three pages to the Ukrainianphone *the Revolution of Dignity*, the Anglophone *2014 Ukrainian revolution*, and the Russianphone pages *The Change of power in Ukraine in February 2014* on 19th February each year.
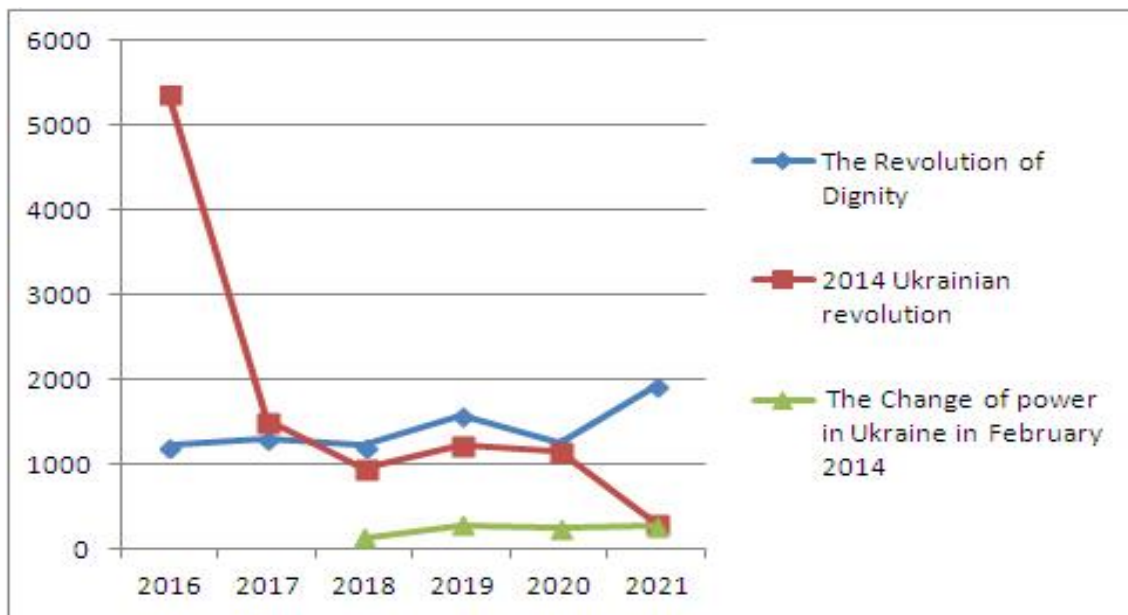
Figure 6: Visitis to the pages of the Revolution of Dignity in three languages on February 19 from 2016 to 2021.

We can mention that the visit to the Ukrainianphone page on 19th February increases slightly every year, while the Anglophone page was most viewed in the 2nd year after the revolution, and then the number of views decreased with a slight increase in 2019 and 2020 (Figure 6).

6. Conclusions

Wikipedia is studied as an important global public information service intended to reflect social and cultural events of both global and national scale. The main conflicts and threats of legal and social information nature regarding the factors influencing public projects are given.

Research has shown visits and edits to the pages of two historical events – the Orange Revolution and the Revolution of Dignity, which led to the same situation.

Correlation analysis using Spearman's rank correlation coefficient was performed to determine the relationship between the number of views and the number of edits, and the rank correlation between qualitative characteristics was determined.

An analysis of the information generated about an event during the research periods, which had many edits and led to a large number of views of the full information page, is presented. The historical event is considered in the context of comparing the engagement in the Wikipedia page in three languages, where the analysis is carried out by two parameters, namely engagement and a specific annual date. Our study presents the importance of Wikipedia in human life, i.e. the established truth about cultural values and the formation of a nationally consious individual. Our study presents the importance of Wikipedia in human life, i.e. the established truth about cultural values and the formation of a nationally consious individual. Regularities, interest to one event presented in Wikipedia in three languages and influence of similar notable events on it are established.

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