Hashtag as a Way of Archiving and Distributing Information on the Internet

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Abstract. According to the history of hashtag creation, the analysis of three social networks such as Twitter, Instagram and Facebook and resources to search for hashtags, can be argued that hashtag is one of the best ways of archiving and distributing information on the Internet. In this work effective methods of using hashtags were proposed in three social networks. The tips and basic rules for adding a hashtag to the post and the latest updates on the hashtag functionality in the social networks are considered. In order to use an effective hashtag strategy for marketing, the types and basic principles of hashtag usage were considered. In one of the social networks a survey on the use of hashtags was conducted. We analyzed the resources through which one can track the popularity and usability of the hashtag. A chart was created where you could track the search query "hashtag". The graph of hashtags related to #education is designed. The method of determining effectiveness of hashtag is proposed.

Keywords: Hashtag, Twitter, Instagram, Facebook, Social Networks, Internet.

1   Introduction

In today's world it's hard to imagine yourself without social networks. The need for information exchange and communication is one of the key aspects of modern person's life. It is difficult to overestimate the role of the hashtag in this regard, because thanks to it we can provide and receive information, promote our own business and much more.

Hashtag is a phrase or keyword before the symbol (#) hash or more known as a number or a pound sign. It was initiated by a community of micro-bloggers to create a flow of information around a particular topic or trend. The purpose of the hashtag is to categorize topics, to combine ideas, to encourage exchanges and joining. Posts with hashtags in social networks are not regulated. The owners of blog and web sites have more free will to express thoughts. This is why the use of hashtags is actual and trendy on Google +, Twitter, YouTube, Instagram, Facebook, Pinterest and other social networks that support them [1]. In June 2014, the Oxford English Dictionary

added the term "hashtag" [2] that is used to identify publications related to a specific topic. According to the Instagram study in 2014, 88% of brands have at least one unique hashtag per post, 91% of leading brand posts have seven or fewer hashtags. Posts in social networks with at least one hashtag become 12.6% additional popularity. Hashtags are an important discovery in various social networks, which enables brands to influence certain spheres of interest. While they cannot contribute to the growth of exponential activity, hashtags provide audiences with an easy way to detect certain content through topics and forums that interest them [3]. The proper use of hashtags is a key to successful promotion of content in trendy social networks today, where millions of users daily post new photos, leave comments and likes, follow other people's photos, promote products and services.

2   Case Study

The subject is the study of the hashtag popularity in social networks and their effectiveness. The object of this research is the study of the effectiveness of hashtag usage in different social networks and these developed methods was also tested on the Facebook page of Lviv Polytechnic National University.

The key task of this study is to prepare a comprehensive strategy for applying hashtags to various topics, their shares and popularization in virtual services.

3   Related Works

The analysis of informational sources on the given problem has shown that the influence of hashtags on the effectiveness of communicative processes in social services is studied by scientists of different directions. Researchers such as L. Young, T. Sun and M. Ziang are studying hashtags that can unite people into separate groups in social networks. A. Bruns and J. Barges [4] are analysed the process of adding a hashtag to publication. Some scholars explore the peculiarities of the distribution of hashtags in social networks. P. Wikstrom [5] draws attention to the communicative and gaming potential of the hashtags. J.A. Van den Berg [6] distinguishes hashtags in different types and functions. In her study, M. Zappavigna [7] observes the coincidence of hashtag functions with the main functions of the language, in particular text.

The widespread use of hashtags started with Twitter, but later spread to other social media services. In the 2007, C. Messina reported in one of his tweets that Twitter began to group the topics using the pound symbol. Internet Relay Chat that used the hash symbol to identify groups and topics inspired him. Twitter initially rejected this idea. However, in October 2007, local journalists began using the "#SanDiegoFire" hashtag, at the suggestion of Messina, to send and archive messages about the San Diego forest fires series. The practice of adding hashtags has flown up. Now users and brands use hashtags to spread serious political events and entertaining themes [8]. Online communication as part of the university's information image has been deeply studied [9-13].

Research on the popularity of the social network Tweeter is the subject of research by many authoritative scholars in Ukraine and abroad. Having carried out a thorough analysis, it is possible to conclude that the opinions of scientists divided into two directions. So, for example, in his scientific works Shetty P., Sridharan R., Vishwakarma S., Kanuri S., & Jangam V. [14] claiming that Twitter is on the wave of popularity in the United States and Europe. According to Pentina I., Basmanova O. and Zhang L. [15] works, this may be due to the use of Twitter's social network for influencing opinions, political and religious views of the community, the use of special marketing technologies, and more.

According to Limnéll J., & Geers [16], now these processes are also taking place in the Ukrainian society, which increases the popularity of this social network.

However, Berman Ron and Humphrey, Colman and Melumad, Shiri and Meyer, Robert J. [17] claim that Twitter has already lost its popularity. Also concludes that Twitter was at the top of popularity in 2014, and now this social network loses its credibility among US users.

However, Mervi Pantti [18] claim that Twitter has been popular among European users for over ten years and does not lose its popularity rating. Also, Twitter is visual coverage of the Ukraine crisis [19, 20].

Traditional use of tags begins with the first days of the existence of online communities such as IRCs, Delicio.us, and Flickr, where it was used to make information easier to find. Its shape varies depending on the design of the site or place of application. In mid-2007, this changed when Twitter users started tagging the pound symbol tag. Since the experience of each Twitter user is unique to his or her list of followers, this so-called hashtag allowed users to report on a shared event or topic so that they can follow or imitate each other. By clicking on the hashtag, users can perform some kind of the specific search for a specific word or phrase and see all posts and tweets that use this hashtag. The main form of the hashtag in Twitter is closely related to its content. Adding, for example, hashtag #education to post means that the post itself is intended to be searched and read by users who are looking for this particular term. Without a hashtag, the tweet may not be spotted by any Twitter user outside of the list of "followers" of this person or "news feed".

Therefore, the pound symbol (#) has become synonymous with sorting, searching, and branding. Other social media applications used tagging functions until Twitter started to use the pound symbol (#) and the term "hashtag" and then spread that trend to Instagram, Pinterest, Tumblr, and then Facebook. For example, if you dig deeper, then you can say that the use of keywords that fit in web pages and scientific papers for easier search sometimes resembles the principle of hashtag. Consequently, the dynamism and constant development of the hashtag's potential require further study of this issue.

4 Analysis of hashtags usage

This section covers various social networks that use hashtags. They act not only as archivists of posts, but also as powerful marketing and promotional tools. The fea-

tures of each social network will be shown and their characteristics compared to determine the most optimal and effective network for using hashtags.

Twitter. Twitter is one of the largest social networks where instant messages (tweets) are published daily. Users tend to freely express their own feelings on Twitter, making them an ideal source for capturing thoughts on a variety of interesting topics such as products, services, or superstars, etc. People can foresee an approach to getting the general tendency of perceiving these areas directly, rather than through reading a huge amount of tweets about them. This will help the search engine which, when you enter the hashtag, provides many opportunities to filter content. The first is the topic that is the most popular and most relevant tweets that have previously been introduced to the hashtag. You can also select an option that displays the most recent tweets with the mentioned hashtag. There are also options for selecting people (accounts), photos, news, broadcasts and videos. While you entering the hashtag, the list of recent most trendy hashtags is highlighted, and the number of tweets in the last hour is shown below each. We can say that Twitter gives us an opportunity to see if the hashtag is current. The information is very fast, because everything changes in a matter of minutes. That is, if Twitter constantly publishes news from around the world, then using the same hashtags for tweets on different topics, the list of related hashtags is constantly changing. When we introduce hashtags with general concepts (#education, #love, #life) into our tweet, we give different meaning of hashtag.

The homepage and the Twitter search engine display a selection of topic hashtags. On the left side of the screen, the most frequently repeated tags are collected in the "Current Topics" block. Twitter selects them automatically for user interests based on subscriptions and location. The list can be changed by clicking on the corresponding button in the section. There you can set a new location, which will change the list of topics and hashtags.

If you are writing hashtags on Twitter, you can't use special characters and numbers without letters. There are no restrictions on the number of hashtags in Twitter, but it must be taken into account that the maximum length of tweets is 140 characters, including hashtags. So the relevant number of hashtags is 1-2 per tweet.

When you enter a hashtag on tweets, you will first see the most popular and recent hashtags (each hashtag indicates how many tweets have been used with this hashtag in the last hour). Another good thing about Twitter is that when typing a hashtag in tweets, it shines in a different color, showing whether the hashtag will work.

Twitter is popular due to the massive dissemination of instant messages and the nature of freedom. World news spells, celebrity entertainment gossip and discussions about newly released products are gathered on Twitter. In addition to simply displaying news and reports, Twitter itself is also a great platform for exchanging different opinions. Regardless of where people from, what their religious beliefs are, rich or poor, civilized or uneducated, they comment on, discuss, argue and complain about topics they are interested in, freely sharing their feelings.

In Ukraine, Twitter is not very popular, unlike Facebook or Instagram. This network is mainly used by Ukrainian teenagers to share thoughts and feelings. Therefore, there are not so many official sites in Twitter, because the Ukrainian audience is fo-

cused on personal blogging. On the other hand, in the USA, this network is mega popular and used as a news portal, so most of all hashtags in Twitter are in English.

Hashtags are organically created by Twitter users as a way of categorizing messages and selecting what is done simply by pre-fixing a word or phrase with the pound symbol, for instance "#hashtag". Widespread use of hashtags makes Twitter even more expressive and congratulated by people. Approximately 0.6 million tweets were selected and about 14.6% of its tweets contain at least one hashtag. If only subjective tweets (tweets with positive / negative mood) are taken into account, then this figure is up to 27.5% [21]. Statistics show a great potential in analyzing the mood with hashtags in Twitter. Another aspect of the analysis illustrates the close relationship between topic, mood and hashtags.

To be precise, the hashtags can be divided into three types.

1. Thematic hashtags. Most hashtags have simple topics for all categories of users. "Yesterday, I watched his new clip, it struck me so much. I love it! #Justin Bieber".

2. Sentimental or hashtags of mood. In other cases, hashtags can be an easy way to highlight information about the user's mood. This category of hashtags consists only of words of feelings, such as #love, #sucks, etc.

3. Thematic-sentimental hashtags. In addition, the third type of hashtags are those in which appear thematic and sentimental words.

Instagram. Instagram hashtags work by organizing and categorizing photos and videos. Posts of the social network Instagram which contained at least one hashtag get on 13% more engagement than posts without hashtag. Each created post on Instagram can be accompanied by a text and several hashtags, and these hashtags help in the process of content detection, because such keywords emphasize the main content of the publication. Only this network has a limit on the number of hashtags per publication - up to 30.

In last year Instagram released a new hashtag feature, adding a few new things and even better tracking how fast the post is gaining in popularity. Here are some of the highlights:

- Track the success of the hashtag on Instagram with Post Insights.
  It's a good reason to switch to business profile of the Instagram. More recently, Instagram has added an opportunity to analyze how effective the hashtags are in getting more views of your posts. To access this data, simply open the post and tap "Insights" below it. Swipe up and you'll find the full data page for this post, including coverage, impressions, and how people who viewed your post found you.

- Tracking hashtags on Instagram.
  Another great update. This year Instagram added the ability to monitor hashtags. This means that you now have the opportunity to keep abreast of the different trends (or communities) associated with your interests. This is a huge breakthrough compared to other social networks, because, due to this new function, anyone (who monitors the hashtags used in this post) will be able to see your post. When you follow the hashtag it works the same way as with the user profile.

- Adding hashtags to your Instagram profile biography.
  Thanks to the recent update, now it is possible to add hashtags, usernames and links to your biography on Instagram. This provides greater functionality when the user has a universal (often used or expressed by the user) or branded hashtag (this hashtag is created by the user or the company where all of the brand-related publications are collected [22]). This feature can be used to promote your Instagram community and to highlight your corporate content.
- Adding hashtags to Instagram stories.
  Instagram has recently been able to add hashtags to your stories, giving users another way to distribute their content more widely. This feature is important because, approximating regular posts, when need add an Instagram's hashtag history, it becomes searchable. Therefore, if someone inputs a hashtag to the search engine, they can see your story in the section "History" at the top of the page.

Instagram's users use different types of hashtags. Understanding these types and their respective users is a basic to forming an effective strategy for using hashtags in Instagram.

1. Branded hashtags.
   Branded hashtags are hashtags that are unique to your business. It can be just as simple as the name of your company, the motto, the name of one of your products, or even an interesting word game or little joke. It can also be a hashtag created by the community associated with this brand. For example, well-liked trend cold "give away" a company products or conduct a competition or a survey. There are also branded hashtags that are designed to sort and archive publications of various products or services. As for the number of hashtags, there are usually from one to three. Although community hashtags are designed to increase the reach of your publications and brand development, branded hashtags are designed to sort your brand's original content for your target audience.

2. Community hashtag.
   The connect users to a specific topic. Community hashtags are indirectly related to commercial projects. The community hashtags are wide-ranging in concept and less targeted.

3. Campaign hashtag.
   Although branded hashtags and community hashtags are for long-term collaborations, campaign hashtags are usually short-time, lasts for several months, season, year, or even just a few days. The reason why campaign hashtags have a shorter life's because they are related to specific campaigns, such as launching a new product or partnership. As a result, enterprises will actively promote the campaign in order to get as much activity as possible and then stop promoting it after the end of the campaign [23].

Facebook. Unlike Twitter or Instagram, where the profiles of most users are public, Facebook users have private profiles. The hashtags that most people use in their posts are not open to the public and therefore restricted to people they know.

Therefore, the most public hashtags have its place to influential brands. The Facebook survey was conducted to see how many users use hashtags on Facebook (Fig. 1).
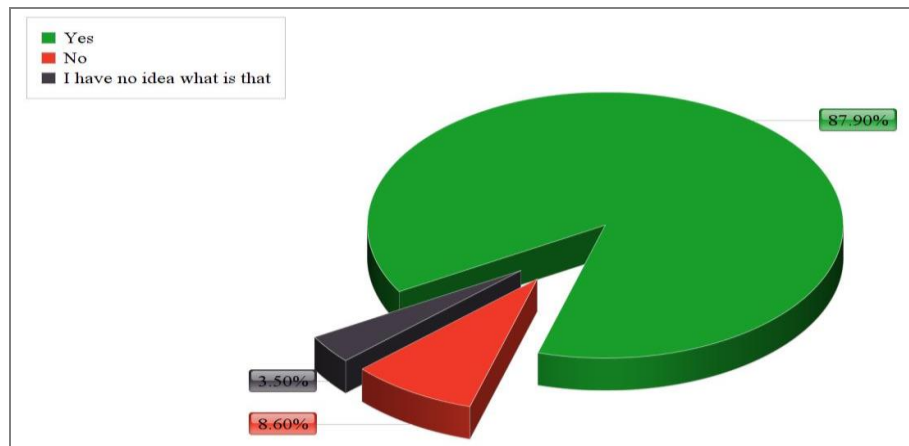

Fig. 1. Poll in Facebook.

For publication in social network Facebook need use more than one or two hashtags. Approximately the same principle works well on Twitter.

It is also worth knowing that hashtags up to 10 characters get a good engagement [24]. Introducing hashtags on Facebook in 2013, nobody knew how they would work and what marketers should do with them. Now some of the useful features that are available on Instagram are not available on Facebook. The question arises whether the hashtags still take place on Facebook and whether they are still working; the answer is "yes". Hashtags on Facebook have a unique feature and brands should pay special attention when using them. Since 2016 Facebook has not updated its own hashtag recommendations, which has forced marketers to find out their own use practices. It is impossible to give a clear answer to the question of whether hashtags increase or decrease engagement. The specifics of Facebook, due to limiting the visible text of the post, limits the use of hashtags to several pieces at the end of a small test either at the beginning or even in the middle. Therefore, there is not enough space for hashtags, unlike Instagram or Twitter, where marketers are inclined to add them in large numbers.

You can also notice that different brands use hashtags of Facebook's users in different ways. Some brands completely ignore them, while others add these messages as they fit. As a rule, brands do not publish hashtags "just because it's needed." As any strategy in social media, there are good reasons to use hashtags on Facebook. The necessity to study social interactions is one of the major trends of social media over the last year. Reviews that interest the audience, which trends are discussed, as well as the most well-liked topics of discussion form a scientific opinion. The posts that surround a certain hashtag or campaign work fine. This is a direct signal to keep this topic in rotation. While tracking hashtags give the impression simpler on Twitter or

Instagram, tracking trends on Facebook is also a wise step for brands. Facebook hashtags help the brand with the study of social interactions.

Hashtags make your posts available for search. Hashtags on Facebook are a great application from the point of view of the search engine, which allows you to get more attention to the messages of your brand. Facebook is categorizing the content of the search. Similarly, hashtags can help separate campaigns or messages that may appeal to your followers. Using Facebook hashtags allows your message to be both: searchable and interactive for followers. Comparing Facebook with Instagram, posts with hashtag get 13% additional interaction than those without them. In addition, hashtags give followers a possibility to interact with your messages in a certain way. Again, following the most well-liked hashtags, expert can find out the content that social network users want to read in the future. In comparison with Twitter, Facebook uses a similar algorithm to track URLs with hashtags [25, 26]. Social network Facebook uses hashtags to collect or classify discussions between Facebook's uses.

So, having considered three different social networks that support hashtags, we can say that Instagram is much better in functionality than other networks. On the second place is Facebook. Further on, it goes a long way with Twitter. This proves that such a social network as Twitter is not quite popular in Ukraine.

5   Results of Work

To determine the functionality of hashtags in different social networks, own research and researches from different resources was used. This chart according to Google Trends shows the statistics of the hashtag search query on the Internet from 2004 to 2018 (see Fig.2).

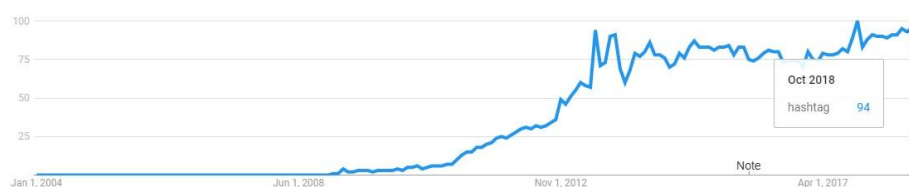**Fig. 2.** Diagram of statistics the searching request "hashtag".

Simply search for the hashtag in the Twitter statistics with "#" symbol. Nevertheless, simply search does not work perfectly all the time for quick searches. For instance, the searched hashtag "#education" that brought up relevant posts. Using the Tweet Reach resource (Fig. 3) we can see estimated reach and exposure for the hashtag "#education".

Fig. 3. Diagram of using the hashtag #education (Tweet Reach).

The graph of hashtags related to #education is designed based on software Ritetag. This graph in Fig. 4 is presented.

Fig. 4. Graph of hashtags related to #education

The effectiveness of hashtag is a complex indicator. The effectiveness of hashtag is calculated by the equation developed by authors (1).

$$\text{Effectiveness}^{\text{Hashtag}_j}(\text{Post}_i) = \begin{Bmatrix} \text{UniqueTweets}^{\text{Hashtag}_j}, \\ \text{Retweets}(\text{Post}_i), \\ \text{Exposure}^{\text{Hashtag}_j}, \\ \text{Relevance}^{\text{Hashtag}_j}(\text{Post}_i) \end{Bmatrix} \qquad (1)$$

where $\text{UniqueTweets}^{\text{Hashtag}_j}$ is a number of unique tweets per one hour of Hashtag_j, $\text{Retweets}(\text{Post}_i)$ is a number of retweets per one hour of user post Post_i, $\text{Exposure}^{\text{Hashtag}_j}$ is a number of hashtag exposure per one hour of Hashtag_j, $\text{Relevance}^{\text{Hashtag}_j}(\text{Post}_i)$ is a number of users that reacted on user post Post_i with hashtag Hashtag_j.

Moreover, $\text{Effectiveness}^{\text{Hashtag}_j}(\text{Post}_i) \in [0, 1]$.

The results of calculation of effectiveness of hashtags related to #education are presented in Table 1. This calculation was made in English because this is most common used language in social networks.

Table 1. Effectiveness of hashtags related to #education

Hashtags	Unique tweets	Retweets	Hashtag exposure	Hashtag effectiveness
#education	267	133	5,936,696	high
#students	46	33	236,504	high
#love	1,104	371	14,425,558	high
#healthcare	292	79	1,264,358	high
#life	342	100	5,072,829	high
#health	442	183	3,301,333	high
#support	96	75	2,459,838	high
#home	242	362	1,186,267	high
#money	296	54	1,011,808	high
#trading	221	46	1,567,317	high
#learning	83	34	263,792	average
#school	121	25	655,862	average
#college	42	16	119,217	average
#country	46	21	157,121	average
#time	67	21	149,896	average
#schools	38	8	259,179	average
#apps	46	37	329,617	average
#community	133	59	148,912	average
#work	154	21	412,267	average
#kids	138	33	253,642	average
#training	133	34	159,592	average
#class	21	8	16,838	average

Hashtags	Unique tweets	Retweets	Hashtag exposure	Hashtag effectiveness
#giving	12	0	50,908	average
#career	154	13	666,05	average
#publiceducation	4	0	442	low
#year	0	4	0	low
#educationsystem	4	0	5,679	low
#collegeeducation	0	4	0	low

Searching for hashtags directly helps to achieve relevant results. While the Twitter search shows every last tweet with a hashtag, Facebook can display different information by another algorithm. This places an even greater emphasis on the proper use of hashtags in Facebook, as it is not the same as on Twitter.

Based on the results of the study, the formula and tested the developed methods on the Facebook page of Lviv Polytechnic National University is calculated.

According to statistics of Lviv Polytechnic National University official Facebook page (see Fig. 5), the number of people, who reach any posts from this page, has increased from 1721 to 5307.

Fig. 5. Graph of hashtags related to #education

So, each hashtag has its own level of effectiveness. Approbation of the results of Lviv Polytechnic National University official Facebook page is proved that the proposed methods are effective.

6 Conclusion and Future Work

One can conclude that the importance of hashtag as a way of archiving and disseminating information can't be underestimated. Through this research can be noted that the hashtag is a multifunctional marketing tool. However, each social network has own instructions and strategies, understanding the fundamentals of usage hashtags. This is a significant part of understanding social media strategy. In this study the graph of hashtags related to #education is designed. Also the method of determining effectiveness of hashtag is proposed. The hashtags with high effectiveness can help user to connect with followers, provide active interaction with users, and attract a new brand users. In this scientific work the use of hashtags in the most well-liked social networks was considered, graphically transmitted information about distribution of hashtags and their role in archiving and preservation of the content. A thorough analysis of hashtag representation in the virtual space has been carried out. Depending on the social network, a particular strategy was defined regarding the use of a certain number of hashtags for the most effective branding. Consequently, the prospect of development in this direction suggests a high probability of using hashtags as means of sorting and archiving information for easy search on a specific topic.

This topic will be used in future research. The use of hashtags in other social networks and various online resources and the research of hashtags effectiveness for Instagram and Facebook for a comparative analysis will be explored in more details.

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