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Qualitative and quantitative analysis of social network data intended for brand management

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Abstract
The purpose of the paper is to point out the importance of analysing data obtained from social media through the qualitative data analysis software. The main goal of conducted research was to evaluate the presentation and perception of selected automotive brands on Twitter and YouTube with the use of qualitative and quantitative analysis tools. The research objects were social networks Twitter and YouTube. As the subjects of the research were selected six brands of the automotive industry. Findings revealed generally positive consumer opinions, attitudes towards all the tracked brands, given the total score of the words contained in the hashtag tweets with the name of the brand (with more words of positive polarity as those with negative polarity). The best position was achieved by the Toyota brand, which was selected as a benchmark for the tracked car brands, followed by the VW, KIA, Skoda, Citroën and Peugeot. This research shows an approach to brand-related Twitter sentiment analysis that deals with the expressed emotions about a brand through tweet texts.

Keywords Brand · Brand Perception · Data Analysis · Social Networks

1 Introduction

Nowadays, car brands are using social media to reach their target market directly. Social media in the automotive industry is about far more than just attracting customers by placing adverts and apping their habits. In fact, increasingly the entire car-buying process takes place over social media. Cars have changed. But along with the vehicles themselves, the way the automobile industry sells cars has changed too, and it's thanks to social media. Social media has completely transformed the conventions of car sales in many ways [9]. According to [32], there were 2.46 billion social networking users worldwide in 2017. In 2016, it was 2.28 billion users, with 2.62 billion users estimated in 2018, and 2.77 billion inhabitants of the planet connected and active on social networks in 2019. In 2021, it is expected to exceed 3 billion users globally. This is why increased attention has been paid to social data analysis on brand building and brand management.

The social network field is an interdisciplinary research programme which seeks to predict the structure of relationships among social entities, as well as the impact of said structure on other social phenomena [4]. Social networks have become a place where potential or existing of consumers of a particular brand make use of content created by other social network users in consumer purchase decisions. If consumers want to buy a product or any service, they look for a review in the online environment; and discuss characteristics of a product or a service within

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social media before making a final purchase decision [13, 16, 28, 33]. User-generated content is too extensive for a common user to analyse. Automation, which uses different sentiment analysis techniques, is therefore needed. Social-networking sites such as Facebook or Twitter are growing in both popularity and number of users. It is crucial that users accept advertising as a component of the social-networking sites [35]. Social networks provide enterprises with the opportunity to communicate with their customers through channels with almost unlimited access and at the same time give individuals the opportunity to use social media and communicate without the need for physical meet up [12, 13]. New technologies accompanied by emerging generations of consumers growing up with social media are an opportunity and a threat to traders [18]. In order to create a sustainable competitive advantage and exploit opportunities and eliminate risks, enterprises need to analyse their target audiences closely in the use of social media, while integrating social media to organizational marketing strategies to increase customer engagement [27]. Data explosion on the Internet makes the research in automatic cataloguing of online texts increasingly interesting, as well as the extraction of information through the sentiment analysis of an opinion, an emotion in a tweet or generally messages posted on social network by its users [10]. Aaker [1] defines the value of the brand as a set of five categories, indicating in the fourth category which is associated with creation of positive feelings—brand attitudes. This part of the brand value will be focused on the analysis of texts on social network Twitter using the qualitative analysis tool—sentiment analysis. Sentiment analysis is an analysis of feelings and attitudes expressed in the opinions of contributors to the social network. These are unstructured, heterogeneous data that contain either positive or negative (in some cases neutral) connotations of contributors to the topic, or events. Sentiment analysis evaluates the qualitative component of the text in the form of quantitative indicators (number, weight, etc.). It can be described as opinion mining, which aims to listen and process data users post on social media [5, 7].

2 Theoretical framework

Social media is a key public space in which informal communication in forums can influence the brand. Social networks are a subset of social media. Within social networks, interactions take place when users connect to groups, establish relationships (friendships), which creates a network of relationships among them [22]. Social networks were mainly driven by the development of information and communication technologies. However, their use is much wider. They are currently used also by enterprises enabling them to communicate with their existing or potential customers. Social networks are with their high communication potential a part of the new modern marketing [2, 21]. Based on above-mentioned, social media marketing is defined as a connection between brands and consumers, offering a personal channel and currency for user centred networking and social interaction [8]. A social network is a theoretical construct useful in the social sciences to study relationships between individuals, groups, organizations, or even entire societies (social units, see differentiation) [31]. Social networks are very important objects for tracking, processing and influencing consumer attitudes towards the products—brands. Enterprises create profiles for their products and brands, communicate with their customers, inform them about news, or use various sales promotion tools to target selected customer segment. The basic element is the fact that the published content has to be interesting, clear and beneficial to users of the social networks [26]. Social media have engendered new forms of communicating and interacting with the public. One of the most innovative and the most unique yet understudied tool available on social media platforms is the hashtag. Since the first ever sent tweet containing a hashtag in 2007, hashtags have become popular and spread to other social media platforms [20, 30]. Hashtags, short words or phrases that follow the hash or pound sign (#) are used on social media platforms to brand advocacy movements, archive messages for the movement, and allow those not personally connected to a user to see and comment on messages that use the hashtag [3]. Using hashtags with online advocacy efforts allows movements to spread organically to like-minded individuals and organizations and to spread virally to other users of the social media platform [20, 30]. For the purposes of brand management there are important three main functions of social networks [14]:

- information function: social networks become a source of information about new products, services, product innovation;
- commercial function: a way to reach a large number of potential customers (e.g. banks and online stores);
- marketing function: tracking customer needs, which precedes market research, successful promotion, addressing potential customers.

With the growth of social networks, a new era of content creation has emerged, where individuals can easily share experience and information with other users. This can significantly affect their purchase intention [11]. According to [23], blogs and social networks have become a valuable resource for creating a consumer bank of views in various areas, such as customer relationship management, public opinion polling, and text filtering. In fact, social

networking knowledge such as Twitter or Facebook have proven to be extremely valuable to marketing research companies, opinion polls and other text mining on social networks for better targeting marketing tools. According to [21], social listening is a proactive process of tracking what is being said about the brand on the Internet, especially in social media and online communities. It is often the involvement of social media monitoring software to filter amounts of unstructured data from social media conversations into useful information about customer intelligence. According to [36], social networks have pushed brand building and brand management into interactive communication between the brand and its fans. Social networks gave users a "voice and a specific face". Businesses are thus able to closely monitor user behaviour in real time and better tune their communication. Brand content is created by users themselves. According to [29], it is necessary to respect the principles of users' behaviour on social networks. Creativity, emotion, passion must be involved in creating and building social content, as these are the attributes that engage users of social networks. Sentiment analysis involves classifying opinions in the text into "positive", "negative" or "neutral" categories. It is also referred to as an analysis of subjectivity, opinion mining and extraction of evaluation. Opinions, feelings, judgment, and beliefs are often confused, but there are some differences between them [19]:

- Opinion: conclusion that is controversial (because it is different, experts have different opinions).
- View: subjective opinion.
- Belief: deliberate acceptance and intellectual consent.
- Sentiment: opinion expressing the feeling.

Social media research on branding and brand management conducted by [24] pointed out the correlation between social media use, trust and brand loyalty of customers. Social media seem to be the new way for brand management development.

3 Research methodology and data collection

Research sample consisted of 5279 tweets and 5117 retweets. As a data source was chosen social network Twitter. The Table 1 shows the number of analysed tweets and retweets. Collected data in the form of a text were processes by QDA (Qualitative Data Analysis) software MAXQDA, which provides a lexicon approach with evaluating metrics for opinion mining. MAXQDA is able to analyse interviews, news, spreadsheets, online surveys, focus groups, videos, audio files, literature, and pictures. With support of this software, it is possible to organize and categorize any kind of unstructured data, search for information, test theories, and create illustrations and messages.

Table 1 Number of tweets and retweets (own processing)

	Tweets	Replies	Tweets total	Retweets total
KIA	676	19	695	678
Citroën	338	5	343	284
Peugeot	262	4	266	266
VW	1156	43	1199	1502
Toyota	2082	347	2429	1929
Skoda	322	25	347	458
Total	4836	470	5279	5117

Text analysis is demanding due to the lexical and syntactic level of texts. In the analysis, there were used by the authors of the paper tweets sent within a one-week period (23 October 2018—30 October 2018) to evaluate user opinions on well-known brands such as: #VW, #Peugeot, #Citroen, #Kia, #Skoda, and #Toyota. The meaning of words marked with "#" is understood as a keyword form. Short contributions to microblogs or social networks may be marked with "#" in front of significant words. Data were filtered by using hashtags. Filter criteria were tweets marked with hashtag (#VW, #Citroen, #Peugeot, #KIA, #Skoda, #Toyota). The individual hashtags were listed separately as criteria for filtering, that is, the authors of the paper have obtained the data for each hashtag separately. Examined data set is represented by the absolute numbers in the Table 1.

3.1 Brand-related quantitative analysis on social network Twitter

First, the authors of the paper have been monitoring the interconnectedness of selected brands. The goal was to find out to what extent a different brand occurs in tweets obtained by hashtags filtering. The highest number of brand hashtags occurrences during the tracked period was reached by the Toyota brand with 3500 occurrences among all brand names followed by the VW brand with its own brand name occurrences with 2717 times. The third place was reached by the KIA brand with 1306 hashtags occurrences with its own brand name, the fourth place belongs to the Skoda brand (569 occurrences in own tweets), the fifth place reached Peugeot brand (410 occurrences in tweets) and the last place belongs to Citroën (399 occurrences in tweets).

From the results shown in the Table 2 the authors of the paper can state that in Skoda tweets the incidence of the brand "VW" was 5.1%, in KIA 3.21%, in Citroën 14.39%.

Table 2 Relative numbers of brand occurrence in tweets of another brand (own processing)

	Skoda tweet	KIA tweet	Citroen tweet	Peugeot tweet	Toyota tweet	VW tweet
VW	5.10	3.21	14.39	12.41	2.17	94.80
Toyota	0.33	3.00	1.23	1.22	96.23	0.52
Citroen	0.00	0.21	70.00	13.81	0.14	2.27
KIA	0.82	93.15	0.35	0.70	1.24	0.14
Skoda	93.59	0.07	0.00	0.17	0.05	0.17
Peugeot	0.16	0.36	14.04	71.68	0.16	2.09

Similarly, the VW brand was occurred in 12.41% of Citroën tweets and 2.17% of Toyota tweets.

VW brand was in presence in tweets of all other tracked brands (out of five brands ranked first in four cases), as it is possible to see its strength in ability to infiltrate the ideas, views, attitudes of social network users into hashtags and tweets of competing brands.

3.2 Brand-related sentiment analysis on social network Twitter

For the purpose of the research the authors of the paper have selected car brands on the basis of the country of origin. Volkswagen has been operating in Slovakia since 1991. The second wave of investments in 2003 and 2004 was oriented into the automotive industry with the arrival PSA Peugeot Citroen and KIA [34]. Four tracked brands are produced in Slovakia (VW, Citroën, Peugeot, KIA), Skoda were selected according to the traditional representative in the Slovak market and the Toyota brand as a benchmark in the automotive industry. In 2018, Toyota was ranked as the best among other car brands in the Top Global Brands and reached the 7th place [17].

While analysing Twitter text contents of tweets, it is important to remove from the basic text file those words whose content is uninteresting in relation to the research objective. Words are in so-called. "stop" list, which is a list of "uninteresting words" or irrelevant words such as posters, clutches, digits, abbreviations. These are unnecessary words and therefore they have to be excluded from the analysis. On the contrary, the "go" list is a list consisting of words whose scope and content should be restricted to text analysis. For the needs of tweets analysis, the software dictionary QDA–VADER (Valence Aware Dictionary and Sentiment Reasoner) lexicon was used. It is a professionally predefined lexicon containing 7517 words and also emoticons to perform text analysis.

Sentiment analysis based on the VADER dictionary calculates input sentiment score. VADER is a model used to analyse a text sentiment that is sensitive to polarity (positive/negative) and intensity (power) of emotions. It was put into practice in 2014. VADER is an open-source license (MIT license or X11 license is a free software license created by the Massachusetts Institute of Technology), and each word has been evaluated by ten expert evaluators. VADER sentiment analysis uses a human-based approach that combines qualitative analysis and empirical validation with human evaluators and the wisdom of the crowd [6, 15, 25].

The goal of the context sentiment analysis was to find out how many positive polarity words appeared in the tweets for individual brand hashtags in the context of name of the brand. When analysing the context, the authors of the paper have searched for keywords in tweets in the context of five words before and five words behind the keyword—name of the brand. The purpose of the context sentiment analysis was to find out, in what context of words appeared the names of the individual brands.

The goal of the context sentiment analysis was to find out how many positive-polarity words appeared in the tweets for individual brand hashtags in the context of brand name. When analysing the context, we searched for keywords in tweets in the context of five words before and five words behind the keyword—name of the brand. The authors of the paper have compared the results of sentiment analysis with context and results of sentiment analysis without context. The results of comparison are expressed in relative terms, and was found the difference between the results when the keyword was not sought in the context but overall in all tweet contents. The purpose of the context sentiment analysis was to find out, in what context of words appeared the names of the individual brands.

The results from comparing the occurrence of a positive polarity word with the highest achievable value in the sentiment analysis without context and analysis with context showed that Toyota reached 1506 emoticons without context and 2951 emoticons in the context of its brand name, which is 95.95% more in context than without context.

The Table 3 summarizes ten words with the highest negative score for each car brand. As can be seen, for three brands, had the word "no" the highest negative score. In the context of the brand name, the word "stop" appeared at Toyota brand, the word "faults" was the next negative word for Skoda and the word "died" for KIA. The highest negative score was reached by brand KIA with the word

Table 3 Comparison of ten words with highest negative score of car brands—sentiment analysis with context (own processing)

Word Toyota Tweet	Word VW Tweet	Word SKODA Tweet	Word Citroën Tweet	Word Peugeot Tweet	Word KIA Tweet
stop	no	faults	no	no	died
no	low	emergency	miss	bad	killed
limited	stop	broken	shakedown	disappointing	faults
low	scandal	fight	crash	kill	prisoners
bad	lowered	no	bad	dead	no
killer	miss	bloody	tricks	negative	accident
accident	missed	gravel	alarm	faulty	severely
dirty	lowlife	trouble	kill	nasty	limited
scary	damages	battle	worst	avoid	war
shocks	beaten	death	grim	sick	missing

"died" with a score of − 59.8 (word occurrence 23 times, average weight according to VADER dictionary − 2.6), the second highest negative score had a word "stop" − 51.6 (occurrence 43 times, average weight according to VADER dictionary − 1.2) by KIA.

The Table 4 summarizes ten words with the highest positive score for individual car brands. At the present time, emotions are often used to express emotions, and as can be seen, all brands have the highest positive score with kissing emoticon. In the context of the brand name, Toyota, VW, Citroën are those brands that are associated with the word "great", KIA is associated with the word "best" and Peugeot with the "gt" (grand tour) and Skoda with the word "superb".

The Table 5 shows words of positive polarity with the highest individual positive weight listed in the VADER dictionary. The highest assigned weight of 3.2 was assigned to words best, love, perfectly, freedom, greatest, happiest, and glorious. KIA brand was the best in reaching the most words with the highest assigned weight of 3.2.

The highest positive score was reached by Toyota brand with kissing emoticon. The total value was 5606.9 (emoticon occurrence 2951 times, average weight according to VADER dictionary 1.9).

Table 5 Positive polarity words with the highest assigned weight of 3.2, occurrences and total score according to the VADER dictionary on tracked brands (own processing)

Skoda	KIA	Peugeot	Citroën	VW	Toyota
best (8; 25.6)	best (27; 86.4)	love (5;16)	best (16; 51.2)	love (31;99.2)	best (53; 169.6)
love (5; 16)	love (7; 22.4)	perfectly (1;3.2)	love (6; 19.2)	best (16;51.2)	love (50; 160)
	freedom (4; 12.8)			greatest (2;6.4)	happiest (1;3.2)
	greatest (2; 6.4)			glorious (1;3.2)	perfectly (1;3.2)
	perfectly (1; 3.2)				

The second highest positive score (except kissing emoticons) was reached by the same brand Toyota with the word "great" with a score of 189.1 (word occurrence 61 times, average weight according to VADER dictionary 3.1), the second highest positive score had a word "best" of 169.6 (Toyota, occurrence 53 times, average weight

Table 4 Comparison of ten words with highest positive score of car brands—sentiment analysis with context (own processing)

Word Toyota Tweet	Word VW Tweet	Word SKODA Tweet	Word Citroën Tweet	Word Peugeot Tweet	Word KIA Tweet
*:	*:	*:	*:	*:	*:
great	great	superb	great	gt	best
best	congratulations	congratulations	best	(*	congratulations
love	love	great	win	love	(*
congratulations	(*	best	love	great	great
(*	like	proud	like	active	gt
happy	happy	champion	superb	*)	save
free	welcome	hope	good	:*	free
:*	best	good	:*	happy	*)
amazing	good	(*	prize	free	amazing

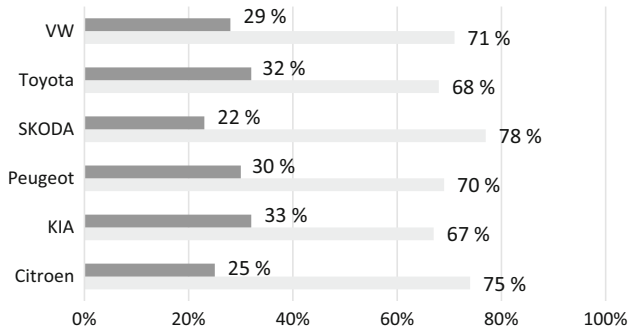

Fig. 1 Relative numbers of positive and negative words polarity for tracked brands (own processing)

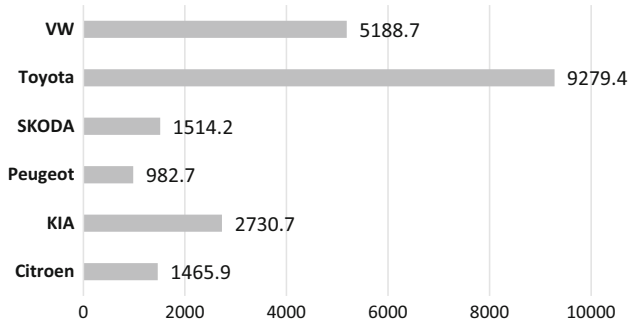

Fig. 2 Total value of positive words for tracked brands (own processing)

according to VADER dictionary 3.2). The third highest positive score showed VW brand with the word "great" of 127.1 (occurrence 41 times, average weight according to VADER dictionary 3.1).

Figure 1 above shows shares of positive (light grey) and negative (dark grey) polarised words as the result of context sentiment analysis. The highest share of positive words in tweets was reached by Skoda with a 78% share of positive words. The second place took Citroen with share of 75%, the third brand was VW that reached share of 71% of positive words related to its brand name. Positive polarity of words clearly prevails for all tracked brands.

The Fig. 2 shows total values of positive polarised words (occurrences x average weight) as the result of context sentiment analysis. The lowest score can be seen by Peugeot (total value of 982.7) and the second lowest Citroën scored with 1465.9. Both brands are part of Groupe PSA. The highest value of positive words reached Toyota (9279.4) and the second best was VW with the value of 5188.7.

4 Conclusion

Each brand has its own history, its lifecycle associated with its improvement, innovation. The current state of brand management is influenced by constantly evolving modern technologies, globalization and hyper-competition. As a result, brand management is becoming more and more challenging. Nowadays, the role of marketing, whose integral part is brand building and brand management, is changing. It is moving towards a holistic view of the brand, which should be the core of the whole business. Holistic approach to brand management currently includes tracking of brands on the social media in interaction with their users. The results of our research showed that all tracked car brands were perceived by users as positive.

The best position in this direction was achieved by the Toyota brand (number of tweets, retweets, value of positive polarised words), which was selected as a benchmark for the tracked car brands, followed by VW, KIA, Skoda, Citroën and Peugeot. The lowest activity on the Twitter social network in the tracking period was reached by Peugeot, the second lowest activity showed Citroën. The highest activity in the tracking period had Toyota; the second most active brand was VW brand in the form of tweets containing the VW keyword. The KIA brand has been ranked among the users of the surveyed Twitter network between VW and Skoda.

The objects of analysis were tweets in English language, as the purpose of the analysis was to track the opinions of users on a global scale. In the future research, there is scope for further tracking of Twitter texts in the Slovak language and the discovery of the preferences of social network users communicating with other users in the Slovak language to compare them with those in English tweets. Limitations of this research lie in imperfections of the VADER vocabulary, which may not include all words (of positive or negative polarity), mentioned in tweet texts.

Research has found out that keywords with a hashtag have achieved greater social networking activity as words without hashtag (tweets, retweets). To maintain or increase the activity of brands, brand managers need to keep track of users' sentiment on social networks, check the content of all sent messages to target selected user segment and engage PR (Public Relations) activities if needed.

The ambition of the research was to point out that besides the financial indicators embedded in the promotion, whether offline or online and quantitative analysis, it is also important to track the qualitative features of texts generated by users on the social networks, as they can show emotional expressions of these users in relation to a particular brand.

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