
EMOTIONAL ASPECTS OF FACEBOOK TEXTUAL POSTS

A FRAMEWORK FOR MARKETING RESEARCH

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Abstract

Social networks have contributed to the deviation from communication model represented by traditional media channels. Within web 2.0 paradigm, social networks enable users not only to passively receive information, but also to actively participate and provide useful feedback. Activity of social network users can be assessed from different perspectives - affective, cognitive or behavioural. The aim of presented paper is to evaluate affective aspects of communication in relation to commercial messages within the scope of sentiment analysis. The incentive for this area of interest lies in recent adjoining of new features to emotional scale on Facebook social network. In the research of Facebook posts from four monitored brands of non-alcoholic beverages we are applying sentiment analysis and extraction of sentiment from recently introduced Facebook Reaction scales in order to investigate similarity or dissimilarity of information obtained from these two social network communication tools with the emphasis on the detection of affective content in examined communication.

Keywords: emotions, sentiment analysis, digital marketing, social network, Facebook

1. Introduction

Throughout various scientific fields, emotions are crucial in constructing the quality of life and the meaning of existence. While Philosophy and Theology point us to an age-long quest of determining good and bad and what lies in between, in Psychology emotions are an essential part of our well-being and communication, in Cognitive science and Neuroscience they are valued as an important component in decision making. Since there are so many possible human demonstrations of emotional states, our study seeks to present a comprehensive view on analysing emotional content (in broader terms of sentiment and valence of textual information) on widely used communication channel.

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Marketers used to assume that customers consider a relatively large number of potential brands prior to their purchase and then methodologically choose and reject from these brands until they reach their final decision. Their relation to a certain brand depends upon advantages a brand can provide. Today, marketing experts following trends in current Neuroscience mostly abandoned model of consumer as a stable and rational subject with clear preferences knowing that in decision process emotions and subconscious mechanisms play a substantial role. This notion is justified by neuromarketing research of emotions and the bloom of behavioural economy. The Interactive Advertising Bureau presented in a report from 2014 [The Interactive Advertising Bureau, Defining and Measuring Digital Ad Engagement in a Cross-Platform World, <http://ix.sk/qjWvJ>] a simple model of user engagement in digital space placing emotions as a self-dependent part of engagement continuum. Meanwhile, emotional processes are a vital part of factors influencing perception. Perception plays an important role in communication process not only as an assumption for actual initiation of communication, but it also influences communication process and communication outputs that are later inputs for subsequent perception [1]. Even though the explicit question ‘What emotions are?’ was asked more than hundred years ago by William James and even before that emotions had been a subject of philosophical thoughts [2], it is a question still hard to answer. Ranchsburg actually speaks about the needlessness to define emotions because every person has them and knows them [3]. Short but eloquent definition regards emotions as a manifestation of organism’s psychological reactions [4]. Vysekalová broadens this general definition by understanding emotions as complex phenomena consisting of feelings as modes of internal processes, behaviour and physiological functions emerging from conscious and unconscious evaluation of subjectively relevant situation [5]. In the light of psychoevolutionary structural theory of emotions Plutchik defines emotion as a complex sequence of reactions to a stimulus including cognitive evaluations, subjective changes, autonomic and neural arousal, impulses to action, and behaviour designed to have an effect (functional) upon the stimulus that initiated the complex sequence [6]. Subtle nuances in definitions of emotions originate from the diversity of approaches and the existence of a multitude of research papers concerning emotions that led to the formation of several theories of emotion. Currently there is no single generally accepted theory of emotion, instead there are several conflicting theories [3, p. 86] including James-Lange theory [7], Schachter’s cognitive – arousal theory of emotions, Lazarus’s cognitive-phenomenological theory of emotions, Weiner’s attribution theory, Averill’s sociological theory of emotions, Zajonc’s theory and psychoevolutionary theories [3, p. 90-105]. The multitude of theories regarding emotions is reflected also in the effort to categorize them. Fehr and Russell provided a research in which they asked 200 students to write as many words connected to emotions as possible within two minutes. As a result of this task they were able to extract 383 different emotions. Most frequently mentioned emotions were happiness, anger, sadness and love [3, p. 136].

Regarding the topic we have selected, social network Facebook enabled to express admiration or delight by the means of the 'Like' button. Negative reaction could be provided only through commenting. Even though users had asked for a dislike button for quite a long time, Facebook headquarters prepared a more complex approach to this issue [B. Barret, *Facebook doesn't need (or even want) a dislike button*, <http://www.wired.com/2015/09/facebook-dislike-button>]. In September 2015 the founder of Facebook Mark Zuckerberg announced the testing of new icons expressing emotions in Ireland and Spain. These new icons represented love, laughter, joy, surprise, sadness and anger [M. Poláš, *Facebook testuje šesť nových emócií, rozšíria voľbu „páči sa mi to“*, <http://medialne.etrend.sk/internet/facebook-testuje-sest-novych-emocii-rozsiria-volbu-paci-sa-mi-to.html>]. To compare, Widen's hierarchic model of emotions contains six basic emotions: happiness, surprise, fear, anger, disgust and sadness [8]. After the testing phase, Facebook extended liking options (called Facebook Reactions) with icons for love, laughter, surprise or shock, sadness and anger. During the testing phase, icon representing happiness wasn't completely understood by recipients and therefore it was excluded. New icons were implemented February, 24 2016 [S. Krug, *Reactions Now Available Globally*, <http://newsroom.fb.com/news/2016/02/reactions-now-available-globally/>]. Our interest in this new functionality of Facebook social network was induced by its analytical possibilities from the point of sentiment evaluation and communication evaluation. As for the most extensive research about emotions (potentially the largest in the area of Social sciences as well) expressed on Facebook, it was published by Moira Burke a Mike Develin [9] who had, because of their jobs for this largest social network, an access to a huge amount of data (resulting in a research sample consisting of 1.4 million of Facebook users, research material composed of more than 14 million statuses using feeling annotation tool and associated analysis of likes, comments and messages related to examined communication). Research performed in 2014–2015 with the help of algorithms analysing deindividualized Facebook communication was focused on answering the questions of how characteristics of one's social network (size and density) were related to valence of shared emotion and what were reactions of Facebook audience (individual's friends) based on the type of shared emotions (valence and self-relevance). Shared emotions facilitate empathy, validation, intimacy and they promote support which can further help coping stress and creating positive mental states. Despite this fact, social networks are generally considered to be an environment with prevalent sharing of positive emotions that was confirmed also in this particular study (51% positive emotionality, 38% negative emotionality, 11% neutral). Greater proportion of negative emotionality in statuses was detected in case of teenagers and young adults; the slightly higher level of positive emotionality in statuses was shown in case of women and older participants. Moreover, research showed that people with smaller and dense networks shared a higher amount of emotions and conversely, larger and more diverse contact networks were linked to lower amount of shared emotions. In connection with the Social sharing theory,

Facebook friends reacted more emotionally to statuses about communicator's problems. Statuses sharing positive emotions generated higher average number of likes (58% increase in likes) and comments related to them were also more positive compared to posts without annotations or with negative feeling annotations (e.g. *I feel disgusted*). This effect was even stronger when expressed emotions were related to poster's self (e.g. *feeling unloved*). Also, negative feelings generated approximately 30% less likes [9]. In their paper, Burke and Develin provide detailed results, but they do not pay significant attention to their commercial impact.

Research regarding emotionality on social networks with commercial potential in the domain of marketing communication is a subject of interest of papers based on the analysis of sentiment to which we devoted our previous work [10]. In this current paper we would like to base upon this current trend in marketing research and data analysis.

2. Research objective

Rheinberg asked the question whether mimic expression or verbal response is a better indicator of emotion since a person can influence or dissimulate both of these responses. How can an observer determine whether emotions are feigned or true? Was the cause of observed emotion an event, cognition or physiological arousal? Moreover, we do not necessarily have to be consciously aware of emotion appraisal or their cognitive evaluation [3, p. 88]. Psychology and its affiliated disciplines have yet not found answers to these questions therefore we have to take these limits into consideration while conducting marketing research linked to emotions. Measuring emotional reactions to marketing communication offers a variety of tools, for example focus group, scaling, neuromarketing research, each of them having advantages as well as limits. Deficiency in unity of definitions of emotions as well as divergence tendency of human behaviour and limits of marketing research are all causing a lack of consensus in possibilities of consumers' emotional states measurements. Demonstrations of emotions are present in both offline and online environment. In online setting, emotions can be detected in users' conversations. Regarding marketing applications, conversations can take course between consumers, between consumer and a brand or in relation to third parties. Measuring the number of online conversations can be a useful tool in determining volume of buzz around a brand [11], also techniques of sentiment analysis are useful for measuring emotion on web 2.0 [10]. We have to keep in mind that internet population is still growing in numbers [12] and therefore it is essential to devote the time to the observation of emotion manifested in internet media and more specifically in the environment of widely used social networks. Implementation of Facebook Reaction scale enriched the possibility of emotional content measurements. We are especially interested in the congruity between emotional content expressed in Facebook Reactions and the results of sentiment analysis for the same content since such comparison of methods has

not yet been known. Ergo, the main purpose of our study is to answer the following research question: What is the extent of similarity between the results of emotion measurements by the means of sentiment analysis and by the means of Facebook Reaction scales?

3. Research material characteristic and data acquisition

Our analysis was based upon official Facebook pages for brands selling non-alcoholic cola-like beverages in Slovakia. Research material was composed of posts published on these pages from February 24, 2016 to April 3, 2016. Altogether we analysed 29 statuses and 475 comments using the method of sentiment analysis.

Sentiment analysis as a part of data mining, opinion mining or social media analysis is getting in the centre of academic interest with the increase of social networking sites' popularity. The purpose of this type of analysis is detection and classification of expressed subjective opinions, sentiments, emotions and attitudes directed towards certain object represented by a person, event, brand or topic. Accordingly important for this type of analysis is also a differentiation between factual and opinionated information. K. Roebuck defines sentiment analysis as an application of procedures in order to identify and extract subjective information in source materials [13]. In the domain of marketing communication, sentiment analysis has a potential to deliver (with relatively low expenses) an insight into the 'black box' of consumer minds with the objective to improve communication effectiveness of brands on social networks. However, sentiment analysis also conveys several challenges: technique selection (and mutual validation of techniques), defining and categorization of examined communication, gathering of data from different platforms and data acquisition automatization, issue of polarity determination, ambiguity and vagueness of textual outputs, detection of opinion spam and creation of corpus for computerized sentiment analysis [14]. These challenges require special attention mainly in case of texts not written in English, because in less common languages the progress of knowledge is notably slower.

The unit of our analysis was a single comment published under respective post. Assignment of sentiment was performed based on predetermined rules:

1. Assignment of sentiment is implemented based on lexical approach [15]. Lexical approach is closely related to questions from semantics and semiotics. These aspects in commercial context are more precisely developed for example in the work of Martin Solík [16].
2. Evaluation of sentiment polarity for comments with the occurrence of emoticons is specific. In case of positive emoticon present in or with positive sentence the whole part is considered positive and vice versa, negative emoticon with negative sentence is classified as negative. Negative emoticon with strongly positive sentence is evaluated as positive, positive emoticon with strongly negative sentence is classified as negative. In case of a sentence with weak sentiment and emoticon with opposite sentiment

polarity there is a conversion of sentiments towards the sentiment expressed in emoticon. When there is a neutral sentence accompanied by emoticon the overall sentiment is the one expressed in emoticon [17].

3. Sentiment can be cleared to neutral, e.g. in case of two emoticons or two expressions with opposite sentiment respective part of the text is considered neutral.

Research process was conducted in two phases. The first phase consisted of Facebook page selection. At this point it is important to note that sentiment analysis is closely linked to particular language. For this reason, we focused on relevant Facebook pages most popular in Slovakia. Some brands have a joined communication for both Slovakia and Czech Republic on Facebook because of historical and cultural background as well as similar languages. The selection of our research material was based on Socialbakers media analytic tool results for Slovakia [<http://www.socialbakers.com>], the need for a satisfactory number of comments to analyse and commercial potential of intended analysis. For these reasons we chose Kofola. Seeing that Facebook Reactions scale was launched February 24, 2016, data gathering phase was quite short (till April, 3 2016), therefore we decided to include to our analysis also competitive brands of Kofola in Slovakia namely Coca cola, Pepri and Šofokola. From four relevant Facebook pages we extracted statuses with comments and counts for emotions selected by users in Facebook Reaction scales. Extracted comments were subjected to manual sentiment analysis by two independent coders. Initially, the accuracy of sentiment evaluation between coders reached 85%, afterwards the coding of disputable comments was repeated until accordance was reached. Consequently, data from sentiment analysis were compared with counts of particular emotions expressed by Facebook Reactions. Comparability was assured by foregoing division of Facebook Reactions icons into categories according to their polarity: positive (like, love, haha), neutral (wow), negative (sad, angry). Surprise or shock can have both positive and negative connotation while it is very difficult to determine these subtle differences therefore we decided to classify 'wow' icon as neutral. The very same division of sentiment polarity is being applied as a common part of sentiment analysis. In the second phase of our research we extracted only those users who evaluated status by commenting together with the usage of Facebook Reactions.

4. Analysis and results

In total we analysed 475 comments (we excluded comments in form of a print screen/picture – in our case most often it was a print screen of a competition result of a respective user) belonging to 29 posts from four monitored brands of non-alcoholic cola-like beverages. Sentiment analysis of comments showed 42.5% of positive comments, 51% of neutral comments and 6.5% of negative comments; hence in case of this pilot study there is 49% of polarized sentiment within examined material. To compare, our previous more extensive research on sentiment analysis of Facebook posts of eight most

common grocery chain stores in Slovakia showed far lesser amount of polarized sentiment (2.7% of positive sentiment and 1.1% of negative sentiment) [10]. One of the objectives of presented study was to compare communication of emotions in comments and demonstration of emotions expressed through recently extended Facebook Reactions icons (like, haha, love, wow, sad, angry) reflecting the fact that so far we haven't detected such comparison in scholarly literature. In regards to this objective there wasn't a statistically significant correlation between the expression of negative sentiment through Facebook Reactions scale and number of negative comments in posts. Same assumption about the correlation between emotions expressed in comments and scales chosen within Facebook Reactions was rejected in case of surprise icon selection (that we marked as neutral sentiment) and number of neutral comments. Nonetheless, we detected a statistically significant mildly strong positive relationship between the selection of positively charged Facebook Reactions icons (like, haha, love) and number of positive comments for particular post: $\rho = 0.451$ ($p = 0.05$). Anyhow, it is important to add that it is necessary to evaluate this relationship in a wider context and later in terms of larger amount of research material.

We also wanted to pay attention to 'traditional' likes that still dominate within reactions to Facebook posts. The highest average number of likes reached Kofola brand with a number nearly eight times higher than the brand with the lowest count of likes – Šofokola (see Table 1).

Table 1. Number of likes, number of posts and average number of likes per post for analyzed brands.

	Pepsi	Šofokola	Coca Cola	Kofola
likes	865	57	1036	2461
number of posts	9	2	7	11
average number of likes	96.11	28.50	148.00	223.73

As we can see in Table 2, the highest count of positive reactions within Facebook Reactions functionality had Kofola brand, on the other side, the highest number of negative reactions within this relatively new tool had Pepsi, but the number of negative reactions was much lower than the number of positive reactions. In case of comments to Pepsi there was a slight domination of positive sentiment over neutral sentiment with a little extent of negative sentiment detected. The highest average number of comments per post had Kofola (30 comments), 2 posts from Šofokola during the analysed period did not induce any comments. Regarding posts from all four brands, positive emotionality is dominating and is present mainly as a reaction to communication of Kofola brand, with this brand having also the highest average number of negative reactions that alters the general ratio of positive to negative manifestations. When implementing sentiment analysis or comparing the emotionality of communication we recommend not only to regard quantitative indexes, but also to consider the ratio of positive indicators to negative ones. The

ratio of cumulative positive emotionality (icons plus sentiment analysis of comments) to negative emotionality is the highest in reactions to Coca Cola. In a simplified manner we could state that regarding researched communication Coca cola is the brand perceived the most favourably. In the classic experiment of Mc Clure et al. involving a blind taste test for Coca Cola and Pepsi while monitoring reactions with fMRI participants in general preferred Pepsi in blind tests, but they believed they preferred Coca Cola based on emotional connections and feelings of nostalgia [18]. This particular work points to the power of brand image.

Table 2. Analysis of emotionality according to brands.

Brand		Like + haha + love	Wow	Sad + angry	Positive comments	Neutral comments	Negative comments	Comments together	Total positive emotionality	Total neutral emotionality	Total negative emotionality	Positive: negative
Pepsi	number of posts	9	9	9	9	9	9	9	9	9	9	72:1
	Mean	111.89	3.44	1.22	8.00	7.00	.44	15.44	119.89	10.44	1.67	
	Sum	1007	31	11	72	63	4	139	1079	94	15	
Šofokola	number of posts	2	2	2	2	2	2	2	2	2	2	57:1
	Mean	28.50	0.00	0.00	0.00	0.00	0.00	0.00	28.50	0.00	0.00	
	Sum	57	0	0	0	0	0	0	57	.00	.00	
Coca Cola	number of posts	7	7	7	7	7	7	7	7	7	7	263:1
	Mean	150.00	0.14	0.29	0.43	0.00	0.29	0.71	150.43	0.14	0.57	
	Sum	1050	1	2	3	0	2	5	1053	1	4	
Kofola	number of posts	11	11	11	11	11	11	11	11	11	11	103:1
	Mean	231.82	1.00	0.09	11.55	16.27	2.27	30.10	243.36	18.18	2.36	
	Sum	2550	11	1	127	179	25	331	2677	190	26	

In the second phase of our research we extracted comments of users who, except from commenting, used also Facebook Reactions icons. Our goal was to assess the congruency of emotion expression. Exact counts for this phase are displayed in Table 3. Despite the fact that statistical procedures in our pilot study for a subgroup of users using both tools for emotion expression (n = 55) did not show a statistically significant relationship between an emotion expression using Facebook Reactions scale and emotionality of particular user’s comment (determined by sentiment analysis), we think it is interesting to point to an incongruence of emotion expression in this group of Facebook users where 60% of subjects in Facebook Reactions expressed positive emotion (Like, Love, Haha – other icons were not used) but their comments under respective post showed a different emotion. This partial result supports the need for further examination of this aspect of communication (that we are planning to address in our future

work) together with the need to analyse these two functionalities (Facebook Reactions and comments) together.

Table 3. Cross-tabulation for Facebook reactions and sentiment analysis of comments.

			Sentiment			Total
			Neutral	Positive	Negative	
emotions	Like	Count	29	21	2	52
		% within emotions	55.8	40.4	3.8	100
	Love	Count	1	0	0	1
		% within emotions	100	0.0	0.0	100
	Haha	Count	1	1	0	2
		% within emotions	50.0	50.0	0.0	100
Total		Count	31	22	2	55
		% within emotions	56.4	40.0	3.6	100

5. Conclusions

With the advancement of technology so characteristic for current era, the amount of textual information is also increasing and taking new forms. Finding ways to extract valuable information from text and fruitful discussion about existing methods are necessary and should be a part of current scientific interest, more so because of the complex nature of emotional phenomena and the belief that writing emotions and sentiment opens gates to minds of our target groups.

In the present paper we applied sentiment analysis and extraction of reactions from Facebook Reaction scales in order to investigate similarity or dissimilarity of information obtained from these social network communication tools. Analysis offers useful information in terms of emotion detection and sentiment analysis and the improvement of brands' Facebook communication with commercial potential.

We found that there wasn't a statistically significant correlation between the expression of negative sentiment through Facebook Reaction scale and number of negative comments in posts and same lack of correlation was found for surprise icon marked as emotionally neutral and number of neutral comments. Our analysis showed a statistically significant positive relationship between the selection of positively charged Facebook Reactions icons (like, haha, love) and number of positive comments for particular post. These findings can be explained at least partially in terms of the limits of Facebook functionalities themselves. Facebook users could use Like button to react to posted content since 2009 [19], but until recent application of Facebook Reaction there was no opposing possibility (no dislike button) concerning negative sentiment/emotion expression except from commenting. Our results could have been influenced by the lack of time delay after the introduction of

Facebook Reactions resulting in users not being accustomed to this extension. Facebook users just haven't created that of a habitude to react negatively with icons. Corresponding results of dominating positivity on Facebook can be found in aforementioned study of Burke and Develin [9]. We might speculate that it is in Facebook's best interest to promote positivity and suppress negativity in order to keep users more satisfied and thus more online.

Our research could be influenced also by the fact that Facebook Reactions act as visual self-assessment method of emotion detection (while comments are still mostly textual), moreover, respondents do not have to be aware of their feelings or they do not necessarily want to share their emotional states.

The main limitation of sentiment analysis regarding semantic analysis technique is subjectivity of coding. According to Heires even in best of conditions (e.g. more coders) the accuracy of sentiment analysis is usually only around 65%-70% with rates dropping even lower when the process is applied to text in languages other than English (in case of computational methods) [20]. In general, sentiment analysis of texts written in Slovak language is still dealing with lexical problems, issues of sentiment classification, challenging automated natural language processing, polarity determination and detection of opinion spamming. In respect to the limits of methods, social network communication analysis should be based on combination of approaches.

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