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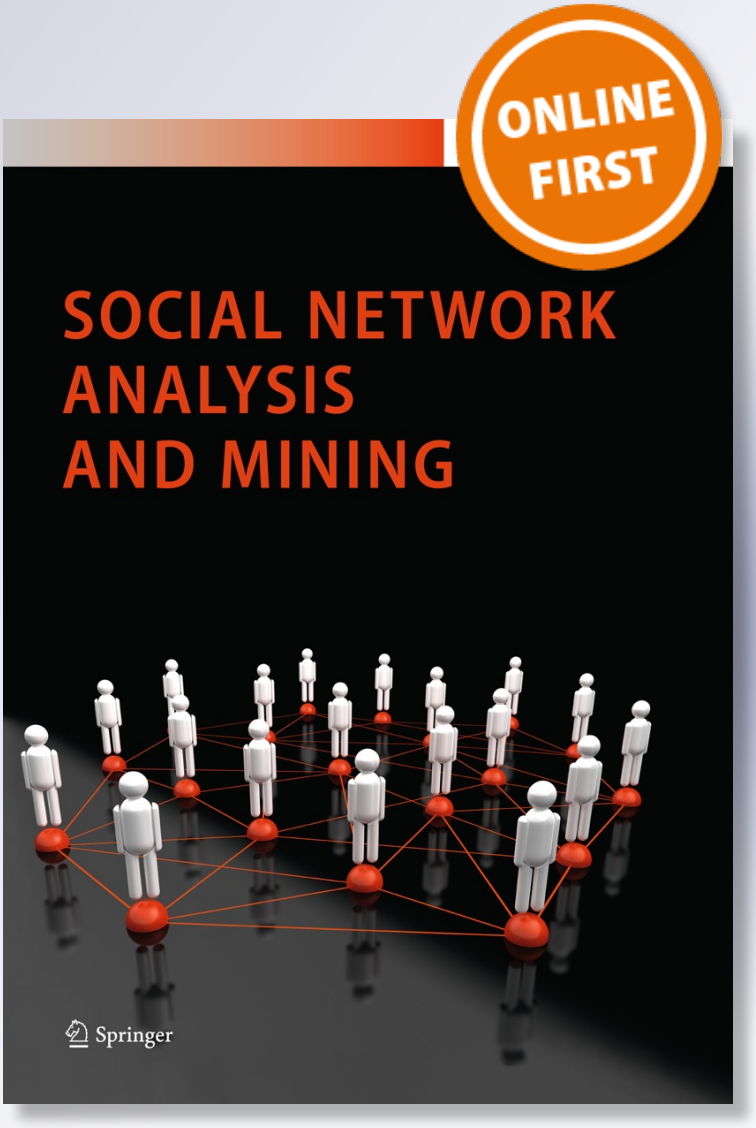
Social Network Analysis and Mining

ISSN 1869-5450

Soc. Netw. Anal. Min.
DOI 10.1007/s13278-013-0098-8



Springer

Soc. Netw. Anal. Min.
DOI 10.1007/s13278-013-0098-8

ORIGINAL ARTICLE

Online engagement factors on Facebook brand pages

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Received: 19 April 2012 / Revised: 14 September 2012 / Accepted: 16 January 2013

Abstract Social networks have become an additional marketing channel that could be integrated with the traditional ones as a part of the marketing mix. The change in the dynamics of the marketing interchange between companies and consumers as introduced by social networks has placed a focus on the non-transactional customer behavior. In this new marketing era, the terms engagement and participation became the central non-transactional constructs, used to describe the nature of participants' specific interactions and/or interactive experiences. These changes imposed challenges to the traditional one-way marketing, resulting in companies experimenting with many different approaches, thus shaping a successful social media approach based on the trial-and-error experiences. To provide insights to practitioners willing to utilize social networks for marketing purposes, our study analyzes the influencing factors in terms of characteristics of the content communicated by the company, such as media type, content type, posting day and time, over the level of online customer engagement measured by number of likes, comments and shares, and interaction duration for the domain of a Facebook brand page. Our results show that there is a different effect of the analyzed factors over individual engagement measures. We discuss the implications of our findings for social media marketing.

Keywords Social networks · Facebook · Social media marketing · Online engagement · Interaction

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1 Introduction

Marketing has recently undergone significant changes in the way information is delivered to the customers (Mangold and Faulds 2009). Social networks (SN), as a part of Web 2.0 technology, provide the technological platform for the individuals to connect, produce and share content online (Boyd and Ellison 2008). As such, for brand owners, they offer the potential for (1) advertising—by facilitating viral marketing, (2) product development—by involving consumers in the design process, and (3) market intelligence—by observing and analyzing the user generated content (UGC) (Richter et al. 2011).

The rise and continued growth of SNs have attracted the interest of companies who see the potential to transmit their marketing messages to the customers and enter into a dialogue with them using the word-of-mouth (WOM) principles. They have evolved their customer approach, shifting from traditional one-to-many communication to a one-to-one approach and offering contact or assistance at any time through SNs such as Facebook, Twitter, MySpace, etc. (Hanna et al. 2011). Using Facebook as an example, this means that companies set up and moderate a Facebook brand page, while continuously monitoring the consumers' activities. As an outcome of this change in the field of marketing, a new phenomenon, generally known as social media marketing (SMM) was introduced.

Social media marketing, a form of WOM marketing, but also known as viral marketing, buzz, and guerilla marketing is the intentional influencing of consumer-to-consumer communication through professional marketing techniques (Kozinets et al. 2010). This is not to be seen as a replacement for the traditional marketing techniques but rather as an additional marketing channel that could be integrated with the traditional ones as a part of the

Published online: 26 January 2013

marketing mix. The advantage of this new electronic channel is that it can be used to communicate globally and to enrich marketing toward consumers at the personal level (Mangold and Faulds 2009). Through users' feedback or by observing conversations on social media, a company can learn about customers' needs, potentially leading to involvement of members of the community in the co-creation of value through the generation of ideas (Palmer and Koenig-Lewis 2009).

Despite the general popularity, viral marketing on SNs has not yet reached the high expectations set (Clemons et al. 2007). Although many SMM channels have already been created, how these channels are being used, what their potential is and how consumers interact remains largely unknown. A structured, academic analysis in this field is still outstanding and has yet to be addressed from different perspectives (Richter et al. 2011).

To contribute in this direction, in this paper we analyze the factors that influence the level of online customer engagement on SMM channels. We focus on two basic elements of the company's engagement plan: (1) which content should be posted to trigger higher level of online engagement and (2) when the content should be posted. To answer these questions, we evaluate the effect of the content characteristics, such as (1) media type, (2) content type, (3) day and (4) time of posting, over the level of online engagement on a Facebook brand page. We measure the engagement level through (1) the number of likes over the content created by the company, (2) number of comments, (3) number of shares and (4) interaction duration.

The continuation of this paper is structured as follows: Section 2 provides an overview of the related work. Section 3 introduces the concept of a Facebook brand page. Section 4 constructs the conceptual framework and derives the hypotheses. Section 5 describes the used methodology. The results of the analysis are presented in Sect. 6, while Sect. 7 discusses the findings and draws implications for practitioners. We conclude the paper with Sect. 8.

2 Related work

2.1 Social networks

A SN can be defined as "web-based services that allow individuals to (1) construct a public or semi-public profile within a bounded system, (2) articulate a list of other users with whom they share a connection, and (3) view and traverse their list of connections and those made by others within the system" (Boyd and Ellison 2008). Since their introduction in 1997 with SixDegrees.com, SNs have attracted millions of users, becoming an integral part of their daily routines (Richter et al. 2011). At the time of writing, Facebook is the largest SN with more than 955 million active users (Facebook 2012a) and the most visited page on Internet (Alexa 2012).

Social networks and Facebook have been studied from different perspectives such as the network structure (Caci et al. 2012), characteristics of the users (Bhattacharyya et al. 2011; Hargittai 2007; Karl et al. 2010), usage patterns (Golder et al. 2007; Lampe et al. 2006), usage motivations (Joinson 2008; Raacke and Bonds-Raacke 2008), identity management and self-presentation (Labrecque et al. 2011; Zhao et al. 2008), social interactions (Kostakos and Venkatanathan 2010; Nazir et al. 2008), and privacy and information disclosure (Debatin et al. 2009; Krasnova et al. 2009). In addition, specific usage contexts were analyzed, such as utilization of SN for knowledge exchange in academia (Ferri et al. 2012), the value of SNs for politics environment (Stieglitz and Dang-Xuan 2012), etc. However, little has been published about the use of SNs in the context of companies, though SNs can be applied in three distinct areas: "(1) recruiting and professional career development, (2) relationship facilitation in distributed work contexts, and (3) business-to-customer interactions" (Richter et al. 2011). It is the business-to-customer (B2C) interactions on SN platforms that are in the focus of this paper.

2.2 Brand communities and consumer engagement

Social networks represent a natural technological platform for marketing, providing access to a large number of users, grouped in non-geographically bound communities, based on a structured set of social relationships among admirers of a brand, i.e. brand communities (Muniz and O'Guinn 2001).

Brand communities were found to be a successful tool for increasing sales (Adjei et al. 2010; Bagozzi and Dholakia 2006). In addition, they have the potential of improving the relationship between the consumers and the brand (Sicilia and Palazon 2008) and may influence members' perceptions and actions (Muniz and Schau 2007).

Brand communities facilitate interactions through exchange of opinions about the brand or a particular product among consumers, thus engaging their members in a form of WOM communication (McAlexander et al. 2002). WOM was found to be a powerful tool for marketing, frequently used by individuals as a source of brand or product-related information (Buttle 1998; Duana et al. 2008). As such it plays a significant role for increasing the brand commitment and purchase decision making (Harrison-Walker 2001; Richins and Root-Shaffer 1988), leading ultimately towards increase in sales (Godes and Mayzlin 2004). Moreover, many-to-many communication on social media platforms is characterized with exponential growth

of the WOM volume. This form of message propagation is often referred to as viral marketing (Kaplan and Haenlein 2011).

The change in the dynamics of marketing interchange between companies and consumers as introduced by SNs has placed a focus on the non-transactional customer behavior. In this new marketing era, the terms engagement and participation became the central construct used to describe the nature of participants' specific interactions and/or interactive experiences (Brodie et al. 2011; Kietzmann et al. 2011). One of the early definitions of engagement within brand communities refers to it as "consumer's intrinsic motivation to interact and cooperate with community members" (Algesheimer et al. 2005). Since then, the term has been increasingly used in the marketing literature, and different context-depended definitions were provided. While certain interpretations focus on the cognitive and emotional aspects of engagement (Bowden 2009), others refer to the concept of engagement primarily as a specific activity type or pattern, beyond purchase, resulting from motivational drivers (Van Doorn et al. 2010). On online platforms, this form of engagement is commonly referred to as online engagement and is addressed from the perspective of measuring undertaken actions, such as the click-through rates (CTR), page views, etc., with different measures being applied depending on the possibilities offered by the platform (Lehmann et al. 2012). This interpretation of the concept of engagement will further be used as a basis for analysis presented in this paper.

Previous studies in the field of customer engagement in brand communities focused mostly on the consequences of engagement, including concepts of satisfaction (Bowden 2009), commitment and emotional attachment to the brand (Chan and Li 2010), empowerment (Cova and Pace 2006; Fuller et al. 2009), consumer value (Gruen et al. 2006; Schau et al. 2009), trust (Casalo et al. 2007; Hollebeek 2011), and loyalty (Andersen 2005; Casalo et al. 2007). Moreover, achieving these marketing objectives was found to be of significant importance for the companies, leading towards increased profitability (Enders et al. 2008; Hallowell 1996; Kumar et al. 2010). Thus, understanding the influencing factors which could increase the level of engagement within online brand communities on social media is a worthy goal which could result in greater volume of WOM and improved attitude towards the brand, potentially increasing company's revenue.

2.3 Social media marketing

Social networks, as the largest social media platform, may play a key role in the future of marketing; they may increase customers' engagement, and help to transform the traditional focus on control with a collaborative approach suitable for the modern business environment, leading towards the concept of SMM (Berthon et al. 2012; Harris and Rae 2009; Mangold and Faulds 2009). SMM can be defined as usage of the existing social media platforms for increasing the brand awareness among consumers on online platforms through utilization of the WOM principles (Drury 2008). As such, it supports two forms of promotion: (1) traditional marketing promotion, which refers to the communication driven by the companies towards their customers and (2) social promotion, which is unique for social media platforms and is embodied within the consumer-to-consumer communication (Mangold and Faulds 2009).

Early studies in the field of SMM have focused on explaining the concept and providing theoretical foundations (Berthon et al. 2012; Mangold and Faulds 2009). In addition, challenges of SMM were investigated, such as aggressive advertisement, lack of e-commerce abilities, and invasion of user privacy (Bolotaeva and Cata 2010; Harris and Rae 2009; Kaplan and Haenlein 2011). An inappropriate approach to these challenges could lead to fan loss and exposing the company to the risk of destroying its own credibility (Fournier and Avery 2011). Apart from the challenges, many opportunities have also been recognized, such as raising public awareness about the company, product development through community involvement, and gathering experience for the future steps by analyzing the UGC (Bolotaeva and Cata 2010; Richter et al. 2011).

More recent work has focused on empirical studies and particularly on ways companies may foster levels of customer engagement. Jahn and Kunz (2012) explore the factors that could convert consumers into loyal fans. In addition, De Vries et al. (2012) examine the popularity of brand posts, making an analogy between brand posts on Facebook and online advertising. Finally, an attempt to evaluate the effectiveness of SMM showed that a carefully managed Facebook advertising campaign increased the sales (Dholakia and Durham 2010). Still, as Wilson et al. (2012) point out, "these few studies only begin to touch on ways in which Facebook can be used to connect with customers."

Based on exploratory findings and practical examples, scholars have tried to generate guidelines for SMM. In general, guidelines that apply for online WOM, also apply to SMM: (1) sharing the control of the brand with consumers and (2) engaging them in an open, honest, and authentic dialog (Brown et al. 2007). Similarly, Parent et al. (2011) point to the importance of continuous engagement and selection of appealing content to be communicated by the companies to increase the viral propagation. Still, these guidelines are mostly general and do not specify what "constitutes great content, and

what will be most likely to be passed on" (Parent et al. 2011).

In order to contribute in the direction of understanding the online customer engagement within brand communities on Facebook and derive implications for companies utilizing Facebook for marketing, we develop a model which explains the relations between the characteristics of the content communicated by the company and the level of online engagement. We evaluate the proposed model based on the large dataset consisted of all activities over 2 months on the top 100 Facebook brand pages in the food/beverages category.

Before presenting the details of the analysis, the basic terminology specific for Facebook as a SMM platform is introduced.

3 Facebook as a platform for social media marketing

The selection of Facebook as an underlying platform was based on the reasoning that Facebook is currently the largest and fastest growing SN (Alexa 2012). In addition, according to the findings from a recent market research (Hubspot 2011), Facebook is considered by the companies as the most attractive social media platform to be used for marketing, in particular for B2C businesses.

Facebook provides five possibilities for companies to utilize the platform for marketing purposes: (1) Facebook Ads, (2) Facebook Brand Pages, (3) Social Plugins, (4) Facebook Applications, and (5) Sponsored Stories (Facebook 2012b). Of these, Facebook pages provide the largest number of engagement possibilities by direct interaction with the consumers through dialog.

In order to define the terminology, we will describe the concepts used in this paper based on the current definitions from Facebook (Facebook 2012c). Although like page is the official name for all Facebook pages which are not user profile pages, we will use the common terminology brand page (Richter et al. 2011) to distinguish pages created and operated by brand owners. The content shared on brand pages is referred to as posts and appears on the central part of the page, known as the wall or timeline. Each page might have one or more administrators responsible for creation and deletion of content, i.e., the page moderator(s). A brand page can have any number of members, in the continuation referred to as users or fans.

Within a Facebook brand page, fans can engage with a company by (1) posting content on the wall (depending on the communication policy set by the company), (2) commenting on the existing post shared by the moderator, (3) indicating interest in an existing post by pressing the "like" button, i.e., liking, and (4) sharing the post on their profile wall. Each of these actions generates a story, which appears on the wall of each of the fan's Facebook friends. As such, these actions represent a form of WOM communication. Moreover, stories which were generated by fans' engagement over moderator posts foster a propagation of the marketing message, leading towards the goal of viral marketing (Kirby and Marsden 2005).

4 Theoretical framework

There are two basic elements that correlate to the posting activity of the moderator as a part of the engagement plan: (1) which content should a moderator post on the wall to trigger more engagement and (2) when the content should be posted.

In the most general way, content shared on Facebook brand pages could be categorized by (1) the type of content enclosed within the post and (2) the post media type. To derive our hypotheses in regard to the content type which could increase the level of engagement, we build upon previous findings in the field of brand communities focusing on the motivations for participation. Further, to address the post media type, we refer to the concepts of vividness and interactivity commonly used as a basis for studying the user responses to different forms of online content, in particular in the domain of online advertisement. Finally, to address the time of posting as potentially influencing factor, we relate to the knowledge regarding usage of SNs and scheduling of online advertisement. Figure 1 illustrates these relations.

In the continuation, we provide details on the underlying reasoning and formulate the hypotheses.

4.1 Content type

Uses and Gratifications (U&G) theory (Katz 1959) is an approach frequently applied by technology and media researchers to understand the goals and motivations of individuals for engagement with different forms of content.

Previous applications of U&G theory over brand communities and social media showed that consuming entertaining and informative content is an important factor for participation in brand communities (Dholakia et al. 2004; Raacke and Bonds-Raacke 2008), where entertainment was found to have a stronger effect (Park et al. 2009). Moreover, entertainment and information were found to be among the main motivations for online engagement over brand-related content in the form of consumption, creation, and contribution (Muntinga et al. 2011). In addition, Muntinga et al. (2011) report remuneration through sweepstakes as the third and least frequently mentioned motivation for engagement (Muntinga et al. 2011). Based on these findings, we assume that if the company-

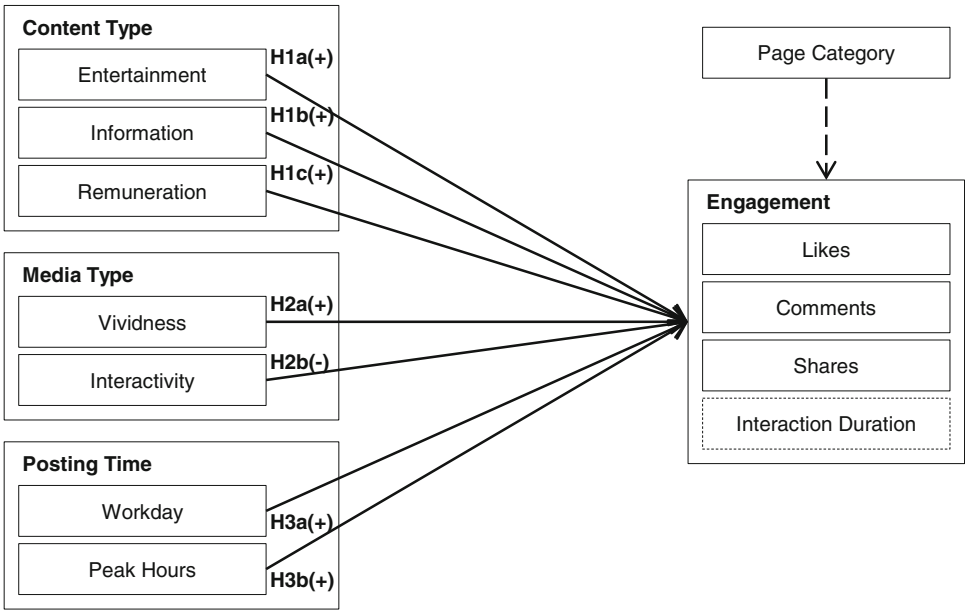

Fig. 1 Conceptual framework for relations between post characteristics and online engagement

communicated content on Facebook brand pages provides entertainment, brand-related information, and remuneration, the motivations for participation will be met, leading towards higher level of engagement. Therefore, we formulate the following hypotheses:

H1a: Posts which contain entertaining content cause highest level of engagement.

H1b: Posts which contain information about the brand cause lower level of engagement compared to entertaining content, but higher level of engagement compared to other content types.

H1c: Posts which offer remuneration cause lower level of engagement compared to informative content, but higher level of engagement compared to other content types.

4.2 Post media type

Post media type corresponds to the actual sharing action undertaken by the page moderator within a Facebook page. At the time of writing, Facebook offers the possibility to share (1) status, (2) photo, (3) video, and (4) link. These media types represent different level of media richness which is commonly referred to as vividness of online content (Daft and Lengel 1986). Moreover, different media types exhibit different levels of interactivity, expressed through the degree to which users can influence the form and content of the media environment (Steuer 1992).

Previous studies in the field of online advertisement found existence of positive effect of vividness over the effectiveness of online advertisement, measured by the level of interaction with the online ad, i.e., the CTR (Lohtia et al. 2003; Fortin and Dholakia 2005). Making an analogy between the marketing content served in the form of advertisement on online platforms and moderator posts shared on Facebook brand pages, we expect similar positive effect of vividness, thus formulating the following hypothesis:

H2a: The higher the level of post vividness, the higher the engagement level is.

However, in the case of interactivity findings vary from positive (Cho 1999) to negative effect (Bezjian-Avery et al. 1998) due to the various interpretations and operationalizations of the concept. In addition, previous studies showed that Facebook is mostly used in short sessions (Pempek et al. 2008). Thus, engagement with posts having high level of interactivity would require longer engagement time, which does not comply with the common SN usage patterns. Therefore, we propose

H2b: The higher the level of post interactivity, the lower the engagement level is.

4.3 Posting time

The concept of scheduling was already recognized as an important element of marketing strategies which could potentially lead to increased revenue (Kumar et al. 2006). For online advertising, it usually assumes having a time and space slot(s) on an online platform where marketing content will be shown (Kumar et al. 2006). In case of Facebook brand pages the situation is different. When the moderator posts the content, it will appear on the profile

walls of the page fans. Still, Facebook profile walls are overloaded with content coming from multiple sources (e.g., posts from friends, other pages, etc.), and it is possible that brand post gets "lost in the pile" without being seen. Therefore, for the Facebook domain, timing is an important aspect of scheduling.

Previous studies over temporal interaction patterns showed that most of the user activities on Facebook are undertaken during the workdays (Golder et al. 2007). Similarly, a study on online advertisement reported that the volume of CTR drops significantly over the weekend (Rutz and Bucklin 2008). Moreover, Facebook users were found to engage least during the morning and early afternoon, while the interaction increases towards the evening, reaching a steady high level during the night (Golder et al. 2007). Thus, if the post is created in the period when Facebook fans are active, i.e., peak (activity) hours, there is a greater possibility for the brand post to be seen on the wall, resulting in potential engagement over the post. Based on this reasoning, we propose the following two hypotheses:

H3a: Posts created on workdays result in higher level of engagement.

H3b: Posts created during the peak hours result in higher level of engagement.

5 The method

5.1 Data collection

Collection of the data for this study was performed using the customized scripts, based on the Facebook Graph API (Facebook Developers 2012). The Graph API provides access to Facebook social graph via a uniform representation of the objects in the graph (e.g., people, pages, etc.) and the connections between them (e.g., friends, content, etc.). For purposes of this study, we have used the posts connection of the page object. Posts connection represents a list of all post objects shared by the page moderator(s). Each post contains the following details relevant for this study: (1) the message, (2) post media type, (3) number of likes, (4) number of comments, (5) number of shares, (6) creation time, and (7) time of last interaction, corresponding to the time of creation of the last comment. The above listed elements extracted from the Facebook Graph API were stored in a relational database for further investigation.

The gathered dataset consists of posts obtained from 100 sponsored brand pages (see Table 4 Appendix). The criteria applied for selecting the set of brand pages consisted of (1) official brand pages created by the companies, (2) fast moving consumer goods (FMCG) pages—Facebook page category: food/beverages, and (3) English language used for communication.

The selection of the FMCG as industry domain was based on the reported situation on the market. According to the study conducted by one of the global social media analytics companies, Social Bakers (2012), FMCG is the industry domain which has attracted the largest number of brand community members on Facebook, at the same time having the lowest level of engagement.

To select the best players on the underlying platform, pages were selected using the Fan Page List web page (Fan Page List 2012) which ranks the Facebook pages according to several metrics. For this study, we have selected the number of fans as a success criterion. The complete list of selected pages and their high-level characteristics are provided in Table 4 Appendix.

In order to guarantee accuracy of the data and ensure independence from potentially changing Facebook policies, posts were fetched on a daily basis over the course of 2 months, from January to March 2012. For the selected period of time, 5,035 moderator posts were obtained. Due to the different engagement possibilities, posts in a form of Facebook polls were not taken into consideration for this study.

5.2 Operationalization of the variables

5.2.1 Independent variables: moderator post categorization

Content type: In order to assign the content type categories to the posts created by page moderators, we performed manual coding, following the coding development strategy (Glaser and Strauss 1967).

In the category entertainment, we included those posts which were not referring to the brand or a particular product. Instead, entertaining posts were written in a form of teaser, slogan, or word play, most of those explicitly asking for an engagement from fans, e.g,

> "Fill in the blank: Today would be perfect if _____". (source: Pizza Hut, 28.01.2012)

As informative posts we selected those that were given in form of traditional advertisement, thus containing information about specific products, brand, or the company, e.g.,

> "Spice up your breakfast with our new Cinnamon Streusel Cakes, available now in single serve! […]" (source: Little Debbie, 26.01.2012)

Finally, to address H1c, we looked into the posts in a form of sweepstakes organized within the Facebook brand

pages. These were coded as belonging to the remuneration category, e.g.,

> "To celebrate our new Facebook Timeline, let's play a game. Red Bull Timeline Timewarp starts now!!! Some serious prizes are at stake […]" (source: Red Bull, 29.02.2012)

Post media type. As already mentioned in Sect. 5.1, post media type is directly included in the obtained dataset for each moderator post.

To address the concept of vividness, we coded obtained post media type into four different levels which correspond to the previous studies (Fortin and Dholakia 2005): (1) no vividness, for status posts since these are written in a form of a short text, (2) low vividness for photos, since these include pictorial content, (3) medium vividness for links, since these redirect the user towards additional text and images, thus representing a combination of both the previous levels, and (4) high vividness for videos, since these offer more media richness and also include a sound.

In case of post interactivity we assigned two levels: (1) no interactivity to statuses and photos, since these two contain static content which can only be seen or read, and (2) high interactivity to links and videos, since these two could be "clicked on" by the fans to view the complete content, i.e., read the text behind the provided link or view the video.

Posting time. For the posting weekday, we distinguish between weekend posts, created on Saturday and Sunday, and workday posts.

Finally, to define the peak hours in terms of user activities, we looked at the volume of posts created by the fans over the day, as illustrated on Fig. 2.

It can be seen that on brand pages users posted the most between 4 p.m. and 4 a.m., which complies with the findings used as a basis for deriving the hypothesis H3b. Thus, this period was coded as peak hours, while the remaining time was coded as low hours.

5.2.2 Dependent variables: measuring the engagement

The Facebook official measure for customer engagement over a content created by the company on a Facebook brand page is the feedback rate (Facebook Pages 2012). Feedback Rate is defined as a ratio between the sum of comments and likes over the post, and the number of post impressions:

$$\text{Feedback rate} = \frac{\#\text{Likes} + \#\text{Comments}}{\#\text{Impressions}} \quad (1)$$

In formula (1), the number on impressions refers to the number of times the post was displayed on the page wall, shown on profile walls of fans or within the Fan Box widget (Facebook Pages 2012). As such, this measure is not accurate since it does not guarantee that the post was seen or read by the fan (e.g., it might have been rendered on the lower part of the page which was not visible). In addition, the engagement possibility of sharing the content, recently introduced by Facebook, is not taken into consideration in this formula.

To overcome this problem, in this study we propose a modification of the above measure. We start from the engagement possibilities described in Sect. 3, i.e., commenting, liking, and sharing the content created by page moderators. Since these interaction possibilities indicate different levels of engagement ,we propose separate measures that correspond to each of the possible activities. Further, since the number of comments, likes and shares is not an absolute measure, but is related to the number of page fans at the moment of posting, we use the likes (LR), comments (CR), and shares (SR) ratio as more accurate measures. Thus, the calculation of the depended variables was performed using the following formulas:

$$\text{LR} = \frac{N_{\text{L}}}{N_{\text{F}}} \quad (2)$$

$$\text{CR} = \frac{N_{\text{C}}}{N_{\text{F}}} \quad (3)$$

$$\text{SR} = \frac{N_{\text{S}}}{N_{\text{F}}} \quad (4)$$

where N_{L}, N_{C}, and N_{S} are the number of likes, comments, and shares, respectively, while N_{F} is the total number of fans on the day of posting.

In addition to the likes, comments, and shares ratios, we propose interaction duration as an additional variable that might be of interest for the brand page moderators, in particular for planning the posting frequency. Interaction duration is an indirect measure of engagement. Therefore, it will not be taken into consideration in regard to the

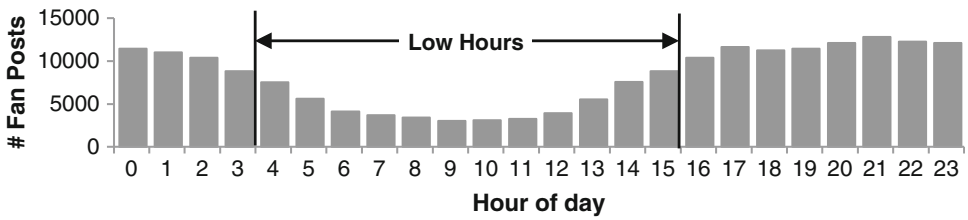

Fig. 2 Distribution of user posts over the day

hypothesis confirmation. Instead, an exploratory approach will be applied to estimate if the analyzed factors have the same expected effect.

To calculate the interaction duration we used the following formula:

$$\mathrm{ID} = T_{\mathrm{LI}} - T_C \tag{5}$$

where T_{C} is the time of post creation and T_{LI} is the time of last interaction over the post. The obtained values for interaction duration were rounded over minutes scale.

5.3 Data analysis

Dependent variables used in this study, i.e., number of likes, comments, and shares, as well as the interaction duration, represent count variables with a Poisson distribution. In addition, since the distribution variance and mean were different for all of the dependent variables, we used a Negative Binomial estimation method which overcomes the problem of overdispersed count data (Cameron and Trivedi 1998). Thus, the model to explain the engagement over moderator posts can be expressed as

$$\begin{aligned}\log(\mathrm{y}_i) = \mathrm{b0}_i &+ \sum_j \mathrm{b1}y_i \mathrm{content\ type}j \\ &+ \sum_j \mathrm{b2}y_i\ \mathrm{media\ type}j \\ &+ \mathrm{b3}y_i\ \mathrm{workday} + \mathrm{b4}y_i\ \mathrm{peak\ hour}\end{aligned} \tag{6}$$

Within the formula (6), y_i refers to the likes ratio, comments ratio, shares ratio, or interaction duration. Of the remaining variables, content type indicates the presence of a particular content type in the post. Similarly, media type indicates the presence of a particular media type in the post. Further, workday indicates that a post was created on workday, and peak hour indicates that the post was created during the peak hours.

6 Results

6.1 Descriptive statistics

To gain a general understanding on how are Facebook brand pages utilized we first looked into the descriptive statistics for the selected factor variables.

In regard to the shared content, posts containing entertainment were most frequently used by page moderators (2,948 occurrences, 58 % of total). These were followed by posts providing brand-related information with 698 occurrences (14 %), while remuneration occurred in 387 posts (8 %). In terms of media type, posts in form of photos were the most frequently used (2,032 occurrences, 40 % of total), followed by status posts (1,842, 37 %), links (688, 14 %), and videos (473, 9 %). Finally, most of the moderator posts were created on workdays (4,047, 80 %) and during peak hours (3,224, 64 %).

Further, in order to understand how fans engage over posts created by moderators on Facebook brand pages we looked into the descriptive statistics for the three dependent variables that correspond to the individual actions, i.e., likes, comments, and shares ratios. We were interested in finding out the differences between these variables in terms of the most and least commonly used form of engagement on Facebook brand pages. For easier visualization, Fig. 3 illustrates the mean values of the analyzed variables.

Obtained results indicate that fans engage by liking the content created by the page moderators far more frequently ($M = 0.000509, \mathrm{SD} = 0.000969$) compared to commenting ($M = 0.000122$, $\mathrm{SD} = 0.000308$) and sharing ($M = 0.000045, \mathrm{SD} = 0.000601$).

In terms of the interaction duration, the average value was found to be 12,926.34 min (SD = 16,274.68). Details of the descriptive statistics are provided in Table 5 Appendix.

6.2 Model evaluation

Empirical results obtained from the estimation of the proposed model for engagement over moderator posts are presented in Table 1.

As shown in Table 1, the proposed model for the likes ratio is significant as a whole (LR χ^2 (8, $N = 5{,}035$) = 814.183, $p < 0.0001$). The same applies for the comments ratio (LR χ^2 (8, $N = 5{,}035$) = 996.493, $p < 0.0001$), shares ratio (LR χ^2 (8, $N = 5{,}035$) = 1,035.499, $p < 0.0001$), and interaction duration (LR χ^2 (8, $N = 5{,}035$) = 258.225, $p < 0.0001$). In addition, different effects of independent variables were found to exist over individual engagement measures. Details of the obtained results for each of the analyzed factors are presented in continuation.

6.2.1 Content type

Content type was found to be a significant factor for all measures of engagement: the likes ratio (LR χ^2 (3,

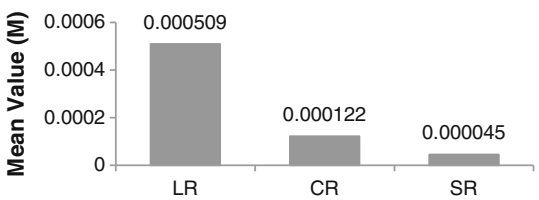

Fig. 3 Mean values of engagement measures within the observed dataset

Table 1 Estimation results for engagement over moderator posts

	ln(LR)		ln(CR)		ln(SR)		ln(ID)	
	B	Std. err.	*B*	Std. err.	*B*	Std. err.	*B*	Std. err.
(Intercept)	−8.248**	0.072	−10.788**	0.081	−10.740**	0.147	8.581**	0.082
Content type								
Entertainment	0.513**	0.050	0.937**	0.057	0.357**	0.093	0.238**	0.058
Information	0.129*	0.060	0.345**	0.069	−0.008	0.115	0.495**	0.072
Remuneration	−0.323**	0.073	0.225*	0.083	−0.217	0.143	0.123	0.086
Others	–	–	–	–	–	–	–	–
Media type								
Photo [V = low, I = low]	0.942**	0.055	0.860**	0.064	1.326**	0.108	0.730**	0.064
Status [V = no, I = low]	0.409**	0.059	1.007**	0.068	−1.089**	0.109	0.327**	0.068
Video [V = high, I = high]	0.261**	0.073	−0.078	0.084	0.914**	0.140	0.349**	0.085
Link [V = medium, I = high]	–	–	–	–	–	–	–	–
Weekday								
Workday	−0.095*	0.043	0.211**	0.049	0.110	0.082	0.062	0.050
Weekend	–	–	–	–	–	–	–	–
Posting time								
Peak hour	−0.291**	0.040	0.012	0.045	−0.570**	0.079	0.157*	0.047
Low hour	–	–	–	–	–	–	–	–
(Neg. binomial)	1.422**	0.025	1.816	0.032	5.170	0.110	1.985	0.034
LR χ^2 (8, N = 5,035)	814.183**		996.493**		1035.499**		258.225**	
Deviance/*df*	1.212		1.244		1.036		1.260	

Unstandardized coefficients are reported in the table

* $p < 0.05$, ** $p < 0.0001$

$N = 5{,}035) = 216.604$, $p < 0.0001$), comments ratio (LR χ^2 (3, $N = 5{,}035) = 311.292$, $p < 0.0001$), shares ratio (LR χ^2 (3, $N = 5{,}035) = 32.790$, $p < 0.0001$), and the interaction duration (LR χ^2 (3, $N = 5{,}035) = 49.337$, $p < 0.0001$).

In terms of individual content categories, entertainment was found to be a significant factor which increases the likes ratio ($b_{1\text{LR (entertainment)}} = 0.513$, $p < 0.0001$), comments ratio ($b_{1\text{CR (entertainment)}} = 0.937$, $p < 0.0001$), and shares ratio ($b_{1\text{SR (entertainment)}} = 0.357$, $p < 0.0001$). Moreover, entertainment has the largest effect compared to information and remuneration in all three cases. These results fully support the H1a.

Providing brand-related information was also found to have a significant and positive effect over the likes ratio ($b_{1\text{LR (information)}} = 0.129$, $p < 0.05$) and comments ratio ($b_{1\text{CR (information)}} = 0.345$, $p < 0.0001$), but does not have an effect over the shares ratio. In addition, the observed effect over the likes and comments ratio is larger compared to the one caused by remuneration content type. Thus, we conclude that H1b is supported only for likes and comments ratios.

Finally, remuneration was found to be significant factor for the likes ($b_{1\text{LR (remuneration)}} = -0.323$, $p < 0.0001$) and comments ratios ($b_{1\text{CR (remuneration)}} = 0.225$, $p < 0.05$). However, the effect over the likes ratio was found to be negative which is opposite to the predicted. In addition, no significant effect was found to exist over the shares ratio. Thus, hypothesis H1c is supported only for the number of comments.

Looking at the interaction duration, entertainment was again found to be an influential factor with a positive effect ($b_{1\text{ID (entertainment)}} = 0.283$, $p < 0.0001$). The same result was observed in the case of posts providing information ($b_{1\text{ID (information)}} = 0.495$, $p < 0.0001$). However, the order of the effect size differs from the predicted, i.e., interaction lasts longer over the informative content. Finally, remuneration as content type showed no significant effect over the interaction duration.

6.2.2 *Post media type*

Post media type was also found to be a significant predictor for the model for all measures of engagement, the likes ratio (LR χ^2 (3, $N = 5{,}035) = 387.052$, $p < 0.0001$), comments ratio (LR χ^2 (3, $N = 5{,}035) = 345.641$, $p < 0.0001$), shares ratio (LR χ^2 (3, $N = 5{,}035) = 1{,}006.879$, $p < 0.0001$), and the interaction duration (LR χ^2 (3, $N = 5{,}035) = 156.719$, $p < 0.0001$).

To compare the effect size caused by individual media types, links, which correspond to medium vividness (V = medium) and high interactivity (I = high), were taken as a baseline for the model.

Looking at the model coefficients obtained for the likes ratio, the results indicate that videos, which have same interactivity level as links (I = high), but higher vividness (V = high), result in a higher level of engagement ($b_{2LR\ (video)} = 0.261,\ p < 0.0001$). Further, status posts, which have a low level of interactivity (I = low) and no vividness (V = no), were found to cause greater level of engagement compared to both links and videos ($b_{2LR\ (status)} = 0.409$, $p < 0.0001$). Finally, the greatest effect was obtained for the photos ($b_{2LR\ (photo)} = 0.942$, $p < 0.0001$), which have the same level of interactivity as status updates (I = low), but higher level of vividness (V = low). To summarize these results, we point to the following: for posts with same level of interactivity, those with higher level of vividness trigger higher number of likes. These results support the H2a.

In addition, higher level of interactivity results in lower likes ratio (videos and links versus photos and statuses) which supports H2b.

In the case of commenting activity, interactivity has the same negative effect as observed for the likes ratio, i.e., photos ($b_{2CR\ (photo)} = 0.860,\ p < 0.0001$) and statuses ($b_{2CR\ (status)} = 1.007,\ p < 0.0001$) which have low interactivity (I = low) cause larger number of comments compared to videos and links with high interactivity (I = high). These results comply with H2b.

Still, there is a difference in the effect caused by the level of vividness, i.e., there is no significant difference found between engagement over links and videos, while engagement over photos is lower compared to the engagement over status posts. Thus, H2a cannot be supported.

Finally, in terms of shares ratio, vividness was found to have a positive effect, i.e., within posts with same level of interactivity, those with higher level of vividness, videos ($b_{2SR\ (video)} = 0.914, p < 0.0001$) and photos ($b_{2SR\ (photo)} = 1.318,\ p < 0.0001$), cause greater level of engagement compared to links and statuses ($b_{2SR\ (status)} = 0.327$, $p < 0.0001$). Thus, H2a is confirmed in this case.

In terms of interactivity, status posts were found to be the least frequently shared media type, while coefficients for photos and videos appear in the same order as already observed in the case of likes and comments ratios. Thus, H2b is only partially supported for shares ratio.

In regard to interaction duration, similar to already observed, among posts with the same interactivity level, the positive effect of vividness was found to exist. Posts created in a form of a video ($b_{2ID\ (video)} = 0.349$, $p < 0.0001$) attracted the attention of fans longer compared to the links. In addition, interaction lasted longer over photos ($b_{2ID\ (photo)} = 0.730,\ p < 0.0001$) compared to status posts ($b_{2ID\ (status)} = 0.337,\ p < 0.0001$). In the case of interactivity, videos (I = low) resulted in slightly longer interaction compared to statuses (I = high). It should be noted that this difference is not significant. Remaining media types maintained the order which complies with the previously observed negative effect of interactivity.

6.2.3 Weekday

Opposite to expected, weekday was found to be an influencing factor only for the likes ratio (LR χ^2 (1, $N = 5{,}035$) = 4.938, $p < 0.05$) and comments ratio (LR χ^2 (1, $N = 5{,}035$) = 18.578, $p < 0.0001$), while no effect over the model was found to exist for the shares ratio and the interaction duration.

As predicted, posting on workday was found to increase the number of comments ($b_{3CR} = 0.211,\ p < 0.001$). However, the effect over the likes ratio was found to be negative ($b_{3LR} = -0.096,\ p < 0.05$). Thus, H3a can only be supported for the comments ratio.

6.2.4 Posting time

Posting time type was found to be a significant factor for the models representing the likes ratio (LR χ^2 (1, $N = 5{,}035$) = 51.946, $p < 0.0001$), shares ratio (LR χ^2 (1, $N = 5{,}035$) = 52.023, $p < 0.0001$), and the interaction duration (LR χ^2 (1, $N = 5{,}035$) = 11.241, $p < 0.05$). In the case of comments ratio, no significant effect was found to exist.

Moreover, posting during the peak hours was found to have a negative effect on both the engagement variables, i.e., the likes ratio ($b_{4LR} = -0.291, p < 0.001$) and shares ratio ($b_{4SR} = -0.570,\ p < 0.001$). These results are opposite to the expected behavior. Thus, H3b is not supported.

On the contrary, interaction over post created during peak hours lasted longer compared to interaction over posts communicated over low hours ($b_{4ID} = 0.157, p < 0.05$).

A summary of the above presented results in terms of the supported hypotheses is provided in Table 2.

6.3 Secondary analysis

Manual investigation revealed two page sub-categories within the analyzed dataset consisted of Facebook brand pages from food/beverages category: (1) pages created by brands which offer FMCG product(s) and (2) those which represent retailers, such as restaurants, bakeries, etc.

Page sub-category is determined by the type of offered service. As such, it is not related to the content characteristics and does not represent a factor which could be

Table 2 Summary of the result showing supported and non-supported hypotheses

Hypothesis	Expected	Obtained			
		Likes ratio	Comments ratio	Shares ratio	Interaction duration
H1a (Entertainment)	(+)	Supported	Supported	Supported	Partially
H1b (Information)	(+)	Supported	Supported	No effect	Partially
H1c (Remuneration)	(+)	Not supported	Supported	No effect	No effect
H2a (Vividness)	(+)	Supported	Not supported	Supported	Supported
H2b (Interactivity)	(−)	Supported	Supported	Partially	Partially
H3a (Workday)	(+)	Not supported	Supported	No effect	No effect
H3b (Peak Hour)	(+)	Not supported	No effect	Not supported	Supported

adjusted as a part of the company's SMM strategy. For that reason, page category was not included in the model. Still, in order to explore the possible differences between these two sub-categories, a secondary analysis was conducted by applying the same methodology over two separate datasets, each corresponding to individual page sub-category, i.e., product (71 pages, 3,528 posts) versus retailer (29 pages, 1,507 posts). The results of the test of model effect which identifies significant predictors for both categories are provided in Table 3.

It can be seen that differences appear between the page sub-categories in terms of the effect of the analyzed factors over the models for comments ratio, shares ratio, and interaction duration.

In the case of commenting activity, posting time has a significant effect for the retailer sub-category (LR χ^2 (1, $N = 1{,}507$) $= 18.116$, $p < 0.0001$) which increases the level of engagement ($b_{4\text{CR}} = 0.282$, $p < 0.0001$). This result differs from the product subcategory but also from the main model over the full dataset where no effect was found to exist.

Further, content type shows no significant effect over the shares ratio for the retailer sub-category. Thus, the effect in the main model originates solely from the positive effect of the entertainment content type in the case of product page sub-category ($b_{1\text{SR (entertainment)}} = 0.560$, $p < 0.0001$).

Finally, in the case of interaction duration, posting time shows no significant effect for the product sub-category. This result is opposite to the observed positive effect for the retailer pages ($b_{4\text{ID}} = 0.270$, $p < 0.0001$) which leads to existence of positive effect over the main model.

In addition to the differences between the product and retailer brand pages, an additional difference appears for both sub-categories compared to the main model, i.e., weekday does not represent a significant factor on individual level for the likes ratio.

Additional deviations from the main model which occur on the level of individual coefficients for the content and media type factors, obtained from the model evaluation for each page sub-category, are provided in Tables 6 and 7 in Appendix of this paper.

7 Discussion and managerial implications

The results presented in the previous section show that different components of SMM posting strategies have effect on the engagement level of the fans over the posts created by the moderators on Facebook brand pages. Thus, the main implication to be drawn from this study for the SMM practitioners would be

Table 3 Test of model effects for Product and Retailer page sub-categories

Source	*df*	Likes ratio		Comments ratio		Shares ratio		Interaction duration	
		Likelihood ratio χ^2		Likelihood ratio χ^2		Likelihood ratio χ^2		Likelihood ratio χ^2	
		Product	Retailer	Product	Retailer	Product	Retailer	Product	Retailer
Content type	3	160.151**	88.937**	250.869**	76.939**	34.626**	*4.336*	23.368**	8.174*
Media type	3	214.095**	204.144**	204.116**	155.474**	637.430**	341.301**	77.173**	163.882**
Weekday	1	*2.369*	*3.496*	36.300**	6.248*	2.444	0.978	2.835	0.186
Posting time	1	33.393**	24.717**	3.057	*18.116***	31.860**	4.828*	*1.813*	19.586**

Italic lettering denotes differences between page sub-categories and deviations from the main model

* $p < 0.05$, ** $p < 0.0001$

I_1: Companies utilizing Facebook brand pages as a platform for SMM should prepare clear engagement strategies which specify the appropriate content type, media type, and posting time to increase the level of engagement over the moderator posts.

7.1 Content type

Content planning was shown to be an important element of the posting strategy which significantly increases the level of engagement.

Entertaining content was found to be the most influential, by increasing the engagement on all three individual levels—liking, commenting, and sharing. Moreover, it was also found to have a positive effect over the interaction duration, though the effect size is smaller compared to providing brand related information.

Posts offering brand-related information increase the level of engagement through liking and commenting, but do not cause an effect on the number of shares. This could be explained by the fact that product or brand related content is specific to the brand and perceived as valuable within the community, but might lose its significance when shared outside the community. In addition, providing informative content was found to cause the greatest increase in the interaction duration. A possible explanation for this result might be that majority of Information posts were written in a form of photo media type which was shown to cause the greatest interaction duration (66 %, 462).

Further, the remuneration content category deviated from the expected behavior. While positive effect was found to exist only over the comments ratio, no effect was found to exist over the shares ratio. A possible explanation for this result could again be related to the loss of relevance of this type of content outside the Facebook brand page. Surprisingly, a negative over the remuneration was found to exist over the likes ratio. Finally, this content type had no effect over the interaction duration. One possible explanation might be that contests organized on Facebook brand pages which are referred to within this content type are usually with limited duration. Once the winner has been announced, the post is no longer of interest for the fans.

Previous discussion can be summarized in the form of the following managerial implications:

I_{2A}: Facebook brand page moderators should create content that provides Entertainment to achieve the highest level of engagement.

I_{2B}: Facebook brand page moderators should provide brand-related Information to increase the number of likes and comments, and also to achieve longest interaction duration.

I_{2C}: Facebook brand page moderators should provide remuneration to the fans to increase the number of comments.

7.2 Post media type

Media type planning was also found to be an important element of the posting strategies. Through the media type, practitioners have the possibility to address the concepts of vividness and interactivity which were already found to be important factors for online advertisement. Since these two constructs are contained within the same post feature, on Facebook brand pages vividness and interactivity should be addressed from the perspective of finding the "optimal mix", as already proposed by Fortin and Dholakia (2005).

Results presented in previous section showed that on overall level photos, with low interactivity and low vividness, have caused the greatest level of engagement, followed by status posts (low interactivity, no vividness), videos (high interactivity, high vividness), and links (high interactivity, medium vividness). These results indicate that interactivity has stronger effect over the engagement level, resulting in content with higher level of vividness (links and videos) to be perceived as less attractive compared to content with lower level of vividness (photos and statuses) due to the higher interactivity.

Looking at the individual engagement measures, liking shows the same order of media type preference as on the overall level.

In the case of sharing there is a slight difference, while photo, video, and link posts maintain their order, status posts display the lowest level of sharing. We believe that this behavior is due to the fact that fans may feel that content with higher level of vividness could be more appealing to their friends compared to plain text.

Finally, in terms of commenting, while interactivity exhibits the same negative effect, the effect of vividness differs from the expected behavior. In particular, photos which have higher level of vividness received less attention compared to status posts which have lower level of vividness. This effect might be due to the fact that within the observed dataset, majority of status posts contain entertaining content (1,591, 86 % of status posts, 32 % of total) which was found to have a significant effect over the level of commenting.

It should be noted that similar results were obtained for the interaction duration, with photos causing the longest interaction, and links the shortest. Thus, post media type could be used to select the appropriate posting frequency depending on the previously created content.

To summarize the previous discussion in the form of managerial implications we propose

I_{3A}: Facebook brand page moderators should create less interactive content, i.e., photos and status updates, to increase the total level of engagement.

I_{3B}: Facebook brand page moderators should focus on vivid content, i.e., videos, photos, and links to increase the reach of their message, by stimulating the sharing activity of the fans.

7.3 Posting time

Posting weekday was found to be a significant factor for the engagement level in terms of likes and comments ratios. Still, positive effect occurred only over the commenting activity, while a small negative effect was found to exist over the liking activity. In addition, no effect occurred in regard to sharing and interaction duration. Since commenting requires more time than liking and sharing (which only requires one click), we might assume that people are willing to spend this time on the days when they use Facebook with greater intensity, i.e., on the workdays.

Thus, due to the fact that we were not able to fully confirm our hypothesis, we could only recommend

I_{4A}: Facebook brand page moderators should post on workdays to increase the number of comments.

Opposite to the expected, posting in the peak activity hours was found to have a negative effect over the liking and sharing activity. Positive effect was found to exist only over the interaction duration, while commenting activity is not influenced by posting time. One possible explanation might be that during the peak hour fans give the priority to the engagement with their friends which would comply with previous finding over the motivations for usage of SNs (Raacke and Bonds-Raacke 2008). Thus, the managerial implication to be drawn from the obtained result is

I_{4B}: Facebook brand page moderators should post during the low hours to increase the level of engagement through liking and sharing.

7.4 Page sub-category

The secondary analysis presented in this paper revealed existence of differences in regard to the effect of the analyzed factors over the model between the two identified page sub-categories, product and retailer. In addition, differences appeared between the obtained coefficients for separate factor levels. These results indicate that different brand communities might have different interests and motivations for participation, resulting in different responses to characteristics of the content created by the company on Facebook brand pages. Thus, the final implication for practitioners would be

I_4: Companies utilizing Facebook brand pages as a platform for SMM should perform continuous monitoring of the undertaken actions and customers' responses to them to gain knowledge about the specific characteristics and interests of their own brand communities, which enables fine-tuning of the initially established SMM engagement strategy.

8 Summary, limitations, and future work

In this paper, we analyzed the characteristics of the content created by companies as factors that might influence the level of online engagement on Facebook brand pages, used as a platform for SMM. We developed a model which explains the relationship between these constructs. Our results showed that providing entertaining and informative content significantly increases the level of engagement. In addition, fans positively react to content offering remuneration but only in a form of commenting. We also showed that vividness increases, while interactivity decreases the level of engagement over moderator posts, making photos the most appealing post media type. Finally, posts created on workdays increase the level of comments, while posting in peak activity hours will reduce the level of engagement. These findings should encourage moderators of Facebook brand pages to prepare engagement strategies that trigger the activity of fans and drive brand adoption in the long run.

The results presented in this paper are limited to Facebook brand pages as SMM platform. As such, the concept of engagement investigated in this paper is limited to online engagement and reflects the selection of Facebook as an underlying technological platform. In addition, the existence of friendship between the fans as a factor that might influence the level of engagement is not taken into consideration due to the inability to obtain such information from Facebook, as a result of the limitations imposed by the existing privacy policies. Finally, the analysis was conducted only over the food/beverages category of Facebook brand pages, thus limiting the industry domain to FMCG.

In order to confirm our findings or identify specific industry domains that display different behavior, we plan to expand our analysis to the posts gathered from other categories of Facebook brand pages. Further, we plan to investigate existence of additional factors that might influence the level of engagement, such as the posting frequency, post length, community size, etc. Finally, we would like to investigate the interaction over the posts shared by the fans to understand if they exhibit similar results. This would provide us with an insight into the level of influence of the individual users versus the moderator within the Facebook brand page.

Appendix

See Tables 4, 5, 6, 7

Table 4 Characteristics of the brand pages

Brand	Fans		Moderator posts		User posts	
	Number[a]	Growth (%)[b]	Number[b]	Average[c]	Number[b]	Average[c]
Coca-Cola	36,585,722	10	13	0.22	13,979	232.98
Starbucks	26,568,303	8	25	0.42	19,099	318.32
Red Bull	25,328,419	7	92	1.53	0	0.00
Oreo	23,734,423	6	17	0.28	2,152	35.87
Skittles	19,628,802	7	57	0.95	2,904	48.40
Pringles	16,258,916	12	67	1.12	2,740	45.67
Monster Energy	12,866,375	14	142	2.37	10,164	169.40
McDonald's	12,215,217	40	1	0.02	0	0.00
Nutella	11,917,508	17	18	0.30	0	0.00
Dr Pepper	10,923,342	5	106	1.77	13,608	226.80
Taco Bell	7,664,011	8	85	1.42	8,313	138.55
Pepsi	6,894,498	11	98	1.63	6,140	102.33
Mountain Dew	6,312,189	6	23	0.38	2,978	49.63
Buffalo Wild Wings	6,001,986	13	115	1.92	3,215	53.58
5 Gum	5,590,471	9	0	0.00	1,022	17.03
Dunkin' Donuts	5,423,131	9	93	1.55	8,565	142.75
Sprite	5,154,844	47	1	0.02	1,127	18.78
Pizza Hut	4,969,803	29	60	1.00	4,389	73.15
Kit Kat	4,840,509	33	38	0.63	3,551	59.18
Chick-fil-A	4,750,804	3	27	0.45	2,556	42.60
Dippin' Dots	4,577,831	6	23	0.38	330	5.50
Gatorade	4,399,366	6	96	1.60	1,003	16.72
Domino's Pizza	4,340,110	27	112	1.87	6,763	112.72
Slurpee	4,325,088	6	0	0.00	395	6.58
Dairy Queen	3,815,738	18	32	0.53	1,096	18.27
Krispy Kreme Doughnuts	3,801,554	8	23	0.38	0	0.00
Ben & Jerry's	3,483,379	7	131	2.18	1,532	25.53
Kellogg's Pop-Tarts	3,480,495	12	21	0.35	606	10.10
Baskin-Robbins	3,363,546	19	42	0.70	1,011	16.85
Kinder Surprise	3,342,607	21	12	0.20	713	11.88
Lay's	3,220,645	17	13	0.22	1,561	26.02
Vitaminwater	3,023,714	5	1	0.02	1,081	18.02
Twix	3,020,883	26	27	0.45	1,311	21.85
Snickers	2,904,408	28	28	0.47	1,219	20.32
Arizona Iced Tea	2,712,300	14	63	1.05	754	12.57
M&M's U.S.A.	2,685,728	17	92	1.53	2,493	41.55
Life Savers Gummies	2,557,410	19	37	0.62	212	3.53
Kinder Bueno	2,502,956	31	0	0.00	942	15.70
Sour Patch Kids	2,443,625	24	61	1.02	654	10.90
Burger King	2,404,909	79	79	1.32	6,502	108.37
Trident® Chewing Gum	2,270,645	18	4	0.07	367	6.12
Frito-Lay	2,194,315	3	26	0.43	1,077	17.95
Tic Tac	2,176,727	44	11	0.18	502	8.37
Hard Rock	2,125,187	5	73	1.22	1,610	26.83
Doritos	2,117,932	56	22	0.37	1,738	28.97

Table 4 continued

Brand	Fans		Moderator posts		User posts	
	Number[a]	Growth (%)[b]	Number[b]	Average[c]	Number[b]	Average[c]
Toblerone	2,073,377	19	17	0.28	451	7.52
Cadbury Creme Egg	2,062,032	8	2	0.03	957	15.95
Papa John's Pizza	1,997,206	10	74	1.23	5,409	90.15
Cadbury Wispa	1,794,119	2	61	1.02	1,089	18.15
ICEE	1,746,202	22	69	1.15	2,178	36.30
Tim Hortons	1,720,900	5	21	0.35	2,060	34.33
Panda Express	1,688,461	29	18	0.30	962	16.03
Cold Stone Creamery	1,676,449	8	18	0.30	662	11.03
Wendy's	1,640,488	19	69	1.15	1,730	28.83
Outback Steakhouse	1,638,200	9	40	0.67	1,441	24.02
Hooters	1,612,289	25	50	0.83	2,594	43.23
Kool-Aid	1,588,714	16	22	0.37	975	16.25
Bingo!	1,570,112	10	63	1.05	0	0.00
Chipotle Mexican Grill	1,545,461	10	7	0.12	4,846	80.77
Fanta	1,522,753	67	46	0.77	1,899	31.65
Nespresso	1,428,793	11	15	0.25	1,124	18.73
WARHEADS	1,400,633	35	19	0.32	739	12.32
Diet Coke	1,392,726	21	1	0.02	688	11.47
Pillsbury	1,382,356	15	111	1.85	786	13.10
Cadbury Celebrations	1,200,287	15	243	4.05	739	12.32
Little Debbie	1,164,285	10	45	0.75	1,065	17.75
Jamba Juice	1,154,797	13	66	1.10	0	0.00
Nescafé	1,153,004	20	22	0.37	759	12.65
Butterfinger	1,138,096	19	38	0.63	592	9.87
Rockstar Energy Drink US	1,115,195	26	212	3.53	1,316	21.93
Cafe Coffee Day: Official	1,086,974	30	106	1.77	1,449	24.15
Mentos US	1,070,540	15	71	1.18	600	10.00
Jarritos	1,020,803	8	30	0.50	287	4.78
Lipton Brisk	968,440	12	82	1.37	1,903	31.72
Heinz Ketchup	897,602	7	29	0.48	1,896	31.60
Carl's Jr.	859,134	12	48	0.80	750	12.50
Ching's Secret	835,513	0	5	0.08	182	3.03
Jones Soda	811,520	10	80	1.33	689	11.48
Wawa	806,744	4	32	0.53	592	9.87
Pepsi Max	804,307	53	102	1.70	767	12.78
Nabisco Cookies	798,932	6	22	0.37	560	9.33
Whole Foods Market	766,403	8	131	2.18	0	0.00
Pepsi Max	758,132	24	58	0.97	228	3.80
Marmite	751,762	4	80	1.33	1,621	27.02
Snapple	726,273	31	105	1.75	1,360	22.67
Coca-Cola Zero	724,324	12	4	0.07	1,071	17.85
Arby's	722,412	18	55	0.92	578	9.63
Tabasco	678,139	6	20	0.33	616	10.27
Nestle Drumstick	676,005	10	25	0.42	161	2.68
Cheetos	664,539	23	11	0.18	541	9.02
DiGiorno	609,775	23	47	0.78	1,355	22.58
Florida's Natural	439,450	26	51	0.85	463	7.72
Wheat Thins	423,335	6	19	0.32	505	8.42
Nestlé	286,423	34	27	0.45	1,160	19.33

Table 4 continued

Brand	Fans		Moderator posts		User posts	
	Number[a]	Growth (%)[b]	Number[b]	Average[c]	Number[b]	Average[c]
Lipton Iced Tea	238,888	3	31	0.52	376	6.27
Popchips	232,976	7	33	0.55	563	9.38
Tropicana	169,396	12	60	1.00	589	9.82
Sierra Nevada	130,130	6	28	0.47	877	14.62
Campbell's Condensed Soup	49,016	25	43	0.72	362	6.03
PepsiCo	44,089	17	144	2.40	429	7.15
Average (per page):		17	50	0.84	1,995.65	33.26

[a] Obtained on January 1st, 2012

[b] For the selected period: from January 1st to March 1st 2012

[c] Per day

Table 5 Descriptive statistics

	Likes	Comments	Shares	Likes ratio	Comments ratio	Shares ratio	Interaction duration
Mean							
Value	1,434.90	200.05	87.57	0.000509	0.000122	0.000045	12,926.34
Std. error	46.22	6.82	4.12	0.000014	0.000004	0.000008	229.36
95 % CI for mean							
Lower bound	1,344.30	186.67	79.49	0.000482	0.000113	0.000028	12,476.70
Upper bound	1,525.50	213.42	95.64	0.000535	0.000130	0.000061	13,375.98
5 % trimmed mean	921.74	130.11	41.00	0.000368	0.000071	0.000017	10,835.33
Median	446.00	74.00	12.00	0.000242	0.000038	0.000003	6,266.00
Variance	10,754,469.66	234,220.60	85,476.09	0.000001	0.000000	0.000000	264,865,117.43
Std. deviation	3,279.40	483.96	292.36	0.000969	0.000308	0.000601	16,274.68
Minimum	0.00	0.00	0.00	0.000000	0.000000	0.000000	0.00
Maximum	58,883.00	11,166.00	5,429.00	0.026227	0.006749	0.041288	90,253.00
Range	58,883.00	11,166.00	5,429.00	0.026227	0.006749	0.041288	90,253.00
Interquartile range	1,165.00	162.00	59.00	0.000399	0.000085	0.000024	16,254.00
Skewness							
Value	7.30	9.99	8.34	8.955210	8.307810	64.481556	1.93
Std. error	0.03	0.03	0.03	0.034510	0.034510	0.034510	0.03
Kurtosis							
Value	81.78	158.22	93.00	151.662499	112.258214	4402.700757	3.73
Std. error	0.07	0.07	0.07	0.069007	0.069007	0.069007	0.07

Table 6 Model evaluation for product page sub-category

	ln(LR)		ln(CR)		ln(SR)		ln(ID)	
	B	Std. err.	*B*	Std. err.	*B*	Std. err.	*B*	Std. err.
(Intercept)	−8.294**	0.092	−10.931**	0.104	−10.938**	0.199	8.447**	0.107
Content type								
Entertainment	0.649**	0.062	1.093**	0.070	0.560**	0.124	0.219*	0.076
Information	0.297**	0.083	0.668**	0.095	0.156	0.164	0.463**	0.100
Remuneration	−0.206*	0.095	0.349*	0.109	−0.341	0.194	0.066	0.113
Others	–	–	–	–	–	–	–	–

Table 6 continued

	ln(LR)		ln(CR)		ln(SR)		ln(ID)	
	B	Std. err.	*B*	Std. err.	*B*	Std. err.	*B*	Std. err.
Media type								
Photo [V = low, I = low]	0.881**	0.075	0.844**	0.087	1.450**	0.155	0.725**	0.086
Status [V = no, I = low]	0.314**	0.078	0.953**	0.092	−1.142**	0.155	*0.476***	0.094
Video [V = high, I = high]	0.223*	0.093	−0.159	0.108	0.996**	0.187	0.325*	0.109
Link [V = medium, I = high]	–	–	–	–	–	–	–	–
Weekday								
Workday	*−0.084*	0.055	0.380**	0.063	0.173	0.111	0.111	0.066
Weekend	–	–	–	–	–	–	–	–
Posting time								
Peak hour	−0.305**	0.053	−0.102	0.058	−0.612**	0.108	*0.083*	0.062
Low hour	–	–	–	–	–	–	–	–
(Neg. binomial)	1.643	0.034	2.075	0.043	6.436	0.172	2.370	0.048
LR χ^2 (8, N = 5,035)	559.978**		732.546**		691.021**		128.795**	
Deviance/*df*	1.232		1.258		0.957		1.281	

Unstandardized coefficients are reported in the table

Dataset limited to product page sub-category

Italic lettering denotes deviations from results obtained over complete dataset

* $p < 0.05$, ** $p < 0.0001$

Table 7 Model evaluation for retailer page sub-category

	ln(LR)		ln(CR)		ln(SR)		ln(ID)	
	B	Std. err.	*B*	Std. err.	*B*	Std. err.	*B*	Std. err.
(Intercept)	−7.979**	0.111	−10.235**	0.127	−10.464**	0.203	8.968**	0.112
Content type								
Entertainment	*0.124*	0.081	0.403**	0.094	*−0.204*	0.140	*0.106*	0.082
Information	*−0.242**	0.087	*−0.242**	0.099	−0.311	0.161	0.226*	0.092
Remuneration	−0.684**	0.109	*−0.134*	0.123	−0.323	0.203	−0.010	0.113
Others	–	–	–	–	–	–	–	–
Media type								
Photo [V = low, I = low]	0.983**	0.074	0.741**	0.085	0.827**	0.136	0.817**	0.080
Status [V = no, I = low]	0.550**	.080	0.979**	0.093	−1.103**	0.141	*0.103*	0.083
Video [V = high, I = high]	*0.211*	0.117	−0.141	0.132	0.727*	0.212	0.502**	0.122
Link [V = medium, I = high]	–	–	–	–	–	–	–	–
Weekday								
Workday	*−0.115*	0.061	*−0.179**	0.072	0.113	0.115	−0.028	0.066
Weekend	–	–	–	–	–	–	–	–
Posting time								
Peak hour	−0.284**	0.057	*0.282***	0.066	−0.230*	0.105	0.270**	0.061
Low hour	–	–	–	–	–	–	–	–
(Neg. binomial)	0.892	0.029	1.169	0.037	2.996	0.108	1.011	0.032
LR χ^2 (8, N = 5,035)	298.367**		357.846**		306.728**		211.778**	
Deviance/*df*	1.146		1.179		1.180		1.164	

Unstandardized coefficients are reported in the table

Dataset limited to *Retailer* page sub-category

Italic lettering denotes deviations from results obtained over complete dataset

* $p < 0.05$, ** $p < 0.0001$

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