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Social Media Marketing for Businesses: Organic Promotions of Web-Links on Facebook

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Abstract

Effectiveness of social media marketing is a topic of great interest for researchers as well as marketers. To enrich the literature, regarding the effectiveness of various types of posts with a web-link, we design and conduct an experiment on Facebook (FB). This experiment was conducted in a real business environment, through the FB fan page of a Polish e-commerce store. The observations were analysed through simple linear regression and metrics adapted for this particular experiment from the literature. Results show that a web-link placed in the comments of an FB post, instead of the caption, is more lucrative. It is also shown that, based on the campaign aims, the metrics can give valuable information about the time of posting, as well as the interval between posts.

Keywords: Social Media Marketing, Facebook Marketing, Organic Promotion, Web links, external links

1. Introduction

Exponential growth in the number of internet users has lead the business to explore efficient ways of managing their presence in the electronic space. Businesses have adapted new business models that allow them to utilize the opportunities that the internet has to offer (Wielki, 2010). With a growing number of internet users, social media also gained traction rapidly and a significant increase in social media users is still noticeable across the globe. The number of social media users worldwide is estimated to be 2.82 billion. It is anticipated that, in 2020, the user base will reach 2.96 billion, which would further grow to 3.09 billion in 2021 [1]. The power of the social media ecosystem is amplified due to these huge numbers, but its high importance is due to the fact that it connects directly or indirectly online as well as offline elements of the economy (Hanna et al., 2011). This is especially the case for Facebook (FB), with more than 2.4 billion active monthly users (https://www.statista.com/statistics/264810/number-of-monthly-active-facebook-users-worldwide/), which has proven to be a very popular platform to market products,

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[1] for more details see: https://www.statista.com/statistics/278414/number-of-worldwide-social-network-users/

promote brands, manage relationships and lead discourse with customers (Chodak and Suchacka, 2017; Myers West, 2018). The numerous studies of social media research over the last two decades point out its growing importance for businesses (Kapoor et al., 2018), especially in the aspect of direct marketing in today's digital economy (Unold, 2003). Therefore, activities on social media frequently become the basis of the marketing strategy of companies. In the present world, where each person can communicate about products, businesses or brands with thousands of peers, the impact of consumer engagement has been greatly magnified (Liu et al., 2018). Consequently, in the current culture, when planning the marketing content, managers are strongly dependent on the users and also the algorithms of social media platforms (Kanuri et al., 2018). However, the studies concerned with social media communication often do not take into account the effectiveness of communication for a variety of content, especially the links between position, levels of interaction and time of posting. There is also a lack of agreement about how to measure the effectiveness and which social media marketing indicators define communications performance in the best way (Lamberton and Stephen, 2016). This has attracted a lot of research in this field (Alalwan et al., 2017; De Vries et al., 2012a), however, significant gaps are still observed. This paper aims to fill some of these gaps.

The purpose of this article is to analyze the effectiveness of different types of content in the context of link position in generating user engagement, through organic promotions on Facebook in a real business environment. In particular, we aim to: (i) Check the best position for placing a web-link on a Facebook fan page post, intended to be promoted organically (i.e. without paid promotions); (ii) To analyze various metrics for effectiveness of marketing communication in social media and draw out the engagement patterns among different types of post types, posted at different times of the day.

The structure of the article is as follows: After a brief introduction, the manuscript in this Section 1, the literature review regarding social media media marketing, its effectiveness and challenges for conducting an experiment on social media in a real business environment is discussed in Section 2. After that, Section 3, discusses in detail the experiment setup and the methods used for analysing the empirical data recorded during the experiment. In the same section, metrics for analysing the results of a social media campaign and its constituent variables are also described. This was followed by the description of results & observations from the experiment in Section 4 and discussion on conclusions in Section 5. Lastly, the limitations and future scope of research have been discussed in Section 6, followed by the bibliography and appendix with the long tables.

2. Literature Background

2.1. Social Media Marketing and Effectiveness

Evolution in technology has enabled social networking platforms to give users the medium to share content in various forms, such as text, visuals, audio-visuals, weblinks, etc. The general impact of different kinds of content on the brand's page have been studied and shows that there is a variation in engagement levels among different types of content. (De Vries et al., 2012b). There is an unavailability of analysis in the literature on how individual elements of the communication process and communication strategies of its participants are influenced by mutual feedback in communication channels. These are fully bi-directional, highly dependent on the socio-cultural

context, variety of media forms, variable roles of participants, as well as a separate way of coding information. There is a need for establishing links between social media content and engagement, drivers of engagement and further conceptualization as well as measurement of Social Media content (Dolan et al., 2017).

Customer engagement may be defined as a concept able to capture customers' total set of behavioral activities toward a brand or company (Coulter et al., 2012). User engagement, measured by likes, comments, shares and clicks, is the basis on which the reach of the content usually is determined. Customer engagement creates enhanced organizational performance including, among others, increased sales, superior competitive advantage and profitability (Kumar et al., 2010; Hollebeek, 2011) and emotional connections (Chan and Li, 2010). Dehghani and Tumer (2015), presented that Facebook advertising significantly affected brand image and brand equity and both factors contributed to a significant change in purchasing intention. Consumers interactions through Facebook and the posted messages supports them on their purchasing decision as well as choosing of products in order to settle the purchasing decision (Di Pietro and Pantano, 2012).

Efficiency of Facebook advertising may be analysed using modified methods taken from Internet marketing theory like composite efficiency index (CEI) (Vejačka, 2012), however, such methods don't take into account specific conditions of social media. Oviedo-García et al. (2014), proposed metrics for customer engagement on Facebook called ratio of effective interest, which take into consideration the likes, comments, shares and other clicks, divided by number of posts in relation to average impressions. Shen et al. (2016), claimed that communication effectiveness, in the form of attitudes toward advertising and message-sharing intention is higher in an interactive advertising format than in a non-interactive format. In social media the higher the content engagement, the higher the reach is obtained (Lipsman et al., 2012). Social Media platforms keep updating and modernizing their algorithms to make the content more and more relevant for the users. Through an analysis of EdgeRank, the algorithm dedicated to structuring the flow of information and communication on Facebook's 'News Feed', researchers have argued that the distribution of content is biased based on its type (Bucher, 2012).

To obtain better insights on social media marketing effectiveness, the authors analyzed various metrics. All popular social media platforms provide some measurements that help to understand users' engagement. Although researchers have raised the problem of needed expertise and adequacy of widely available metrics (Baym, 2013), the engagement is one of the most popular success factors for social media marketing. Based on those findings, authors decided to calculate metrics focusing on the effectiveness and interaction patterns among Facebook users. The effectiveness of communication is usually defined by the ISO 9000: 2005 standard, as the degree of achieving the planned goals. The meaning of effectiveness is based on the praxeology approach - the theory of efficient action (Kotarbinski, 2013). According to this meaning, the efficacy describes each component of good work" as constituting: effectiveness, favorableness and economy. The primary form of efficient action is effectiveness, described as a compatibility of action with the intended aim (Pszczołowski, 1967). In this meaning, the action can be effective when all performed activities enable reaching established goals. This can be measured as the level of reaching goals (what is not always easy to evaluate) or the degree of approach to reach them (defined as purposefulness). When the goal is reached partially, the action is also partially effective and, when the

goal is not achieved, the action is not efficacious, therefore, the effectiveness can be characterized by a different intensity (Chodak et al., 2019).

Taking into consideration only the users presence on social media pages is not a sufficient indicator for marketing communications. Its marketing communication effectiveness should rather relate to what the users pay attention to. Assessing the effectiveness of marketing messages is crucial in many areas of communication research, from campaign design to theory testing. Detailed evaluation is very expensive in terms of time, financial as well as human resources but, at the same time, it is necessary to avoid future expenditures of campaign funds on weak messages (Kim and Cappella, 2019). The effectiveness measure is also connected with the area of social media usage. For example, Nawaz et al. (2017) analysed the effectiveness in healthcare, and Beshears (2017), in police. Kusumasondjaja (2018) analysed the roles of message appeals and orientation on social media brand communication effectiveness. Baruah (2012) pointed out the important feature of social media communication, namely instant messaging has created another method of interaction, firstly, the length of messages is shorter and the style of the interaction is more conversational.

Peters et al. 2013 distinguish four dimensions of social media analysis: motives, content, network structure, and social roles and interactions. In that perspective, content has three distinct aspects: quality (e.g. interactivity, vividness, education, entertainment, information), valence (e.g. emotions, tonality, rating variance), and volume (counts and volumes). Since the purpose of the presented experiment was to measure the difference between the interaction patterns of FB users, the proposed metrics should focus on that area. It is also worth to mention that, according to Kim et al. (2019), effectiveness is the third most popular area in digital marketing communication research.

2.2. Experimenting on Social Media in Real Business Environment

The experiment, whose results are described in this article, was conducted in a real business environment. Apart from the interesting results, there is also another scientific problem to be discussed - how to plan and carry out the experiments in a real business social media environment. The theory about experiment design is very wide, e.g. (Montgomery, 2017; Emery and Nenarokomov, 1998). There is also literature available about experiment design in real business (Gray, 2019), but there is a research gap in designing experiments in a real social media business environment, like on a Facebook fan page of a real business.

The first problem is well known in the literature that experiments can't be repeated many times, therefore, scientists should conclude from one experiment. Repeating an experiment many times in the same environment is impossible as the social media services change very dynamically. Considering a Facebook fan page – the number of followers may increase/decrease, the algorithms of post positioning may change and the competitors activities may influence the posts order.

It is also hard to design experiments with a control group on the Facebook (as well as Twitter and Instagram) environment, as it is impossible to plan in which configuration and when the users from the control group will see the posts. Another important topic is that the sample, which takes part in the experiment, is not a random sample. Firstly, each business fan page has followers which are interested in specific products of the company. Secondly, the process of gathering the followers usually requires targeted marketing with a selection of users of certain age, sex and interests. Thirdly, the network effect causes the most active Facebook users with a higher number

of connections with other users to influence the experiment results more than those with a few connections.

Another point is that Facebook users can not be aware of taking part in the experiment, otherwise, the reactions of users may be different. There is also a problem of the number of posts (or general marketing messages) which are created in the experiment. Too many posts may discourage the users, but too few may cause the results from the experiment to not be worthy from the scientific point of view – for example, the statistical analysis is impossible.

There are also practical problems which we met in this experiments. The products, which were advertised, should be on constant sale. If there is a longer time between designing, starting and finishing, the experiment for some products may become not available on the market, which distorts the results.

The presented content for different types of posts should have the same form – the experiment designers must be aware that the ceteris paribus condition is met. This condition is important if we want to measure the influence of one factor on another without influence of other factors like quality of product photos, category of products, etc. Therefore, we suggest that the analysed group of products should be homogeneous.

There is also the problem of getting access to an administration panel and databases to analyse the results of experiments. If databases include sensitive data, like customers addresses, the access to the database panel is restricted only to authorized users. This problem can be solved by signing an agreement with the company concerning sensitive data confidentiality. The second solution is an export by the company, excluding sensitive data, from the experiment which is valuable for the researchers. There is also the problem of the duration of the experiment. In a social media environment, where reactions from the audience and shares of posts influence the overall marketing effect, there is a need to wait with finishing the experiment. On the other hand, too long of a duration for the experiment may cause that additional external factors will blur the results. From our experience, a few days (less than 5) is too short a period to analyse Facebook reactions, therefore, we propose the optimum social media experiment duration to be one week to a maximum of two weeks. After that, time results should be gathered and analysed. Gathering the results is also a crucial point. It is advisable to collect data automatically using dedicated software, however, in some cases, data can be collected manually.

3. Experiment Design, Method and Metrics

3.1. Experiment Structure and Design

The experiment was designed and conducted in collaboration with a Polish e-commerce store, that sells various board games, books, films and other products. The name of the company is not given due to the non-disclosure agreement and is simply called "E-Store" hereafter. Facebook (FB) page is one of the two advertising channels, the other being Google Ads, used by the E-Store for reaching out to customers. E-Store uses different types of posts and content on their FB page to inform customers about various products and novelties available at their store. FB is a two-way medium of communication, hence, it proves beneficial for the E-Store to obtain direct feedback from actual and prospective customers (**?**). This feedback is vital to understand the needs and opinions of the customers about the range of products available on the E-Store. The

E-Store also uses the FB fan page to disseminate special discount coupons, spread information about promotions and organize competitions with prizes for customers, which has been found to be effective (Radzi et al., 2018).

The structure of the experiment was adapted from a previous study in the literature, that investigated the effectiveness of marketing communications for various types of promotional content such as graphics, videos, photo album and text (Chodak et al., 2019). We used the E-Store's FB business page, to run the experiment, which enabled us to gather real-time empirical data from the engagement and actions of actual customers. During the course of the experiment, no other social media channels were active, apart from the E-Store's FB page on which the experiment was conducted. The owner of the store randomly selected 24 books (P1-P24), which were similar in type and market ratings, out of numerous books available on from the E-Store. For each book, we created four posts (A1-A4) consisting of the weblink to the book's details and buying option on the E-Store's website with a short one line caption. The position of the link was changed in each type of post, as shown in Table 1.

Table 1: Four types of posts, based on position of the link, used for each book in the experiment

Type	**Structure**	**Description**
A1	Link then Text	In the caption, the link was placed first and then the text
A2	Text then Link	In the caption, the link was placed after the text
A3	Text Link Text	In the caption, the link was sandwiched between the text.
A4	Text, Link in Comment	In the caption, only text was placed with the preview image. The link was placed in the post as a comment.

96 posts, in total, were published over 4 days at an interval of one hour between each post; as shown in Table A.5. The posts were scheduled to be published using the FB's publishing tool, which enabled us to control the exact time of posting. The time for publishing the posts for each book title was the same each day and only the type of post changed. For example: for the book title P1, the time of posting was 00:00, and the post types were A1, A2, A3 & A4 on day 1, day 2, day 3 & day 4, respectively. Each post underwent organic promotion, without any interference from the authors, for 10 days. There were no posts on the E-Store's FB, since 24 hours before the beginning of the experiment and also after the posting ended on day 4; all the observations were recorded on day 14. This was done to ensure that no other campaign had influence on the reactions, clicks or sales of the 24 book titles included in the experiment. Observations were recorded exactly 240 hours after each post was published, as shown by "O.Post" in Table A.5. The design of the experiment was such that there were only two explanatory variables, type of post and time of the post, which would result in a difference in performance of the post.

3.2. Methods

To analyse the effect of these two variables, we used the metrics adapted from Chodak et al. (2019), which were defined based on the typical measurements and the dimension of social media

content analysis. These metrics focus mainly on the volume, with less focus on the quality of content. For this particular experiment, this doesn't create a bias, as all the products (in this case books) were of similar type and were best sellers in the market. Focus on volume also omits the valence dimension, as positive endorsement instead of rating is more of a basis for propagation of content on FB. Other negative reactions such as, hide post, hide all posts, report as spam and unlike page, are possible but we did not observe any such reactions in our experiment. Another important reason to use these metrics is because these volume related measures, although easiest to gather and analyse, can be treated as indicators of quality. The following variables were defined for the experiment in order to adapt the metrics and show the most effective way of placing weblinks on FB posts for organic promotion. For each advertised book title t (t = {P1, P2....P24)} and post type z (z = {A1, A2, A3, A4}) the following variables were defined:

- $\mathbf{R_t(z)}$ – the number of FB users reached by a particular post type "z", of a particular book title "t", respectively, in the experiment.
- $\mathbf{R_t}$ - the total number of FB users reached (through all four post types), by a particular book title "t", in the experiment.
- $\mathbf{L_t(z)}$ – the number of reactions (in our case only Likes, Comments and Shares) by FB users on a particular post type "z", of a particular book title "t", respectively, in the experiment.
- $\mathbf{L_t}$ - the total number of reactions (on all four post types) by FB users, on a particular book title "t", in the experiment.
- $\mathbf{C_t(z)}$ – the number of clicks by FB users that were recorded on a particular type "z", of a particular book title "t", respectively, in the experiment.
- $\mathbf{C_t}$ - the total clicks (on all four post types) by FB users, on a particular book title "t", in the experiment.
- $\mathbf{T}_post$ – the particular time of the day, when the posts of a particular book title "t", was published.
- $\mathbf{S_t(z)}$ - total sales of a particular book title "t", through a particular post type "z", in the experiment.
- $\mathbf{S_t}$ - total sales of a particular book title "t" (through all four post types) in the experiment.

The following are the metrics that have been analyzed in this study. The proposed metrics are mutually comparable and analyzed further. For instance, it could be a case that a campaign is attractive but not persuasive or neither persuasive nor effective; a campaign could be less intense but more effective; content type could be persuasive but not attractive and so on.

- Metrics related to goal attainment that focus on conversion rate:

  - **Effectiveness of the campaign ($\mathbf{E}_t$)**, related to the conversion rate which is compared between the book titles advertised.

$$E_t = \frac{S_t}{C_t} \tag{1}$$

  - **Effectiveness of the post type ($\mathbf{E}_t(\mathbf{z})$)**, z = {A1, A2, A3, A4}, mutually compared.

$$E_t(z) = \frac{S_t(z)}{C_t(z)} \tag{2}$$

- Metrics related to content valence, which describes a post's attractiveness and the users' willingness to engage (like, comment or share):

  - **Attractiveness of the campaign ($\mathbf{A}_t$)**, compared between campaigns.

$$A_t = \frac{L_t}{R_t} \tag{3}$$

  - **Attractiveness of the content type ($\mathbf{A}_t(\mathbf{z})$)**, z = {A1, A2, A3, A4}, mutually compared.

$$A_t(z) = \frac{L_t(z)}{R_t(z)} \tag{4}$$

- Metrics related to quality of the content, which illustrate the power of the message conveyed through the content to get the desired action (link click):

  - **Campaign's persuasiveness ($\mathbf{P}_t$)**, compared between campaigns.

$$P_t = \frac{C_t}{R_t} \tag{5}$$

  - **Persuasiveness of the content type ($\mathbf{P}_t(\mathbf{z})$)**, z = {A1, A2, A3, A4}, mutually compared.

$$P_t(z) = \frac{C_t(z)}{R_t(z)} \tag{6}$$

- Metric related to the volume of content concerned with its publication dynamics:

  - **Intensity of the campaign ($\mathbf{I}_t$)**, compared between time frames or between campaigns.

$$I_t = \frac{\Delta R_t}{\Delta T} \tag{7}$$

  - **Intensity of the type of post ($\mathbf{I}_t(\mathbf{z})$)**, z = {A1, A2, A3, A4}, compared between time frames or between campaigns.

$$I_t(z) = \frac{\Delta R_t(z)}{\Delta T(z)} \tag{8}$$

– **Intensity of campaign's attractiveness ($\mathbf{I}_t^A$)**, compared between time frames or between campaigns.

$$I_t^A = \frac{\Delta L_t}{\Delta T} \tag{9}$$

– **Intensity of type of post's attractiveness ($\mathbf{I}_t^A(\mathbf{z})$)**, z = {A1, A2, A3, A4}, compared between time frames or between campaigns.

$$I_t^A(z) = \frac{\Delta L_t(z)}{\Delta T(z)} \tag{10}$$

– **Intensity of campaign's persuasiveness ($\mathbf{I}_t^P$)**, compared between time frames or between campaigns.

$$I_t^P = \frac{\Delta C_t}{\Delta T} \tag{11}$$

– **Intensity of type of post's persuasiveness ($\mathbf{I}_t^P(\mathbf{z})$)**, z = {A1, A2, A3, A4}, compared between time frames or between campaigns.

$$I_t^P(z) = \frac{\Delta C_t(z)}{\Delta T(z)} \tag{12}$$

4. Experiment Results and Observations

4.1. Observed data and initial data analysis

Recorded data before initiating the experiment shows that the E-Store's FB page had 5032 fans which increased to 5045, as per the post experiment data records. Cumulatively, the E-Store sold 101 books during the experiment. The day-wise sales record of each book is presented in Table 2. The book P12, ran out of stock and was unavailable after its final unit sale on the 3rd day. The stock of each book was verified before initiating the experiment but, for P12, there was a bulk purchase of 11 units on Day 1, which caused this unavailability.

Throughout the campaign, in this experiment, the E-Store reached out to 17,546 FB users,which resulted in 664 reactions and 258 link clicks. The largest overall reach (1,284 FB users) and link clicks (26) were found to be for the book title (P21), which had it's posts at 8 pm in the evening. The maximum reactions, 97, were observed on the post at 7 am in the morning, which was of book title (P8). The Figure 1, shows the overall reach, reactions and clicks on the posts of each book title at the end of the experiment.

In terms of the type of posts, A4 contributed to an overall 44.48% reach, 48.34% reactions and 62.02% clicks in the campaign. This showed that it was the most dominant type of post out of the four used in this experiment. To further see the effect of including the A4 type of post in the campaign, we calculated the mean and standard deviation (SD) of reach, reactions and clicks for each book title. For each title, two means and SD were calculated. First, which included all the four types of posts (A1-A4) for each book title and second, for only three types (A1-A3), excluding the dominant A4 type of posts. The calculations in Table A.6 show that, for each individual book

Table 2: Day-wise sales recorded for each book during the experiment

Book/Day	1	2	3	4	5	6	7	8	9	10	11	12	13	14	Units Sold	E_t
P1		1			2										3	0.6000
P2															0	0.0000
P3									1		1			2	2	2.000
P4				2		1	1			1				3	5	0.5000
P5				1	1		1			1	1				5	0.6250
P6		1			2			1	4						8	8.0000
P7	1				1			1	3	7	2		1		15	1.1429
P8		1		1								1		1	2	0.1905
P9					1										1	0.1111
P10															0	0.0000
P11					1	6				1		1	1	1	8	1.2222
P12[*]	11		1	Out of Stock											12	N.A.[+]
P13															0	0.0000
P14															0	0.0000
P15										2					2	0.6667
P16			1						2						3	0.1765
P17									1						1	0.0526
P18															0	0.0000
P19								3		1					4	2.0000
P20					1			4							5	0.7143
P21															0	0.0000
P22					1										1	0.0833
P23				1						1					2	0.2000
P24	3			1		2	1				1	1			8	0.7857
Total number of books sold during the campaign															**101**	

[*] *This title was out of stock in the E-store, after the sale of its final unit on Day 3.*

[+] *E^t(P12) is not calculated as the product was not available in store for the whole duration of the experiment .*

title, the inclusion of post type A4 increased the mean of reach, reactions and clicks. There were only four cases found where, the mean of the reactions, was slightly higher when post A4 was not included. This was for the means of reactions of P1, P13, P20 and P22, where the difference between the means was 0.08, 0.25, 0.08 and 0.42, respectively. There was no direct explanation of these two exceptions, as both the means of reach and number of clicks were higher for these titles when we included the A4 type of posts. According to us, it might have something to do with the time duration between the time of posting and the first reaction on these posts, but we could not ascertain it for sure. From the data in Table A.6, we observed that more reach did not necessarily mean more reactions or clicks. Hence, we carried out simple linear regression, with the dependent variable as the overall reach (R_t) of each book title (where all four posts were included) and the regressors as the total reactions (L_t) and clicks (C_t). We found that reactions (L_t) had a statistically significant and positive relationship with reach (R_t), whereas the relationship of clicks was statistically insignificant. We repeated the regression by excluding the post type A4 and obtained similar results. Results of both the regressions are shown in Table 3. Regression analysis, in both cases, showed that more reach of a post resulted in more interactions but did not

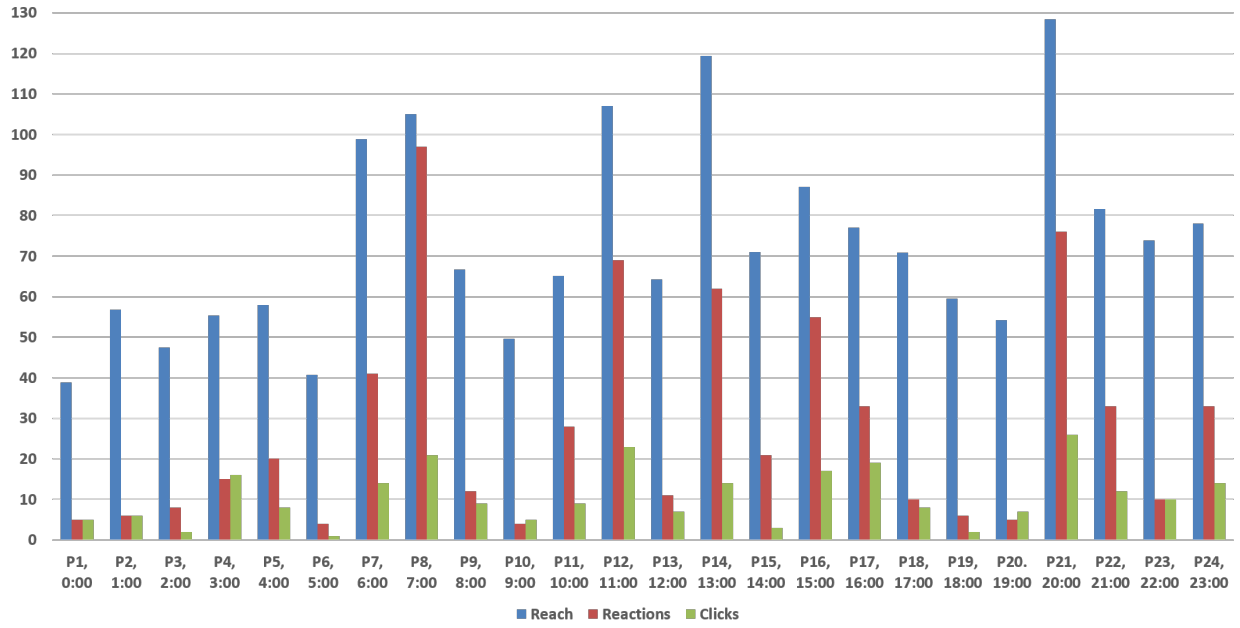

Figure 1: Combined reach, reactions and clicks of posts for each book, during the lifetime of the experiment
Note: The value of "Reach" is scaled to 1/10th, in this graph, so as to improve visibility of the reach and reactions bars.

necessarily transform into more link clicks.

Table 3: Results of simple linear regression with dependent variable as R_t and regressors as L_t and C_t (all four types of posts considered)

	Coefficient	**Std. Error**	***t*-ratio**	**p-value**
For Dependent variable $\mathbf{R}_t$ and Regressors as L_t & C_t (all four types of posts considered)				
const	470.597	43.4852	10.82	0.0000
$\mathbf{L}_t$	6.47050	1.63771	3.951	0.0007
$\mathbf{C}_t$	7.57849	6.22431	1.218	0.2369
For Dependent variable $\mathbf{R}_t$ and Regressors as L_t & C_t (A4 type posts excluded)				
const	260.407	22.3275	11.66	0.0000
$\mathbf{L}_{t(withoutA4)}$	5.07253	2.31923	2.187	0.0402
$\mathbf{C}_{t(withoutA4)}$	17.8711	9.12456	1.959	0.0636

We also performed linear regressions with the dependent variables as reach of each type of post (R_t(A1)... R_t(A4)) and their corresponding reactions and link clicks. The results of these regressions are shown in Table 4. Individually, for post type A1, A2 & A3, total reach was positively

and significantly related with both their corresponding reactions and link clicks. This is interesting because, in terms of their collective sum, there was no significant relation of the reach with link clicks. For post type A4, only a significant relation between reach and reactions was found.

Table 4: Results of simple linear regression with dependent variables as R_t(A1), R_t(A2), R_t(A3) & R_t(A4), and regressors as their corresponding $L_t(A_n)$ and $C_t(A_n)$

	Coefficient	**Std. Error**	***t*-ratio**	**p-value**
For Dependent variable $\mathbf{R_t(A1)}$ and Regressors as L_t(A1) & C_t(A1)				
const	89.5194	10.1230	8.843	0.0000
$\mathbf{L_t(A1)}$	7.22855	1.51810	4.762	0.0001
$\mathbf{C_t(A1)}$	16.8512	5.03877	3.344	0.0031
For Dependent variable R_t(A2) and Regressors as L_t(A2) & C_t(A2)				
const	85.9984	10.0510	8.556	0.0000
$\mathbf{L_t(A2)}$	5.27508	2.11231	2.497	0.0209
$\mathbf{C_t(A2)}$	17.0753	6.67204	2.559	0.0183
For Dependent variable R_t(A3) and Regressors as L_t(A3) & C_t(A3)				
const	70.7781	9.38505	7.542	0.0000
$\mathbf{L_t(A3)}$	5.63590	2.10307	2.680	0.0140
$\mathbf{C_t(A3)}$	19.0862	8.12237	2.350	0.0286
For Dependent variable R_t(A4) and Regressors as L_t(A4) & C_t(A4)				
const	208.237	24.5274	8.490	0.0000
$\mathbf{L_t(A4)}$	5.86555	1.42167	4.126	0.0005
$\mathbf{C_t(A4)}$	5.77798	4.22092	1.369	0.1855

4.2. Performance of the campaign, based on metrics

For all the book tiles and post types, various metrics are defined in sub-section 3.2. The detailed results obtained for each metric are illustrated in the following subsections.

4.2.1. Effectiveness

The effectiveness of the campaign was calculated based on equation 1, where the sale of each particular book title "t" (S_t) was divided by its respective number of clicks (C_t) and is shown in Table 2, along with the sales of each book title. Due to the small number of sales for individual post types, we did not have any conclusive evidence regarding the effectiveness of the post types calculated based on equation 2, hence, their details are not included in the article. The effectiveness of the campaign (E_t) gives us two main results. First, it shows that, even though the collective reach

(of all four book titles) of a certain book title was less as compared to some other posts, it can have higher E_t. For example, let us consider the sales of three book titles, P7, P11 and P19. They had sales of, 15, 8 and 4, respectively, whereas their E_t were 1.1429, 1.2222 and 2.000, respectively. From this, we can deduce the second factor, which was the time of posting. As the book titles were all from a similar category, all being best sellers (same level of quality based on market opinion) and all having the four types of post, the time of posting can be one of the measurable factors that differs between them. Hence, E_t can also be used to determine the best time of posting in case the objective of the campaign is to be the most effective. In the current experiment, the best time of posting in descending order is, 5 am, 2 am or 6 pm, 10 am and so on. These times also show another important detail when compared with insights provided by Facebook to the administrators of a Facebook page. The number of users online at a certain time, shown under the "Posts" section on "Insights", did not seem to be significant for the effectiveness of the campaign. According to the insights for the E-Store, the maximum users were online at 8 pm and 9 pm, which were not the recommended times of posting based on the calculation in this study.

4.2.2. Attractiveness

The attractiveness of the campaign of each book title was calculated based on equation 3, and the attractiveness of each post for each book title was calculated based on equation 4. The obtained results have been plotted on the graph in Figure 2. Attractiveness of the campaign was the highest for book title P8, corresponding to 7 am as the time of posting. Followed by (in decreasing order of campaign attractiveness) P12 (11 am), P16 (3 pm) and P21 (8 pm). On average, the post type A4 was the most attractive (average $A_t(A4) = 0.0348$), with the rest of the three types with similar attractiveness scores. Averages of $A_t(A1)$, $A_t(A2)$ & $A_t(A3)$, were 0.0253, 0.0277 & 0.0281, respectively. Two of the four cases (P13 and P22), where the means of reactions was higher when post type A4 was excluded, can be related to this remotely. Both these book titles had their posts after the highly attractive P12 and P21 but this effect can also be by chance, hence, we emphasize that we did not have any clear evidence of these exceptions. Individually, the A4 type of post was most attractive for 9 book titles, mostly between the posting times of 3 am to 5 pm. The rest of the three posts were most attractive for 5 book titles each and scattered during the day. We also observe a steep increase and decrease in the attractiveness of all the campaign as well as the post types, in a very similar pattern. From this, we can conclude that the posting made between 12 am to 2 am, around 5 am, 10 am, 5 pm to 7 pm, would be less attractive to the E-Store's audience. While, the peaks in the graph, in Figure 2, show the times where posts can be highly attractive to their audience and more reactions can be obtained.

4.2.3. Persuasiveness

Persuasiveness of the campaign and of each post type, for each book title, were calculated based on equations 5 and 6, respectively. The results of the calculations are presented in the Figure 3. P04, P17, P12, and P21 had the most persuasiveness of the campaign (in decreasing order), while P06 had the least. The pattern of peaks observed for attractiveness was also observed here. The A4 type of post was found to be the most persuasive for 15 out of the 24 book titles in the experiment. Among the average of the persuasiveness of all types of posts, A4's persuasiveness was more than double of A2, A3 or A4, individually. This shows that users were more likely to

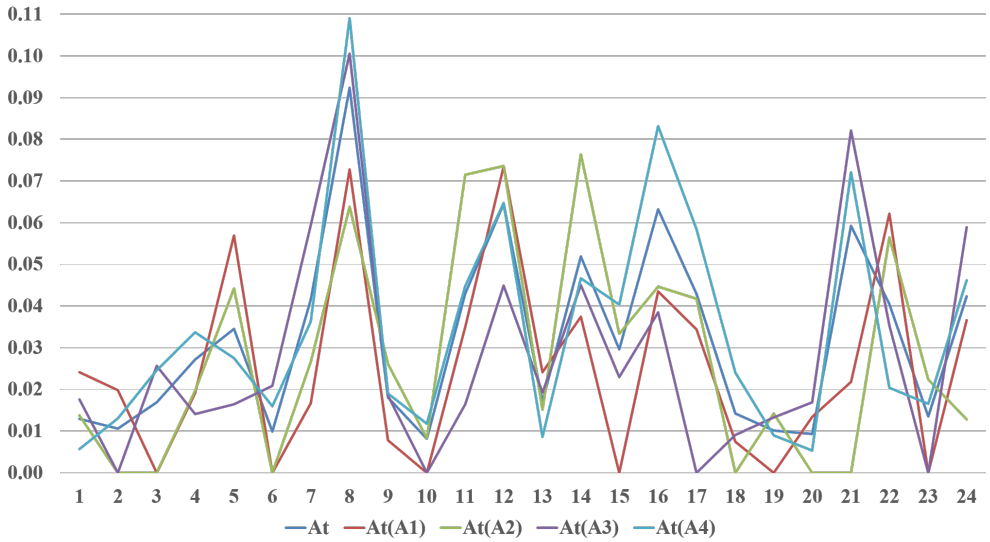

Figure 2: Attractiveness of the campaign and each post type, for respective book titles.

Note: At = Attractiveness of the campaign of respective book title (A_t), At(A1)..At(A4) = Attractiveness of respective post type for the respective book titles ($A_t(A1)..A_t(A4)$)

click on the links with the A4 type of post. The average persuasiveness of A3 was found to be lower than A1, even though A3 was found to the most attractive for 6 book titles, whereas A1 was found for 2. The A2 type of posts were found to be the least persuasive.

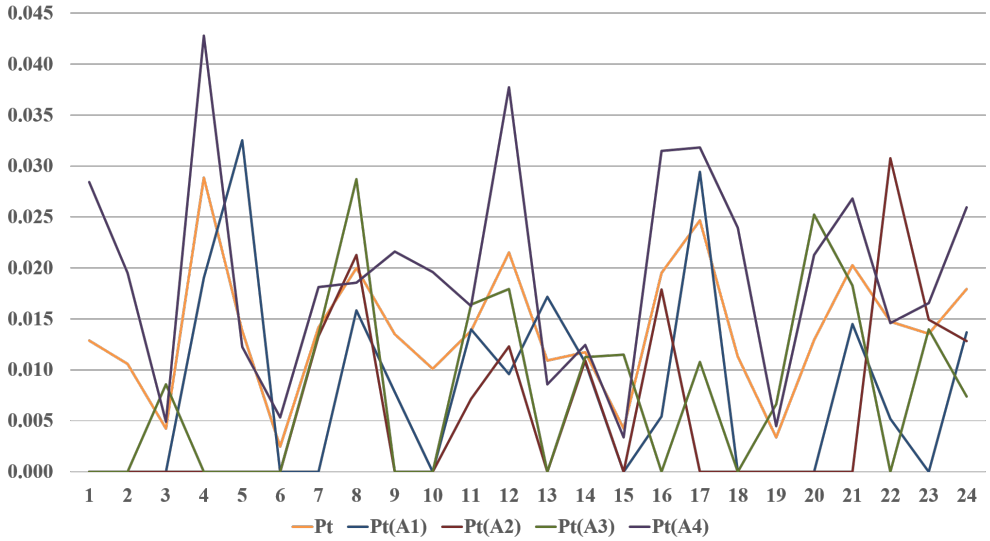

Figure 3: Persuasiveness of the campaign and each post type, for respective book titles.

Note: Pt = Persuasiveness of the campaign of respective book title (P_t), Pt(A1)..Pt(A4) = Attractiveness of respective post type for the respective book titles ($P_t(A1)..P_t(A4)$)

4.2.4. Intensity

The intensity of the campaign, for each book title, was calculated using the equation 1 and the intensity for each type of post was calculated using equation 8. It is very important to ensure that campaigns are not highly intensive because it can lead to flooding the news feed of the user and may lead to negative reactions. Results presented in the figure 4 show that, overall intensity of the campaign, ranged between 1.2468 for P1 and 4.11 for P21. For intensity as well, we saw a similar peak of patterns in persuasiveness and attractiveness, but here, for the intensity of the campaign, it was observed as an upward trend. This is because there were more users online on Facebook during the later part of the day. For different types of posts, it can be seen that the intensity of post type A4 was the highest as compared to the other three types posts apart from two instances, around 6 am and 12 noon. At these two times, the A1 type of post had more intensity. Know the intensity of the campaign and a certain post time can be fruitful in determining the time interval between posting. This would allow the performance of the posted content to achieve its maximum possible efficiency.

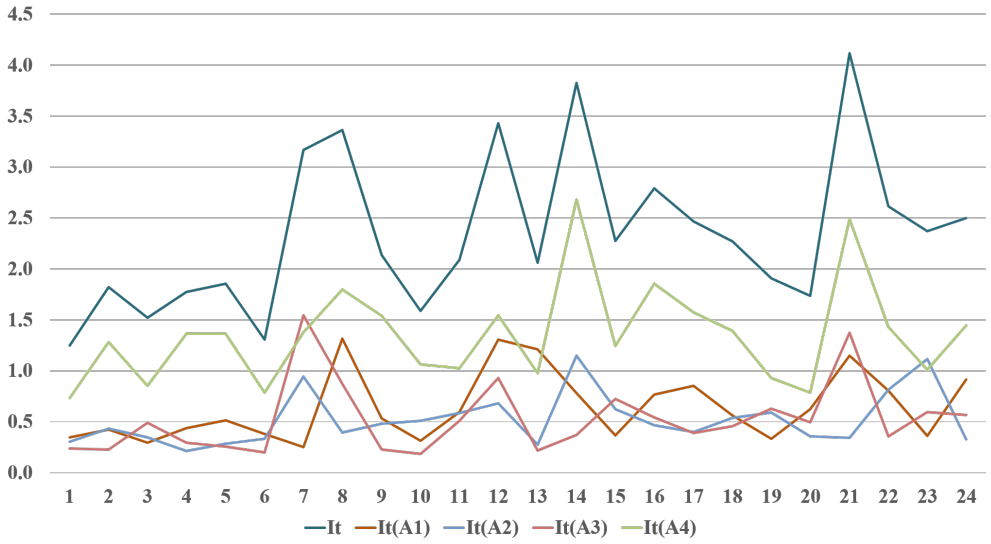

Figure 4: Intensity of the campaign and each post type, for respective book titles.
Note: It = Intensity of the campaign of respective book title (I_t), It(A1)..It(A4) = Intensity of respective post type for the respective book titles ($I_t(A1)..I_t(A4)$)

For the intensity of the campaign and post types, two additional metrics, intensity of attractiveness and intensity of persuasiveness, were also calculated using the equations 9, 10, 11 and 12, respectively. The results for intensity of attractiveness for the campaign and for each type of posts of each book title are presented in Figure 5. Here again, we observed a similar peak pattern and that the post type A4 was the most dominant. Higher intensity of attractiveness, for the campaign, was observed for the posts made at 7 am, 11 am, 1 pm, 3 pm and 8 pm. These times also corresponded to the higher intensity of attractiveness of post type A4.

The results for intensity of persuasiveness of the campaign and the post types, for each book title, is shown in figure 6. The results for intensity of persuasiveness is quite similar to that of

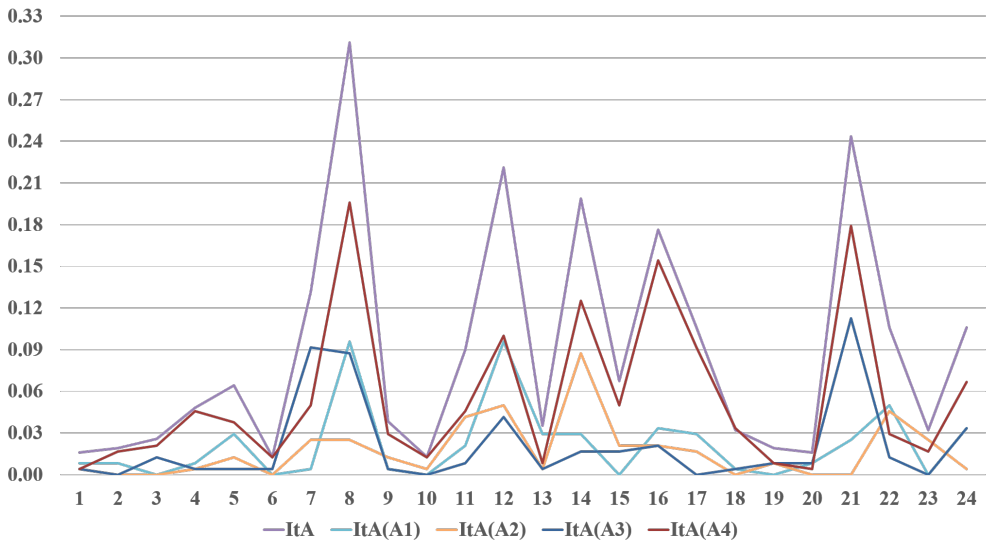

Figure 5: Intensity of attractiveness of the campaign and each post type, for respective book titles.
Note: ItA = Intensity of Attractiveness of the campaign of respective book title (I_t^A), It(A1)..It(A4) = Intensity of Attractiveness of respective post type for the respective book titles ($I_t^A(A1)..I_t^A(A4)$)

the intensity of attractiveness of the campaign. The post type A4 had the highest intensity of persuasiveness, while the rest of the post types were more or less similar. Comparing the figures 4, 5 and 6, it is evident that the intensity of attractiveness and intensity of persuasiveness, for both the campaign, as well as the type of posts, were directly affected by the intensity of the campaign and of the post types, respectively. The desired combination had a lesser intensity but higher intensity of attractiveness and persuasiveness. Through these results, for different times of the day, different types of posts can be selected or the campaign can be designed to achieve the desired combination.

5. Conclusion and Discussion

The fabric of social media marketing is very dynamic and keeps marketing managers on their toes to help the business progress in competitive markets. There are numerous challenges, which scientists have to face, in order to design an efficient experiment for determining the effectiveness of marketing communications on social media in a real business environment. The experiment dealt with four specific type of posts, which dealt with different possible placements of links for organic promotion on a company's FB page. We found that the most lucrative post type was A4, where the link was posted as a comment on the post and the preview of the book title, along with a short textual caption, formed the post. This accounted for maximum reach, reactions, as well as clicks on the post. Our analysis showed that while, for other post types (A1, A2 A3) the number of clicks depended upon the reach of the posts while, for post type A4, it did not. This made the link clicks though the A4 types of posts unpredictable but, for all cases, A4 accounted for the most link clicks than any other type of post. Hence, it would be the most effective option for organic promotions of a web link on FB. According to us, this could be because of one or both of the following reasons. First, the FB algorithm rates the organic appearance of posts with web

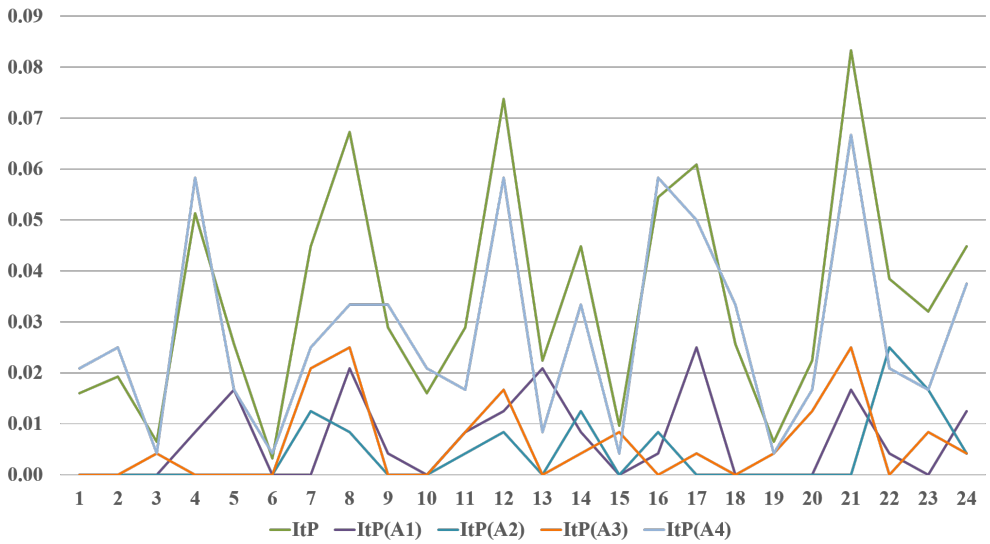

Figure 6: Intensity of Persuasiveness of the campaign and each post type, for respective book titles.
Note: ItP = Intensity of Persuasiveness of the campaign of respective book title (I_t^P), ItP(A1)..ItP(A4) = Attractiveness of respective post type for the respective book titles ($I_t^P(A1)..I_t^P(A4)$)

links (A1, A2 & A3) lower than the posts which do not have a web link (A4, as it's link is in the comments). Secondly, the link posted in a comment, along with the post, could be treated as an immediate reaction by the FB algorithm, resulting in a higher ranking or probability of the post to be displayed to other users. The first reason makes sense from FB's point of view also, as any user or business trying to promote web links on FB do so for drawing customers from FB to their website, which generates revenues for them. Hence, the links are more valuable to marketers, so lower organic dissemination means that marketers would invest in paid promotions of the link.

The metrics defined and analysed for the different post types and book titles, give various pieces of information. These metrics would be useful for scientists, as well as managers, to calculate the effectiveness of a campaign. Firstly, based on the aim of a campaign, the time of posting can be decided through the 24 hour graphs (Figure 2 - 6). We emphasize here that these results could and would vary for each business page, based on their geographic location, location of their audiences, exact time of posting, the text in caption, segment of the market and so on. Hence, we recommend that, for getting personalized times and results, a similar experiment can be run and the observations can be compared with the ones in this study. Secondly, the peak and valley pattern of the graphs for various metrics is similar. Observing the time interval between the peak points in the graphs, gives information of the minimum duration that should be maintained the between posts. The schedule of posting, for a particular experiment or campaign, can be synchronized to the peaks in the graphs, which should result in a more uniform horizontal lined graph. A perfectly horizontal line would mean that each post is performing to its utmost efficiency and the interval between the post is good. Another interesting result that we obtained by the impact of the number of users online, shown in FB insights, did not have any significant impact on the results of the metrics. There was an effect in the intensity metric, which depends on the number of users online

but, for the rest, there was no uniform effect observed.

6. Limitations and Future Scope of Research

The experiment designed in this study provides a basis for the theoretical, as well as practical research experiments, which overcomes a number of challenges discussed in the literature. It opens new doors for research on the effectiveness of marketing communication on social media and also real market experiments, giving valuable insights to the marketers. In the present state, the study has some limitations. The experiment was designed and conducted for a specific online store with specific products. Due to numerous factors that would define the outcome of the results on social media, this experiment can be run in different geographical locations, for different market segments, on different social media platforms, and so on. Although, we expect the results, in a certain market segment in a country / region, to not differ too much, it would be interesting to replicate this experiment for another E-Store with similar products, audience and segment.

Appendix A.

Table A.5: Schedule of publishing the posts and recording the observations

Day 1	**22 November 2019**																							
Time	**00**	**01**	**02**	**03**	**04**	**05**	**06**	**07**	**08**	**09**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**
P. Code	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	P14	P15	P16	P17	P18	P19	P20	P21	P22	P23	P24
T. Post	A1	A2	A3	A4	A1	A2	A3	A4	A1	A2	A3	A4	A1	A2	A3	A4	A1	A2	A3	A4	A1	A2	A3	A4
Day 2	**23 November 2019**																							
Time	**00**	**01**	**02**	**03**	**04**	**05**	**06**	**07**	**08**	**09**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**
P. Code	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	P14	P15	P16	P17	P18	P19	P20	P21	P22	P23	P24
T. Post	A2	A3	A4	A1	A2	A3	A4	A1	A2	A3	A4	A1	A2	A3	A4	A1	A2	A3	A4	A1	A2	A3	A4	A1
Day 3	**24 November 2019**																							
Time	**00**	**01**	**02**	**03**	**04**	**05**	**06**	**07**	**08**	**09**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**
P. Code	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	P14	P15	P16	P17	P18	P19	P20	P21	P22	P23	P24
T. Post	A3	A4	A1	A2	A3	A4	A1	A2	A3	A4	A1	A2	A3	A4	A1	A2	A3	A4	A1	A2	A3	A4	A1	A2
Day 4	**25 November 2019**																							
Time	**00**	**01**	**02**	**03**	**04**	**05**	**06**	**07**	**08**	**09**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**
P. Code	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	P14	P15	P16	P17	P18	P19	P20	P21	P22	P23	P24
T. Post	A4	A1	A2	A3	A4	A1	A2	A3	A4	A1	A2	A3	A4	A1	A2	A3	A4	A1	A2	A3	A4	A1	A2	A3
Posts are allowed to organically spread from 26 November 2019 to 1 December 2019 (Day 5 to Day 10)																								
Day 11	**2 December 2019**																							
Time	**00**	**01**	**02**	**03**	**04**	**05**	**06**	**07**	**08**	**09**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**
P. Code	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	P14	P15	P16	P17	P18	P19	P20	P21	P22	P23	P24
O. Post	A1	A2	A3	A4	A1	A2	A3	A4	A1	A2	A3	A4	A1	A2	A3	A4	A1	A2	A3	A4	A1	A2	A3	A4
Day 12	**3 December 2019**																							
Time	**00**	**01**	**02**	**03**	**04**	**05**	**06**	**07**	**08**	**09**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**
P. Code	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	P14	P15	P16	P17	P18	P19	P20	P21	P22	P23	P24
O. Post	A2	A3	A4	A1	A2	A3	A4	A1	A2	A3	A4	A1	A2	A3	A4	A1	A2	A3	A4	A1	A2	A3	A4	A1
Day 13	**4 December 2019**																							
Time	**00**	**01**	**02**	**03**	**04**	**05**	**06**	**07**	**08**	**09**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**
P. Code	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	P14	P15	P16	P17	P18	P19	P20	P21	P22	P23	P24
O. Post	A3	A4	A1	A2	A3	A4	A1	A2	A3	A4	A1	A2	A3	A4	A1	A2	A3	A4	A1	A2	A3	A4	A1	A2
Day 14	**5 December 2019**																							
Time	**00**	**01**	**02**	**03**	**04**	**05**	**06**	**07**	**08**	**09**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**
P. Code	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	P14	P15	P16	P17	P18	P19	P20	P21	P22	P23	P24
O. Post	A4	A1	A2	A3	A4	A1	A2	A3	A4	A1	A2	A3	A4	A1	A2	A3	A4	A1	A2	A3	A4	A1	A2	A3

Note: P. Code = Product Code; T. Post = Type of Post; O. Post = Observations recorded for the type of post.

Table A.6: Reach, reaction and clicks, along with their mean and standard deviation (SD) among the four types of posts, for each book title

	Reach						Reactions						Clicks					
Title	$(R_t)^1$	$(R_t)^2$	**Mean**^{1}	**Mean**^{2}	**SD**^{1}	**SD**^{2}	$(L_t)^1$	$(L_t)^2$	**Mean**^{1}	**Mean**^{2}	**SD**^{1}	**SD**^{2}	$(C_t)^1$	$(C_t)^2$	**Mean**^{1}	**Mean**^{2}	**SD**^{1}	**SD**^{2}
P1	389	213	97.25	71.00	53.58	13.11	5	4	1.25	1.33	0.50	0.58	5	0	1.25	0.00	2.50	0.00
P2	568	260	142.00	86.67	112.92	27.47	6	2	1.50	0.67	1.91	1.15	6	0	1.50	0.00	3.00	0.00
P3	475	271	118.75	90.33	60.08	23.86	8	3	2.00	1.00	2.45	1.73	2	1	0.50	0.33	0.58	0.58
P4	554	227	138.50	75.67	127.63	27.30	15	4	3.75	1.33	4.86	0.58	16	2	4.00	0.67	6.73	1.15
P5	579	252	144.75	84.00	124.62	33.96	20	11	5.00	3.67	3.65	3.06	8	4	2.00	1.33	2.31	2.31
P6	407	219	101.75	73.00	60.32	22.34	4	1	1.00	0.33	1.41	0.58	1	0	0.25	0.00	0.50	0.00
P7	988	657	247.00	219.00	138.85	155.62	41	29	10.25	9.67	9.03	10.97	14	8	3.50	2.67	2.65	2.52
P8	1050	619	262.50	206.33	144.35	111.02	97	50	24.25	16.67	16.96	9.29	21	13	5.25	4.33	2.50	2.08
P9	667	297	166.75	99.00	139.29	39.51	12	5	3.00	1.67	2.83	1.15	9	1	2.25	0.33	3.86	0.58
P10	496	241	124.00	80.33	93.03	39.27	4	1	1.00	0.33	1.41	0.58	5	0	1.25	0.00	2.50	0.00
P11	651	405	162.75	135.00	56.27	11.36	28	17	7.00	5.67	4.24	4.04	9	5	2.25	1.67	1.26	0.58
P12	1070	699	267.50	233.00	92.53	75.50	69	45	17.25	15.00	7.27	7.00	23	9	5.75	3.00	5.56	1.00
P13	643	409	160.75	136.33	119.91	134.13	11	9	2.75	3.00	2.87	3.46	7	5	1.75	1.67	2.36	2.89
P14	1194	551	298.50	183.67	241.91	93.04	62	32	15.50	10.67	12.18	9.07	14	6	3.50	2.00	3.11	1.00
P15	710	412	177.50	137.33	88.13	44.38	21	9	5.25	3.00	4.99	2.65	3	2	0.75	0.67	0.96	1.15
P16	871	426	217.75	142.00	154.56	37.47	55	18	13.75	6.00	15.56	1.73	17	3	4.25	1.00	6.55	1.00
P17	770	393	192.50	131.00	133.40	63.24	33	11	8.25	3.67	9.60	3.51	19	7	4.75	2.33	5.50	3.21
P18	708	374	177.00	124.67	105.21	13.05	10	2	2.50	0.67	3.70	0.58	8	0	2.00	0.00	4.00	0.00
P19	595	372	148.75	124.00	58.61	38.43	6	4	1.50	1.33	1.00	1.15	2	1	0.50	0.33	0.58	0.58
P20	542	354	135.50	118.00	43.93	32.51	5	4	1.25	1.33	0.96	1.15	7	3	1.75	1.00	2.06	1.73
P21	1284	687	321.00	229.00	212.44	130.03	76	33	19.00	11.00	19.75	14.18	26	10	6.50	3.33	6.81	3.06
P22	816	473	204.00	157.67	105.96	62.94	33	26	8.25	8.67	4.11	4.93	12	7	3.00	2.33	2.94	3.21
P23	739	497	184.75	165.67	85.05	93.09	10	6	2.50	2.00	3.00	3.46	10	6	2.50	2.00	1.91	2.00
P24	780	433	195.00	144.33	116.69	70.87	33	17	8.25	5.67	6.13	4.04	14	5	3.50	1.67	3.79	1.15

[1] *For all four types of posts (P1-P4),* [2] *For only three types of posts (P1-P3)*

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