Characterizing Quantitative Measures of User Engagement on Organizational Facebook Pages

Leora Mauda
University of Haifa
lymauda@zahav.net.il

Yoram M Kalman
The Open University of Israel
yoramka@openu.ac.il

Abstract

Social network sites (SNSs) such as Facebook open up novel communication and marketing capabilities by engaging customers and other organizational stakeholders. This study applies insights from Social Information Processing theory to quantitatively characterize five measures of user engagement on SNSs: likes, comments and shares, and two chronemic (time-related) measures of response time and of the rate of comments. We use data collected unobtrusively from 939 posts on Facebook pages of seven organizations to describe the prevalence of the engagement activities, to measure the correlations between them, and to explore how engagement is influenced by post attributes. Findings demonstrate that, similarly to customer engagement behaviors in traditional settings, user engagement behaviors on SNSs too are rich and multifaceted, and are influenced by each organization's unique characteristics. The findings also suggest that engagement with a post can be predicted based on activity levels in the first hour after it is posted.

1. Introduction

One of the key challenges of organizations who maintain pages on social network sites (SNSs) such as Facebook is engaging the users [1]. Research conducted in the last few years links online engagement with important organizational goals such as customer satisfaction and revenue generation [2, 3], and practitioners are constantly seeking tips on increasing user engagement on SNSs (e.g. [4]). Despite this, the literature on user engagement on SNSs is still fragmentary. The goal of this study is to systematically explore and quantitatively characterize several variables associated with user engagement on SNSs.

1.1 What is engagement?

Engagement is used to describe ongoing communication between two or more parties. In business and marketing literature, engagement is usually framed as customer (or consumer) engagement behavior (CEB), or stakeholder engagement, and is defined by van Doorn, et al. [5] as "the customers' behavioral manifestation toward a brand or firm, beyond purchase, resulting from motivational drivers". It can include word-of-mouth, recommendations, assisting other customers, writing a review about a brand [5], etc.

User engagement is also discussed in depth in the computer-mediated communication (CMC) literature, and in this study we combine the insights gained by CMC researchers, with the CEB perspective, to better understand the nature of user engagement in SNSs. CMC researchers focus on the nature of online communication, emphasizing the importance of interactivity, and differentiating between simple reaction, and deeper levels of engagement such as interactive communication [6]. One of the most useful perspectives on user engagement on SNSs is offered by Social Information Processing (SIP) theory [7]. SIP theory demonstrates that online communicators are just as motivated and capable of engaging with each other, as communicators who use "traditional" communication media such as face-to-face communication. SIP-oriented studies have often shown that when we identify and measure the relevant variables, we can demonstrate how online communicators achieve interpersonal communication goals in a manner that is comparable to those achieved in more traditional settings [8]. CMC users adapt to the medium they use, and find ways to communicate and engage given the cues the medium affords. These include both verbal cues, the words of the message, as well as nonverbal cues such as chronemic (time related) cues, emoticons, and more. The cues that are used to convey the nonverbal components of the message in CMC are called CMC cues, and have been defined as "... those modifications of a CMC message that, within a socially shared coding system, modify the meaning of the message while preserving the words

of the message and their sequence" ([9] p.187). CMC cues include cues such as question marks, exclamation marks, use of capital letters, emoticons, letter repetitions, etc. These cues assist in clarifying messages and expressing emotions when traditional nonverbal cues, as in FtF communication, are absent [10]. Another form of CMC cues are chronemic cues. These are nonverbal, time-related cues such as pauses, the time of day, or silence [11], and have been shown to be an important component of CMC (see review in [12]).

In this study we apply the SIP perspective to studying user engagement on SNSs. We study variables that represent user behaviors that are the online manifestations of customer engagement behaviors (CEBs) identified in the literature, and characterize their prevalence and rates, the correlations between them, and how they are influenced by CMC cues in messages (posts) posted by the organizations.

1.2 Customer engagement behaviors on social network sites

Social network sites are a game changer for organizations, offering them new ways to reach and communicate with customers and other stakeholders. Barwise & Meehan [13] recommend incorporating social media as part of organizations' branding process. They emphasize that social media should be used "to gain customer insights rather than to sell", commenting that using social media in organizations can boost brand awareness, trial, and sales, especially when a campaign goes viral. SNSs create a platform for customers to stay engaged by publicly promoting or badmouthing the products that they purchased or the service they have received [14]. CEBs encompass more than purchasing a product or subscribing to a service. These behaviors can include a larger network of actors including other customers, suppliers, workers, and the general public. For firms, such non-transactional behaviors compliment the transactional revenue-generating customer behaviors [15].

The success of Facebook pages is tied not only to variables such as number of likes, shares and comments, but also to actions less visible to outsiders such as viewing photo albums, videos, or clicking on links that are created by users on an organizational Facebook page. Different forms of content contribution on Facebook include posting brief status messages, uploading photos, and writing free text on other members' profiles ("walls"). When private users comment on an organizational post, their comments will also become visible to their Facebook friends. Users may also share a post from an organizational Facebook page to their own wall, or to a friend's wall. All of these actions of content contribution and activity on SNS pages are forms of engagement, and the "holy grail" of organizations is to achieve a significant level of engagement with their Facebook audience [1,3].

2. Research questions

The goal of this study is to characterize quantitative measures of user engagement on SNSs. Previous studies were based on questionnaires, surveys and case studies [e.g. 17-19] and studied the antecedents and consequences of user engagement. They measured engagement using one-dimensional and often subjective measures, and lacked a detailed characterization of the engagement variables used. In this study we ask a more fundamental question about the nature of user engagement by characterizing five variables that were chosen based on the marketing and CMC literature briefly reviewed above. We studied (1) their prevalence (2) the correlations between them, and (3) how these engagement activities are influenced by independent message variables which are likely to influence engagement. We conclude by discussing how these findings are in line with our expectations from engagement variable and how they further our understanding of user engagement on SNSs. In the next paragraph we describe the five variables that were studied and the justification for their choice. We then present the three research questions, and explain the choice of an unobtrusive research methodology.

Five variables were chosen: The number of likes, comments and shares each post received, as well as two time-related (chronemic) variables: TTIC (time to initial comment) and FHCR (first hour comment ratio). The five variables are described in detail in the Method section, below. The first three "classic" variables have been used in many of the previous studies, are prominent and visible when viewing a post on a FB page, and are analogous to traditional forms of CEB: Liking a post might be comparable to a non-committal smile or a nod at something you liked or that you were interested in. Comments may be comparable to expressing an opinion about a brand or an organization, or about their message. Sharing is similar to spreading word-of-mouth about a brand or an organizational message, where the user is suggesting to his or her own circle of friends to engage with a certain message by saying: "it's not enough that I saw something – I think you may gain from seeing it too". The two chronemic variables were inspired by SIP theory's emphasis on chronemic cues, and the two variables that were chosen are analogous to traditional forms of CEB: How quickly an organizational post receives its first comment (TTIC), or the rate of accumulation of comments to a post (FHCR), point to a behavior of

joining others, or crowd behavior that takes place when stakeholders engage in a traditional setting by entering a store, lining up to purchase a product, etc.

The first research question is about the prevalence of the three engagement activities and about the ranges of the two chronemic variables, and it is expected that engagement behaviors will be prevalent, and that the variables that measure them will show extensive variability. Thus:

RQ1: What is the prevalence of likes and comments to, and shares of messages posted by the organizations, and what is the range of the chronemic engagement measures?

The second question is about the correlations between the five engagement variables. Since the five variables are expected to reflect different aspects of user engagement, the expectation is that we will find statistically significant correlations between the five variables, but that the level of correlation will be partial and variable. Thus:

RQ2: What are the correlations between the five engagement variables?

The third question is about the influence of nonverbal message characteristics on the five variables with the expectation that nonverbal post (message) cues will influence user engagement, as described by SIP theory studies which demonstrate the influence of cues on user behavior [7, 16]. Specifically, we expect post type, and length of posts to influence engagement on SNSs as well as the appearance of question marks and exclamation marks [8, 9, 16]. Thus:

RQ3: How do post (message) components influence the five engagement variables?

The research questions were studied using non-reactive (unobtrusive) methods. The majority of studies of engagement on SNSs used reactive methods such as questionnaires and surveys, case-studies or content analysis (e.g. [17, 18, 19, 20]). These methods provide richness and depth that helps us understand engagement on SNSs, but they also have some limitations. Some of the disadvantages of using reactive measures are limited diversity of participants to respondents who were available and willing to participate, introduction of biases, small sample size and more [21]. In order to overcome some of the limitations of previous studies of user engagement in SNSs, we employed an unobtrusive or "non-reactive" research approach.

3. Method

3.1 Procedure

The data collected for this study were extracted from organizational Facebook pages using an application that was developed specifically for this study and that extracts public data from Facebook's Graph API (application programming interface). A Graph API is an interface provided by websites such as Facebook which allows developers to connect to the website's database and read specified information from the database. In our application the parameters that were set were each organization's Facebook page name, and the start date and the end dates of the period for which the application should extract the variables. The variables extracted for each post posted during that period include: the name of the organization, time of day and date each post was posted, and time of day and date of the first comment posted to each post, total number of likes, comments and shares each post received at date of extraction, and the number of comments accumulated every hour for each separate post – over a period of 48 hours. Note that the date range defined the date the posts were posted by the organizations, but the variables collected recorded all activities that accumulated until the date of data collection.

Data were collected from a sample of seven US-based organizations: two non-profit, and five for-profit organizations. The seven organizations are described in the Sample section below. Organizations/brands that appeared on at least two of the following three online ranking brands sites were chosen for the for-profit organizations: "ranking the brands" (www.rankingthebrands.com), MillwardBrown – BrandZ (www.millwardbrown.com/BrandZ/Top_100_Global_Brands.aspx), or from the "Fortune 500" list (money.cnn.com/magazines/fortune/fortune500).

Non-profit organizations were picked from one of the following sites: Forbes 100 top charities (www.forbes.com/top-charities), American Institute for Philanthropy's "Charity Watch"(www.charitywatch.org/toprated.html), or "Charity Navigator" (www.charitynavigator.org).

In order to make sure that the chosen Facebook pages are official, all Facebook pages were accessed from the organization web sites. The data collected include all posts uploaded to the organizational Facebook page by the page administrator for a period of four months, from May 1st to August 31st 2012. Extraction of data took place on December, 2012, so practically all engagement activities on these Facebook pages ended by the time of extraction. We performed data cleaning as there appeared to be a number of corrupted posts with zero comments and unreasonably large amounts of likes and shares. Those posts were discarded, and only posts with at least ten comments were used in the study.

3.2 Sample

The seven organizations included in the study include five for-profit organizations from various industries and two non-profit organizations as follows (numbers in parentheses represent the numbering of the organization in the study): For-profits - automotive (2), department store chain (3), retail (4), alcoholic beverages (6), and women lingerie (7). Non-profits: International human-rights (1), and animal welfare (5). The sample used in the study consisted of 939 posts from the seven organizations. These posts constitute 61% of all posts posted by the page administrators, and 5.16% of all posts extracted from the organizational Facebook pages. Of the 939 posts included in this study 898 posts included text (95.6%), and the types of posts included 'status' with 79 posts (8%), 'link' with 131 posts (14%), 'photo' with 636 posts (68%), 'video' with 66 posts (7%), and 'other' with 27 posts (3%). At the organizational level, the highest proportion of post type is for photos, except for organization 1, where the highest proportion is for post-type: link (55%). Post type is designated by Facebook's API.

Two categories of variables were used in the study: engagement variables that reflect important attributes of user engagement, and post variables that describe the post uploaded to the Facebook page by the organization's administrator. The engagement variables comprise two groups: The three "classic" engagement characteristics often used in Facebook studies - the number of "likes", "comments" and "shares" each post received, as well as two chronemic engagement variables: TTIC (time to initial comment: time, in seconds, between the time the post was posted and the initial (first) response posted to that post), and FHCR (first hour comment ratio). FHCR expresses the initial rate of responses to the post, and is defined as the ratio between the number of responses posted in the first hour divided by the average number of responses to posts of each organization. The higher the ratio the more rapid is the rate of responses. For example, if on average a post on the organization's page receives a total of one-hundred responses, and if a specific post received fifty responses in the first hour, the FHCR of this post is 0.50, and if a post in that same organization, received 300 responses in the first hour, the FHCR is 3.00.

The second category of variables used in this study are post variables: question mark in post (yes/no), exclamation mark in post (yes/no), type of post (status/photo/video/link), text (whether the post included text) (yes/no), and length – number of characters in a post.

3.3 Statistical methods

The study is based on the statistical analyses of unobtrusively collected data describing behaviors of users in organizational Facebook pages, and the characteristics of posts on these pages. Pearson correlation tests were conducted both on the aggregate of posts from all organizations, and for each organization separately. The method used to study the influence of nonverbal post variables on engagement variables was a MANOVA (multiple analyses of variance). The MANOVA was used to ascertain influences of different post variables on engagement variables. We tested the influence of the independent variables of the study: question mark, exclamation mark, post type (status, photo, video, or link), text, length (of post) on the dependent variables: likes, comments, shares, TTIC, and FHCR. Here too, the MANOVA model was used both for the aggregate of posts from all organization, and for each organization separately. Prior to the MANOVA, an Anderson-Darling normality test was conducted, to test the assumption of normal distribution of the residuals of the MANOVA model, following a graphic (qqplot) test of normality. The results of the normality testing validated the assumption of normal distribution. Significant MANOVA models were followed by separate ANOVA (analysis of variance) testing for each dependent variable, measuring the main effect of the independent variables.

4. Results

4.1 Descriptive statistics

The means and standard error of means (SE) (per post) for the five variables were analyzed for the aggregate of posts from all organizations and for each organization separately, and are described in Table 1.

Table 1. Means at the aggregate level, and ranges, for engagement variables. Min and max by organization (org #)

	Mean (SE)	Min (SE) org #	Max (SE) org #
likes	6264(313)	852(144) #1	14,925(1220) #7
shares	732(80)	139(26) #3	1667(210) #5
comments	223(12)	54(7) #1	315(27) #7
TTIC	14,009(8,127)	213(84) #2	52,202(49,551) #4
FHCR	0.36(0.18)	0.20(0.05) #3	0.50(0.07) #6

Mean (SE) length of post was 148(2) characters to a post at the aggregate level, and at the level of organizations, means ranged from 78(4) for organization 6, to 179(8) for organization 1.

4.2 Pearson correlations

The results of the Pearson correlation test between the five engagement variables are presented in Table 2 for the aggregate of posts, and in Table 3 by organization.

Table 2. Pearson correlations for engagement variables, all organizations (N = 939)

	likes	shares	comments	TTIC[a]	FHCR
likes	1.00				
shares	.29***	1.00			
comments	.52***	.24***	1.00		
TTIC[a]	-.02	-.01	-.01	1.00	
FHCR	.20***	.12**	.63***	-.03	1.00

Note. [a] N = 934. * $p < .05$, ** $p < .01$, *** $p < .001$

4.3 MANOVA models

Table 4 summarizes the MANOVA (multivariate analysis of variance) tests performed for the aggregate posts. The bold face represents those post attributes that have been found to have a statistically significant influence on each of the engagement variables. In the tests the dependent variables were: likes, comments, shares, TTIC, FHCR. The post length was a covariate. The independent variables were: text, status, photo, video, link, exclamation mark, and question mark. Post-type: video was excluded from analysis by the model due to insufficient group sample size. For example, in Table 4 the right most column shows that four of the seven post variables influenced FHCR with the exception of post-type: link which was not statistically significant, and post-types: text and status which were excluded due to incomparable data.

Each statistically significant MANOVA model is followed by an ANOVA (analysis of variance) test. ANOVA models are presented by engagement variables as follows:

Comments: more comments were posted when no exclamation marks appeared in the post (M = 255, SD = 430), compared to posts with exclamation marks (M = 196, SD = 326). Also, for each two additional characters added to a post, we observed one less comment posted to a post (t=3.18, p=.001, B = -0.56).

Likes: significantly more likes were added on post-type: photo (M = 8,419, SD = 10,752), than posts with no photos (M = 1,741, SD = 3,406). For length, the estimate of the linear regression was B = -11.84, thus, each added character added to a post, reduced the number of 'likes' by nearly 12 (t = 2.75, p<.01).

Shares: number of shares differed significantly between organizations. However, no other significant influences were found for the number of shares on posts.

FHCR: appearance of question marks in a post, resulted in a higher FHCR score (M = 0.47, SD = 0.73) than posts with no question marks (M = 0.30, SD = 0.42). A reversed effect was found for appearance of exclamation marks in a post; posts with no exclamation marks received a higher FHCR score (M = 0.41, SD = 0.58), compared to posts with exclamation marks (M = 0.31, SD = 0.52). Post-type: status received higher FHCR (M = 0.73, SD = 1.03) than post-types: not status (M = 0.32, SD = 0.47). Another post variable that significantly influenced FHCR score was post-type: photo which received higher FHCR scores (M = 0.38, SD = 0.52) compared to non-photo posts (M = 0.30, SD = 0.61). Finally, the addition of a single character to a post (post variable: length), accounted for a decrease of 1% to the FHCR score (t = 4.41, p<.001, B = -0.001).

TTIC: no significant differences were found between organizations.

Based on the aggregate posts MANOVA results which identified organization as a factor influencing four out of five dependent engagement variables, we proceeded and performed separate MANOVA tests for each organization separately to check for specific engagement patterns in each organization. Detailed results are not presented due to length restrictions. All organizations displayed significant models except for organization 1. The post variables found significant varied between organizations and included the following post variables: post types- status, and photo, appearance of question mark, appearance of exclamation mark, and length of post. All engagement variables were influenced by at least one post variable, although the number of engagement variables that were affected by change in post variables differed between organizations. For example, In organization 7 (Hotelling-Lawley Trace F (5,161) = 5.02, p<.001) number of comments were higher for posts with at least one question mark (F = 10.89, p <.001; M(SD) = 393(400) and M(SD) = 260(275) respectively), this was the same for the FHCR score as well, posts with at least one question mark showed a higher FHCR score (F = 21.27, p <.001; M(SD) = 0.57(0.58) and M(SD) = 0.27(0.30) respectively). Engagement variables likes, comments, shares, and FHCR were all influenced negatively by the post length; the longer the post, the lower the engagement.

Table 3. Pearson correlations for engagement variables (N = 939), by organization

organization (# of posts)	likes-shares	likes-comments	shares-comments	likes-TTIC	shares- TTIC	comments-TTIC	likes – FHCR	shares – FHCR	comments - FHCR	TTIC-FHCR
1	.56	.82	.70	-.27	.02	-.25	.64	.24	.78	-.10
(113)	***	***	***				***	*	***	
2	.93	.58	.59	.17[a]	.25[a]	.73[a]	.57	.54	.88	.37[a]
(132)	***	***	***		**	***	***	***	***	***
3	.52	.46	.24	.44	.22	.59	-.06	-.06	.63	-.02
(110)	***	***	*	***	*	***			***	
4	.79	.53	.31	-.02[b]	-.02[b]	-.02[b]	.16	.05	.71	-.03[b]
(147)	***	***	***						***	
5	.67	.60	.57	-.10[c]	-.07[c]	-.06[c]	.56	.36	.69	-.11[c]
(182)	***	***	***				***	***	***	
6	.62	.33	.16	.00	-.10	.00	.17	.06	.93	-.10
(93)	***	**							***	
7	.93	.68	.67	.01	.02	.03	.40	.34	.80	-.10
(162)	***	***	***				***	***	***	

Notes. * p<.05, ** p<.01, *** p<.001. [a] n=130, [b] n=145, [c] n=181, [d] n=114.

Cell shading represents the strength of the correlation based on the following criteria:

NS | weak: r < .25 | medium: r=.25-.50 | strong: r =.51-.85 | very strong : r > .85

Table 4. MANOVA summary, all organizations

	MANOVA		ANOVA $F(15,1047)$ Engagement Variables				
Variable	*F*	df	likes	comments	shares	TTIC	FHCR
model			**30.89*** **	**8.87*** **	**6.57*** **	0.99	**11.15*** **
organization	**16.79*** **	**(30, 2428)**	**43.45*** **	**7.50*** **	**9.65*** **	0.85	**4.90*** **
length	**4.25*** **	**(5,915)**	**7.59** **	**10.10** **	0.12	0.25	**16.89*** **
type: text			1.82	9.68[a]	0.38	5.34[a]	9.98[a]
type: status			0.01	3.85	0.55	0.95	15.51[a]
type: photo			**14.10*** **	2.42	0.10	1.65	**4.26***
type: link			0.00	0.27	5.12[a]	1.22	0.33
question			2.37	1.86	1.82	0.66	**11.43*** **
exclamation			1.11	**8.53** **	0.72	0.00	**5.06***

Notes. Significant models appear in bold. *F* ratios are Hotelling-Lawley Trace approximation of *F*.
[a] excluded due to incomparable data. * *p*< .05, ** *p*< .01, *** *p*< .001

5. Discussion

5.1 Diverse engagement patterns

The seven organizations in this study represent diverse industries and organizational identities. The answers to RQ1 reveal that the engagement variables are also highly diverse. We begin with the three 'classic' engagement variables: likes, comments, and shares. As seen in Table 1, users create a significantly higher percentage (87%) of likes compared to comments and shares. This prevalence of likes is not surprising in light of the fact that "liking" a post is a quick and relatively superficial form of engagement. Interestingly, organization 1 presents a different pattern, with a significantly lower proportion of likes, and with shares being the dominant form of engagement behavior (57%). A possible explanation is that organization 1 is a human rights organization whose posts often show crises around the world. Liking a post that depicts misery may seem awkward or inappropriate, while sharing may seem more appropriate. Likewise, organization 5, an animal welfare organization, shows a high rate of shares (19%) compared to other engagement behaviors, possibly due to the high proportion of photo-type posts, (77%). These photos often depict cute animals, and it is reasonable that users engage by sharing these pictures.

Comments have the lowest proportion of engagement behaviors, ranging between 2% and 6% of engagement behaviors. This probably reflects the fact that commenting represents a higher level of commitment than liking or sharing: it requires adding a personal message that can then be viewed by friends and by others in the network.

Continuing on to the chronemic engagement variables, we find that on average 37% of comments are received in the first hour after a post is posted (FHCR). An examination at the organizational level reveals that four of the organizations show similar patterns (Organizations 1, 2, 4, 7), while organization 6 shows a higher comment ratio in the first hour ($M = 0.5$, $SE = 0.07$), and organizations 3 and 5 show a relatively low FHCR: (Organization 3: $M = 0.2$, $SE = 0.05$, Organization 5: $M = 0.28$, $SE = 0.02$).

5.2 Correlations between the engagement variables

RQ2 focused on the correlations between the five engagement variables: likes, comments, shares, TTIC, and FHCR. The expectation that the five variables will be correlated with each other, but that the level of correlation will be partial, was affirmed. Although the different engagement variables are similar, each of these variables expresses a different aspect of user engagement. Moreover, when we move beyond the correlations at the aggregate level described in Table 2 and explore them at the level of the individual organization (Table 3), we find that some of the patterns of engagement differ widely between organizations. The shading of the cells in Table 3 is a visual aid that helps to observe some of these patterns. The three strongest correlations that were observed in Table 2 are comments-FHCR ($r = .63$, $p<.001$), likes-comments ($r =.52$, $p<.001$) and likes-shares ($r = .29$, $p<.001$). The high positive correlation between comments and FHCR confirms the intuition that a post that leads to a high level of engagement could be predicted by the relatively quick accumulation of many comments in the first hour after it was posted. The medium level of positive correlation between likes and comments and likes and shares is also in line with the intuition that likes comments and shares are all expressions of user engagement, but also that they differ from each other. Interestingly, these three correlations are also apparent in the columns in Table 3. A closer examination of Table 3 reveals that although all the positive and high correlations are statistically significant, their magnitude varies over a wide range. For example, the overall .52 correlation between likes and comments in the aggregate data (Table 2) breaks down to a range from .33 for organization 6 to .82 for organization 1. The latter high correlation in organization 1 might also be explained by the finding discussed earlier that in this organization the proportion of likes was significantly lower than it was in other organizations, possibly due to the reluctance to "like" a post that depicts misery. It is possible that the positive sentiment towards a post by organization 1 is expressed by some users not through a click on the like button, but rather by commenting.

The correlation between shares and comments was .24 - the lowest among the three 'classic' engagement variables. A closer look at the organizational level shows a different picture. Table 3 shows that most organizations have a medium to strong correlation between shares and comments, with the strongest correlations noted are .70 in organization 1, and .67 in organization 7. The strong correlation in organization 1 fits the high proportion of shares compared to likes in this organization. In organization 1 some of the users replace the most common engagement behavior – likes, with shares. In organization 7, the high correlation may be related to the high proportion of post-type: photos. Most photos are of women's intimate clothing which may explain the shares and comments.

Although no correlation was found between FHCR and TTIC at the aggregate level (Table 2), a medium correlation was observed between FHCR and TTIC in

organization 2 (r = .37, p<.001). Moreover, the correlation in organization 2 is, somewhat counterintuitively, positive: a longer wait between a post and its initial response predicts a higher number of comments. Furthermore, an inspection of the three columns that include the variable TTIC shows that it is a meaningful predictor of other engagement variables in organizations 2 and 3, but not in other organizations.

The above discussion of the relationships between the engagement variables underlines the complex nature of user engagement. We can see that all five variables exhibited correlations with at least two other engagement variables. When observing user engagement patterns, we find that some patterns are consistent across all of the studied organizations, but many of the patterns differ significantly, and engagement patterns that are exhibited by users of an organization with specific characteristics might not exist in another organization.

5.3 The influence of post variables on engagement variables

RQ3 explored the ways in which nonverbal message variables influence engagement variables in SNSs. Here too the analysis was first performed on the aggregate data from all organizations, and then on each organization by itself. The discussion will follow the same order.

We examined the influence of post variables on engagement variables using MANOVA (multivariate analyses of variance). The first model, tested for all posts, included the following variables: engagement variables (likes, comments, shares, FHCR, and TTIC) as dependent variables, and message variables (type of message [status, photo, video, and link], text, length, exclamation mark, and question mark) as independent variables. As shown in Table 4, post variables influenced engagement variables in various ways. Engagement variable FHCR was influenced by many post variables: For example, question marks in a post boosted the FHCR value (M = 0.47. SD = 0.73), and lack of question marks in a post was associated with a lower FHCR (M = 0.30, SD = 0.42). A reverse effect was found for exclamation marks; posts with no exclamation marks received a higher FHCR score (M = 0.41, SD = 0.58), than posts with exclamation marks (M = 0.31, SD = 0.52). Posts with question marks often are a request of information from users. For example, organization 6 might use a question mark when they ask about a favorite drink or organization 7 when they ask for users' opinion on their new collection. That might explain why posts with question marks lead to a higher FHCR score as opposed to exclamation marks that might be perceived by users as a declaration.

Absence of exclamation marks in posts is associated with a higher number of comments (no exclamation mark: M = 255, SD = 430; with exclamation mark: M = 196, SD = 326). The length (number of characters) of posts affected comments as well: For each two additional characters added to a post, we observed one less comment (t=3.18, p=.001, B = -0.62). Likes were influenced by two post variables: length and post-type: photo. Each added character to a post reduced the number of likes by nearly 12 (t = 2.75, p<.01), and post-type photo increased the number of likes; Mean likes for posts with photos was M = 8,419, SD = 10,752, compared to likes for posts with no photo: M = 1,741, SD = 3,406. Shares were not influenced by any post variable, and neither was TTIC. However, number of shares differed significantly between organizations, as opposed to TTIC, where fewer differences were observed.

Additional models were tested for each organization separately (not shown in Results section due to space restrictions). Organizations differ from each other by the various post variables that influence diverse engagement variables in each organization. The most prominent post variables that influences engagement variables are 'post-type: photo' and 'length', each of which is a significant factor in four organizations. 'Post-type: photo' influences four engagement variables in organization 7 and organization 2, and one engagement variable in organization 3. In general, the direction of the influence at the organizational level is similar to the direction at the aggregate level, though there is an exception: In organization 4, 'post-type: photo' resulted in less comments than posts with no photos (M = 176, SD = 314, and M = 303, SD = 683, respectively).

TTIC is influenced by length of post and appearance of exclamation marks in a post, in organization 5. Presence of exclamation marks in a post, radically shortened TTIC from approximately 23 hours to less than an hour (no exclamation marks: M = 84,925, SD = 346,084; with exclamation marks: M = 1,671, SD = 8,390). An opposite effect was found for length; each additional character lowered the response time (TTIC) by approximately 20 minutes.

FHCR is influenced by different post variables which vary between organizations. The post variable photo influences FHCR in organizations 2 and 7. The length of a post influences FHCR in organizations 2 and 4. In organization 4, FHCR is influenced by post-type: status as well. Question marks in a post influence FHCR in organizations 6 and 7.

As shown in the aggregate and by organization MANOVA, post variables influence engagement variables. As a result of different organizational characteristics, different post variables influence

various engagement variables. In the aggregate MANOVA (Table 4) FHCR was the engagement variable influenced by the largest number of post variables. However, in the MANOVA by organizations, the most influenced engagement variable is 'likes'. The statistically significant post variables that influenced engagement variables were: 'post-type: photo', 'post-type: status', 'length of post', 'question mark', and 'exclamation mark'.

5.4 The nature of user engagement on organizational Facebook pages

The findings of the study demonstrate that the five variables reveal a complex and multifaceted picture of user engagement: the variables measure different aspects of engagement, and reflect differences between the organizations. When the users of organization 1 engage with posts relating to global human-right issues, their engagement patterns are different from those of users who engage with the cute animal pictures posted by organization 5. Although some interesting generalizations can be made about user engagement across the different organizations we studied, the rich diversity that is exposed at the organizational level is both informative and insightful.

5.5 Contributions to theory and practice

This study demonstrates that online engagement is multifaceted, and that no single variable can measure it on its own. We employed only five variables and used them to measure engagement patterns in only seven organizations, and still the resulting picture is already highly complex. On the one hand we find common patterns that are probably generalizable, such as the clear overall positive correlations between likes and comments or likes and shares. On the other hand, when we examine these correlations at the more granular level of the individual organization, we find extensive diversity, which can often be explained by the unique attributes of the organizations. Unlike previous studies of user engagement on SNSs which used only a single variable to measure engagement, or which used several variables but did not sufficiently characterize them, our results demonstrate the multifacetedness of user engagement, and point the way to future research.

This study contributes to communication theory. Insights provided by SIP theory allowed us to reveal the complex relationships between different online engagement variables, as well as predicted the influence of CMC cues on online engagement. Our findings support the importance that SIP theory attaches to more subtle cues such as chronemic cues [11], and to their importance in an environment where traditional nonverbal cues are limited. The findings also demonstrate the influence CMC cues have on encoding and decoding information in CMC settings [16]. Chronemic cues (TTIF, FHCR) are influenced by other nonverbal CMC cues such as exclamation and question marks, for example in organizations 5 and 7.

This study assists practitioners in organizations in achieving goals such as increasing customer engagement that may lead to customers identifying with a brand, and thus generating more transactions. Stakeholder engagement in the 'real world' could take many forms such as visiting or browsing a store, trying a product, reading a brochure, watching commercials or talking about a product with others. We show that online engagement also has many facets, some of which might show parallels to 'real world' engagement; commenting on a product, or sharing an organizational post on a user's wall is a form of engagement that might be analogous to telling friends about an experience one had with an organization. Furthermore, like a store full of customers that attracts even more customers, a Facebook post that receives a large amount of comments soon after it is posted (high FHCR), could attract users to engage with it themselves. Our study further elucidated the nature of user engagement online, and practitioners can use the insights of this study to better characterize the ways in which users engage with their organizations, to measure this engagement, and to define measures and goals which are not generic but rather in line with each organization's marketing goals. Specifically, the findings of this study inform practitioners involved with the design and operation of SNSs. It suggests variables that should be monitored and quantified in order to understand user engagement on SNSs, suggesting that these measures should be informed by the different goals and characteristics of each organization. Knowing what engagement aspects are important to an organization would assist in setting specific engagement goals. In addition to the more explicit measures such as number of likes, comments and shares, our findings point to the engagement variable FHCR as a useful tool for marketers who monitor the organization's Facebook page. For example, in organizations 1, 2, 5 and 7, FHCR is a predictor of several engagement variables.

5.6 Limitations and future research

This study used unobtrusive, non-reactive methodology, which allowed us to study a large number of posts, and many different variables, without the biases that are the hallmarks of reactive methods. Our methodology also has important limitations. We disregarded the verbal content of the posts, and

measured only components that could be measured automatically (post type, exclamation points, question marks and message length). We also did not include in the analysis personal information about the users, and eliminated content that could have provided further variables and richness (e.g. posts originated by users, posts with less than ten comments, etc.). Truncation of the sample to include messages with at least ten comments was inevitable for technical reasons. It is possible that including posts with few or no comments would have altered our findings.

A fundamental limitation of this study stems from the ambiguity of dependent and independent variables that describe user activity on Facebook. For example, posts that receive a large number of comments could get promoted by the Facebook algorithm on a user's dynamic newsfeed, which in turn increases their visibility compared to low commented posts. Moreover, the level of engagement of users creates explicit signals that, in turn, further influence engagement. For example, the content of comments could influence the engagement patterns of the users who read the comment. The causality chain between these factors might be addressed by future studies.

Finally, this study focused on only seven organizations, five engagement variables, and a small number of post variables. While even these provided a rich and diverse set of findings, this study is only one of the first steps in the effort to quantitatively characterize the nature of user engagement in SNSs.

7. Acknowledgements

Funding was provided by grant #101522 of the Open University of Israel. The authors would like to thank Dr. Daphne Raban for helpful discussions.

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