

Facebook and Public Health: A Study to Understand Facebook Post Performance with Organizations' Strategy

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Abstract—This paper reports on a survey about the perceptions and practices of social media managers and experts in the area of public health. We have collected Facebook data from 153 public health care organizations and conducted a survey on them. 12% of organizations responded to the questionnaire. The survey results were combined with the findings from our previous work of applying clustering and supervised learning algorithms on big social data from the official Facebook walls of these organizations. In earlier research, we showed that the most successful strategy that leads to higher post engagement is visual content. In this paper, we investigated if organizations pursue this strategy or some other strategy that was successful and has not been uncovered by the machine learning algorithms. Performance of each organisation on Facebook is based on the number of posts (volume share) and the number of actions (value share). Calculation of performance with number of actions in the numerator and number of posts in the denominator reduces possible bias in the conclusions due to the varied size of organizations on social media. Moreover, our survey attempts to better understand the behaviour of organizations and to explain why almost half of the public health care content posted on Facebook is in the form of a short text message, where as the information can be communicated through seven other post types. Similar patterns and characteristics for different engagement clusters, also high and low performing companies suggests that a mixed-methods research approach consisting of machine learning techniques combined with expert knowledge using qualitative methods can offer important insights.

Index Terms—Big Social Data, Social Media Performance, Social Media Strategy, Facebook data

I. INTRODUCTION

Innovative advances in participatory Internet make social media platforms such as Facebook an inescapable platform for health care promotion and education according to [1]. The benefits of using social media platforms such as Facebook and Twitter for dissemination of public health-care information include expansive reach, interactivity that enables both anonymity and social networking, according to personal preferences, and relatively lower costs to spread health care information compared to traditional media such as newspapers, TV and radio. Evidence from previous research [2] and market research [3] indicates that the number of organizations and also the number of content postings increases over a period of time, which might lead to information deluge.

Nowadays, many social media platforms and online communities are focussed on health-related issues and communication of public health information. For example one such health-

related issue is diabetes and diabetic patients are joining online communities and social media platforms to discuss everything related to their disease, from exercise and nutrition, to treatment and diagnosis. In a world where such communities clearly hold an abundance of information, organisations are becoming increasingly aware of the value within these communities. Many organisations in general, public health organisations in particular, are struggling with the challenges of extracting valuable insights from the data, so that they can turn it into actionable insights. Some organisations use digital and social media channels to communicate information exclusively about themselves. Research in [4] shows that organisations are not utilising social platforms sufficiently, moreover they do not encourage patients to share personal experiences that might benefit other users. The main challenge for organisations is to analyse data shared by users of various online communities, as it tends to be unstructured and unorganised.

In our previous work [5], we have collected and analysed Facebook data consisting of 153 public health organizations. Clustering and supervised learning algorithms were applied to understand the characteristics of user engagement and post performance. Our research work showed that top 5% of Facebook posts received ≥ 296 post likes, which indicates the high engagement potential of the posts. In contrast, 25% of health care posts did not receive a single post like or a share, indicating the low engagement potential. Our study [5] concluded that visual content and update of previously engaging content is a successful strategy in drawing attention to health care information shared on Facebook and leads to higher engagement. Our previous work [5] is purely based on quantitative and computational approaches, by duly applying data mining and machine learning algorithms on Facebook data of public health organizations. Therefore, in the current research our basic motivation is to use qualitative methods to find if companies pursue this or some other strategy that has not been captured by the machine learning algorithms.

A. Problem Formulation and Research Question

Current research looks in depth into the reasons behind characteristic features of different posts by combining methods such as clustering, classification and survey results. Study on supportive responses to social sharing on Facebook [6] shows that people behave differently on Facebook depending on their network size. Similarly, public health care organizations might show different behavioral patterns due to internal

procedures of the organization or other reasons, which their turn might affect engagement potential of social media content and would be interesting to explore in the current research. Moreover, some posts that are highly popular, do not conform to our previous research conclusion: visual content leads to high engagement. Therefore, current research will address the following research question:

What, if any, is the influence of strategy and process implementation on social media performance?

The remainder of the paper is organized as follows: section II introduces the hypothesis based on related literature and section III introduces conceptual framework. Section IV describes the data set and overall methodology. Section V provides findings of our work and Section VI provides an answer to the research question and possible implications. The Last section concludes the paper by illustrating the tentative future work.

II. RELATED WORK AND HYPOTHESIS

The research in [7] concludes that the main use of social media by health care professionals is aimed at achieving communication and knowledge rather than skill objective. According to the article by [8], people with chronic health conditions are sharing their stories with each other, not just for emotional support, but for the clinical knowledge they gain from an online community. Moreover, [8] also add, that when patients manage the same chronic condition and share observations with each other, their collective wisdom can yield clinical insights well beyond the understanding of any single patient or a physician. [9] found that 'YouTube' has been used for promotion of information about cancer screening as well as obesity. 'Twitter' - in the design of interventions about prenatal health promotion. While, 'Facebook' was used in interventions related to sexual health issues. Moreover, the research in [8] suggests that the ability to engage with consumers in this way is particularly useful for chronic disease management, where lifestyle behaviors can have a significant impact on patient wellness. Similarly, the research in [10] and [11] suggests that social media is a cost effective way to receive greater reach and transcend geographical boundaries, while providing information. Furthermore, the research in [12] perceives social media as an additional advantage for health care organizations and can be used as a rapid exchange of information and timely targeted dialogue. Based on the discussion of the current research, we developed our first research proposition:

Research Proposition 1: *Public health care professionals view Facebook as a platform for low cost information dissemination and a broader message reach across geographical boundaries.*

The research in [13] suggests that there is a positive correlation between social media strategy to engage users and social media performance on Facebook. Additionally, [13] emphasises that to create awareness for a nonprofit organization on Facebook requires careful planning, since it is based on relationship building. Therefore, we consider that having a proper strategy is important for the organizations that want to

use social media for effective dissemination of public health care information. Latter brings forward the second research proposition:

Research Proposition 2: *Any existing strategy will positively affect organizations social media performance as opposed to no strategy at all.*

The research work in [14] argues that accurate and timely predictions of the content would lead to revenue maximisation and the quality of the story will trigger a reaction in the reader. Furthermore, the research in [12] looked into the organizations utilization of tweet frequency, following behavior, hyperlinks, hashtags, public messages, retweets, and multimedia files. Authors found that the largest US nonprofits are not using Twitter to maximise stakeholder involvement at all. Similarly, the research work in [15] suggests that being on social media is not enough, organizations need to know how to use the medium to fully engage stakeholders. Social media managers post *status* type message (short text message) more often than other message types, as short text message constitutes 45% of all the posted content: majority of the low engagement posts and a small portion of messages with medium engagement. As evidenced in [5], such practice does not engage users. In view of the above discussion, our third research proposition is:

Research Proposition 3: *Strategy focused on visual content and repositioning previously successful content will positively affect social media performance [5], as well as the number of other techniques directly or indirectly used by the company.*

The research work in [10] calls for social media training in the organizations to help effectively measure their use. There are other aspect such as commitment and implementation of the adopted strategy. To implement a new strategy hinges on the ability of managers to not only envision new organizational forms but also to direct and control people within them as suggested in [16]. The research [17], [18] suggests that there might be individual differences in cultural values that are positively correlated with normative commitment to the organization. Similarly, communication, socialization experiences might vary considerably across cultures. One of the limitations that this study faced was in assessing differences between organizational cultures and cultures in general. However, this limitation does not undermine the importance of the research, but rather provides insight into future research. Additionally, the findings in [19] highlight that service climate and quality of interaction depends on how engaged and dedicated employees are and can affect customer loyalty. Finally, our fourth and final research proposition is:

Research Proposition 4: *Internal procedures or behavior of social media managers can affect social media performance. Therefore the implementation process is as important as the right strategy.*

III. CONCEPTUAL FRAMEWORK

As part of the conceptual framework, we will discuss corporate communication strategies and then we will look into collective value creation in online communities and social

media channels. Lastly, we will discuss the concept of Socially Shared Health Information, which is built on the model of Information, Motivation and Behaviour.

A. Corporate Communication Strategies

Organisations have started to explore market insights and customer relations as part of their external communications and strategies, rather than simply pushing products onto the market [20]. This new outside-in approach [20] focuses on customer profiling, by considering them as valuable assets to reach new opportunities. Market insights are based on thoroughly analysed data. Accurate reflections from the market are extracted through market intelligence and analytical tools that are built for the purpose [20]. With technological development, increasing number of tools are made available for organisations, in areas such as data mining, cloud services, in-depth surveys, dashboards, statistical software, etc. These tools may be leveraged in an outside-in approach to eliminate communication asymmetries and employ a user-centered approach [20]. However, it is important to emphasise that not all communication is or needs to be performed as two-way communication. Most digital assets that we see today do not talk with, but to customers, patients, or users. Many of these assets, be it corporate websites, branded content, or unbranded domains, are created to communicate to one or more stakeholders. This one-way communication may or may not be created, based on user insights; if the latter is not the case, the user might lose interest and never employ the service. Good, interesting, and strategically well-thought through content, which is built on user interests and needs, can still function as effective one-way communication. This formal communication may still be relevant and can potentially lead to behavioural change. However, will have to compete with other sources of information and be interpreted in accordance with the users' existing knowledge, interest, and contextual setting. Hence, persuasion continues to be taken seriously. Organisations could benefit from adopting a pull-strategy in combination with the traditional push-strategy. Merely pushing products towards users with the expectation that the product offered will be valuable and attractive enough for the target audience is a challenging act in a competitive market. Moreover, when consumers become more knowledgeable and learn to understand the market and its offerings, organisations may want to distinguish themselves by having a relational approach [20]. With this knowledge, organisations can try to adapt their offerings and communications towards the needs and wishes [20] of the audience. In a time when social media has become popular, customer insights leveraged from social media sites, help organisations to adapt corporate communication to the needs and expectations of their customer base. Once customer understanding deepens, organisations might be empowered to offer more personalised and targeted services. This outside-in approach is what drives the methodological choice of many organizations in improving their existing communications with their stakeholder, consumers and patients.

B. Collective Value Creation in Online Communities and Social Media Channels

Computer-mediated communication affords new ways to interact with technology and with other individuals. One of the interesting aspects of this is the vast amount of digital traces these interactions leave behind. These latent sources of information are available via online communities and have sparked the interest of modern researchers and marketers. In [21] Johnson and Ambrose questioned the postmodern thesis that individuals are individualists. Instead, they argued that individuals are social entities that gather in fluid networks for social interaction [21]. These types of networks have existed throughout history, but have come to manifest themselves as virtual communities in the postmodern society. The popularity of online communities and social media channels have emerged due to the socio-technical fit between participants' needs and technology's ability to meet these needs [21]. In the healthcare system, these communities form to fill voids that exist due to the professional healthcare systems' inability to meet the needs and necessities of patients [21]. In the case of insufficient information or support from the healthcare professionals, social platforms can act as a substitute to fulfill the needs of the patients. In recent studies [22], Wenger et. al. investigated online communities as a common place for learning and knowledge sharing. [22] point out that what radically differs online communities from traditional communities is the fact that communication is not defined by place or by personal characteristics. Online communities are not restricted by certain points in time but always open for action. Moreover, these communities are not necessarily inhabited by individuals with a certain mind-set, age, or background, but often formed by members with a common interest or need [22]. Members in these globalised online communities may be politically, economically, and culturally indifferent on a local level, but still unite in communities in a quest to share information [23], and in our case to collectively conquer their disease.

C. Socially Shared Health Information

An interesting phenomena in current research is health information, shared on public health organizations' through social media (Figure 1). Health information management is more conceptually restricted than health informatics and is "concerned with how information is organized and managed, within health, for example by patients and health professionals; [...] or nationally (e.g. the level of health literacy within populations" [24, p. 502]. Socially connected organizations are understood as "institutions that strategically adopt and use social media channels to increase organizational effectiveness, and create value with and for stakeholders." [25, p. 147]. We situate the notion of SSHI (Socially Shared Health Information) within "a cultural value that highlights the ongoing negotiations of the normative aspects of sharing, as cultural practice, and the evidential interplay of socio-technical features" [26, p. 463]. Latter is enabled by digital technologies and adopted by health organisations and users at large.

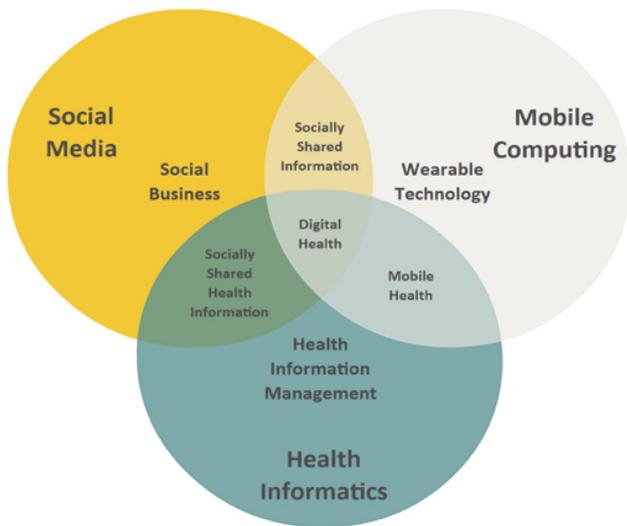


Figure 1: Schema of Socially Shared Health Information

We link the individual’s perception of action-taking possibilities and appropriation of meaning-making opportunities created by SSHI with the process of adhering to a specific public health goal by applying the information-motivation-behavioural (IMB) skills model of adherence. The IMB model of adherence “focusses comprehensively on the information, motivation and behavioral skills factors that are conceptually and empirically linked to adherence and specifies situational and personal factors that may moderate the relation.” [27, p. 463]. In its most abstract form, the IMB model asserts that information, motivation and behavioral skills are fundamental determinants of adherence to public health goals. We have applied blue circles in Figure 2 to indicate that this paper is primarily concerned with the appropriation of information and only peripherally with the motivation for, and tools to, generate behavioural change.

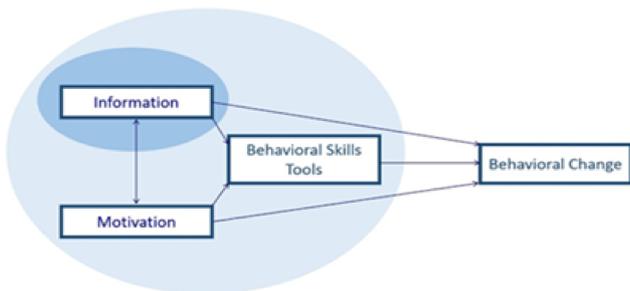


Figure 2: Information, Motivation and Behaviour Model

IV. METHODOLOGY

Descriptive statistics were initially used to visualize data and perform reductions where necessary. Unsupervised learning techniques were applied to achieve post engagement classes

and suitable performance measures were used to ascertain the quality of the data analysis. In order to predict if post performs well or not supervised learning techniques were applied on labeled data derived from the clustering results.

A. Data set description and process flow

Start date: 2006-01-01 End date: 2015-12-30		
Number of Facebook Walls: 153		
Activity	No. of Actions	Unique Actors
Facebook Page Likes	10, 476, 523	–
Facebook Posts	280, 534	101, 351
Post Shares	4, 225, 739	–
Likes on Posts	24, 331, 261	7, 129, 957
Comments	1, 734, 154	788, 297
Likes on Comments	1, 507, 687	493, 266
Comment Replies	208, 512	100, 379
Likes on Comment Replies	176, 920	88, 202
Total	42, 941, 330	7, 531, 865 ¹

Table I: Overall Statistics of Public Health Facebook Dataset

Data from 153 public Facebook walls of various public health organizations was collected using Social Data Analytic Tool (SODATO) [28]. These walls include national as well as international agencies, organisations as well as individual bloggers. The total dataset contains information about approximately 43 million Facebook actions over the period of 10 years as shown in table I. Majority of actions are *Likes on Posts* (around 55%) and the dataset contains around 280 000 Facebook posts. Approximately 34% of the dataset are *Facebook Page Likes* and *Post Shares*. Facebook does not provide user information in respect to these items. In the entire dataset, there are around 7.5 million unique users and as one can notice from table I, the prominent action performed by the users is *like*. The overall methodology that was adopted for this research work is shown in figure 3.

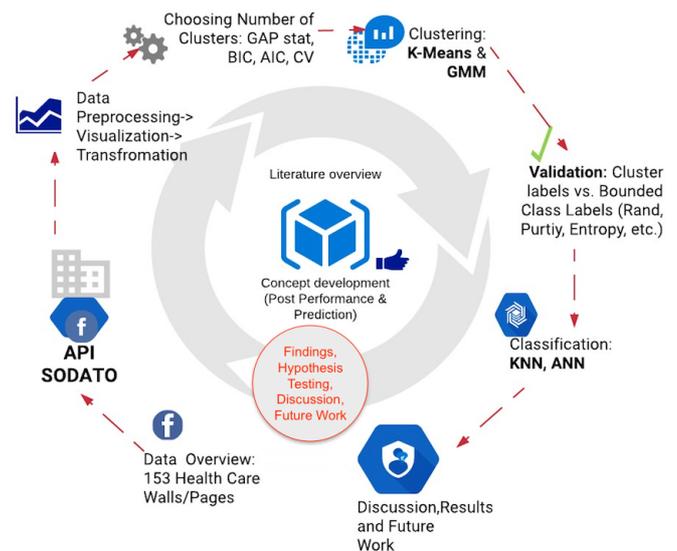


Figure 3: Data Process Flow

¹Total unique actors for the whole dataset

	Health Care Company/Wall Name	Clusters				Post Count Share = Company Total/153 Total	Clusters				Post Value Share = Company Total/153 Total	Social Media Performance = Nr.Of Actions/Nr.Of Posts	Facebook Wall_Category	Country
		low	med	high	Post Total		low	med	high	Action Total				
1	Sociedad Latina de Hipertensión Pulmonar	1211	2340	23	3574	1,27%	47444	6839	4563	58846	0,19%	16,47	Non-Profit Organization	USA
2	Terveyden ja hyvinvoinnin laitos/Nat Inst	812	806	21	1639	0,58%	22656	3063	2812	28531	0,09%	17,41	Government Organization	Fin/USA
3	Anonymous	227	351	6	584	0,21%	4832	1700	8321	14853	0,05%	25,43	Government Organization	Canada
4	Astma-Allergi Danmark	1096	1050	88	2234	0,80%	37574	3850	15844	57268	0,18%	25,63	Non-Profit Organization	Denmark
5	Pulmonary Hypertension Association of	1372	440	179	1991	0,71%	52208	2179	31313	85700	0,27%	43,04	Non-Profit Organization	Canada
6	Pink Ribbon Boezemvriendinnen	421	53	53	527	0,19%	22364	292	12082	34738	0,11%	65,92	Cause	Belgium
7	American Public Health Association	1601	291	218	2110	0,75%	86908	1855	75138	163901	0,52%	77,68	Non-Profit Organization	USA
8	LHL Landsforeningen for hjerte- og lungesyke	679	294	113	1086	0,39%	49215	848	46049	96112	0,31%	88,50	Organization	Norway
9	Diabetesforbundet	1003	1199	435	2637	0,94%	71921	4742	160854	237517	0,76%	90,07	Community Organization	Norway
10	Gigtforeningen	249	908	365	1522	0,54%	16062	2206	143913	162181	0,52%	106,56	overnmental Organization	Denmark
11	National Institutes of Health (NIH)	881	59	444	1384	0,49%	80385	275	197919	278579	0,89%	201,29	Government Organization	USA
12	Kostråd	242	97	178	517	0,18%	13821	240	93948	108009	0,34%	208,91	Government Organization	Denmark
13	Kreftforeningen	883	1520	690	3093	1,10%	95402	3801	944199	1043402	3,32%	337,34	Non-Profit Org	Norway
14	Kreftkamp	462	182	255	899	0,32%	39257	514	293817	333588	1,06%	371,07	Health/Wellness Website	Norway
15	Cancerfonden	602	836	720	2158	0,77%	92696	1642	911670	1006008	3,20%	466,18	Organization	Sweden
16	Støt Brysterne	189	1515	717	2421	0,86%	23228	2491	1390110	1415829	4,51%	584,81	Non-Profit Organization	Denmark
17	Ældre Sagen	243	1785	720	2748	0,98%	10427	3506	1797985	1811918	5,77%	659,36	Non-Profit Organization	Denmark
18	Team Novo Nordisk	458	932	926	2316	0,83%	117870	1360	1674950	1794180	5,71%	774,69	Sports Team	Denmark
	Total	12631	14658	6151	33440	11,92%	884270	41403	7805487	8731160	27,80%	261,10		

Table II: Data for health-care organizations that responded to the questionnaire

Statistics from total data showed that visual content such as *Photo* and *Video* are important for post engagement. *Link* post type comes second and may be partially due to the link leading to visual content. This finding supports a general marketing approach in relation to the content visibility. It also works with public health care related information on Facebook. What is unclear, is why health care organizations continue to use *Status Type* - short messages to communicate information, when clearly better approach would be to use more visual means to trigger higher engagement from the users. This will be explored in the questionnaire analyses section of the paper in greater detail. Table II shows value, volume share and social media performance for eighteen companies that have responded to the questionnaire.

Social media performance for 18 organization is measured by *Total number of Actions* on the posts divided by *Number of Posts*. Cut off for good social media performance is established with the median value: above median value denotes good social media performance. Around 12% of the organisations from the total data set of 153 walls responded to the questionnaire. There are a few Facebook walls that are especially interesting to analyse, such as Team Novo Nordisk. For its relatively small share of posts in terms of volume, the company shows very high engagement per post: a value share of nearly 6% (*Post Like*, *Post Share*, *Comments*, *Comment Like*) and a volume share of below 1%. Therefore, the organization shows a good social media performance rate according to Table II. Similarly, high social media performance is seen from Cancerfonden, Støt Brysterne, Ældre Sagen, Knæk Cancer and Kreftforeningen.

In contrast *Sociedad Latina de Hipertensión Pulmonar*, *Diabetesforbundet*, *American Public Health Association*, *American Public Health Association* and *Pulmonary Hypertension Association of Canada* have much lower post engagement. For example *Team Novos* average post engagement is 775 (Likes, Shares and Comments) and *Sociedad Latina de Hipertensión Pulmonars* post engagement is 16 (Likes, Shares and Comments). Findings in the next section will elaborate on the

reason and will investigate if application of successful strategy leads to higher social media engagement.

V. FINDINGS

The primary purpose of our survey is to discover if there is a specific reason why Health Care related organizations decide to share information on Facebook and if organizations apply certain social media strategies together with implementation procedures. The survey questionnaire was sent to almost all of the organizations simultaneously, but we only received responses from 18 companies. Out of those 18 companies that responded to the questionnaire, one company wished to conceal its name and remain anonymous.

When it comes to the motivation for sharing information on Facebook, we noticed that 72% of the respondents share information on Facebook due to its "relative popularity as a social media tool" to reach a wider audience. Additionally, 22% of respondents share information to achieve "faster message spread" and finally the remaining - 16% share information due to the relative "ease of sharing health related information" on Facebook. Similarly, 22% of respondents also mentioned risk in "loosing the market to competitors" and additionally 11% recognise "importance of reaching a younger demographic". *Pew Research center* report [29] suggests that age is strongly correlated with social media usage, 90% of young American adults (18-29) : use social media as of 2015 in comparison to 12% in 2005. A small increase in social media usage is seen among 30-49 and 65 year old seniors, however still considerable: to 77% and 35% (consequently from 8% and 2% in 2005) [29].

Figure 4 shows 18 responses to question 2 of the questionnaire. Answers suggest that most of the respondents want to reach as many people and as fast as possible ; at the same time reach their target groups through Facebook. One company uses Facebook to establish presence on social media and additionally drive traffic to their website. Most of the respondents (67%) have strategy to create visibility for their posts on Facebook. A 17% do not or are not sure. Figure 5 shows 18 responses to question 3 of the questionnaire.

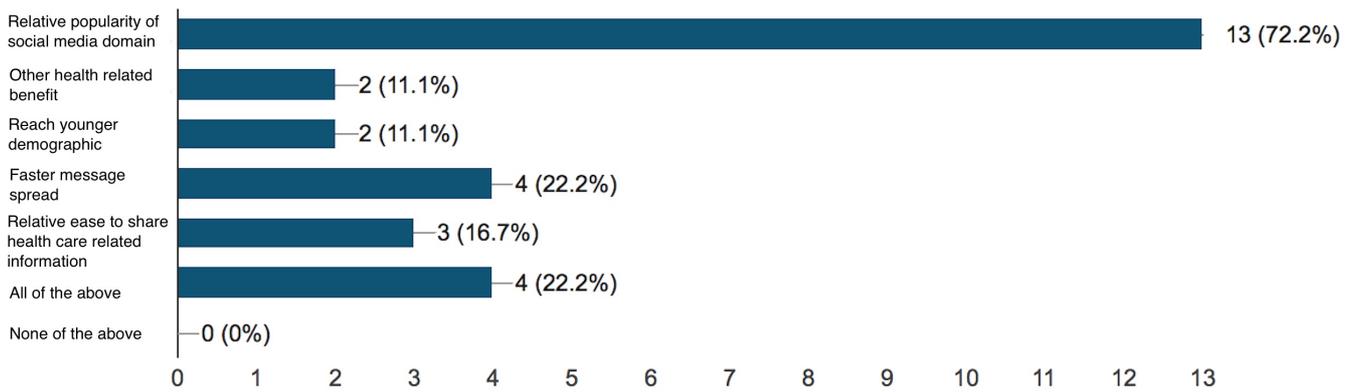


Figure 4: Why did you choose Facebook to share health-care related information?

11 out of 18 respondents commented on their strategy. Two

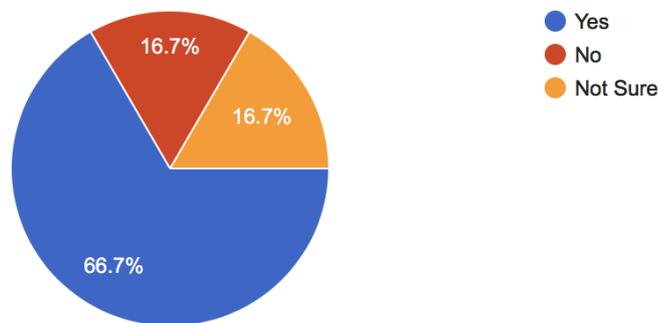


Figure 5: Do you have any strategy to engage users and improve post performance?

companies reward engagement, however is not clear if they mean both *Page like* and *Post like* engagement or either one of the two. Our previous research [5] supports the claim that 'Page Likes' have no influence on post engagement. Therefore, if companies pay users to 'Like' a Facebook page, this strategy might not necessary lead to more people reading and sharing their content. Consequently, if a company just wants to create awareness about its presence on Facebook and lead traffic to its website, paid engagement might suffice, however not enough to increase engagement with the posted content. Other organizations highlighted their focus on the content, personal stories and story telling in general, in order to create better post visibility even if this strategy can be time consuming. Almost, a third of the respondents recognize the importance of using visuals in the form of an image, graph or a video. Our previous findings from [5] and [30] suggest that more than 53% of *High performing* content is visual in the form of *Photo* or *Video*. Two companies mentioned headlines and short text must be important in creating post visibility. Three companies also mentioned advertising, sponsored posts and promotion. From earlier finding in [5] 45% of the posts are *Status*, 31% are *Link* and 20% are *Photo*. The smallest share of total posts constitute *Video*, *Event*, *Note*, *Music*, *Offer* posts.

Historical data for companies that responded to the questionnaire, supports our previous findings from the dataset: most of the posts are *Status* followed by *Link* and then *Photo*. The least frequent are *Event*, *Note*, *Offer* and *Music*. Figure 6 shows 18 responses to question 4 of the questionnaire. 50%

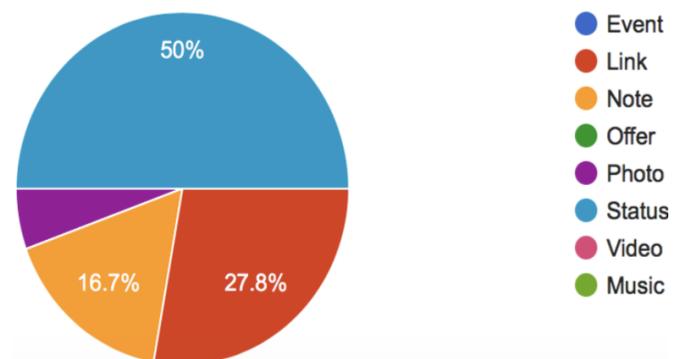


Figure 6: Place following post types in order of time it takes to create a message in your experience/opinion (from 1 to 8: Shortest time to Longest Time).

of respondents to Question 4, suggest that *Status* is least time consuming form to communicate the message and is followed by *Link*, *Note* and then *Photo*. It is most likely a contributing reason to why every second health care post is of type *Status*. 22% of the respondents placed *Link* second in terms of time consumption, followed by *Event* and then *Photo*. *Link* is second most frequent post type evidenced from the total data set. 33% of respondents placed *Photo* on the third spot in terms of time consumption, followed by *Link* and then *Status*. *Photo* type is the third most frequent type of message. The most time consuming in the opinion of the respondents is *Music* post type. Comparison of the results from the questionnaire and historical data, show that there might be a correlation between consideration for the time it takes to communicate certain post and share of the 'Post Type' in the total data set. Figure 7 shows 18 responses to question 5 of the questionnaire.

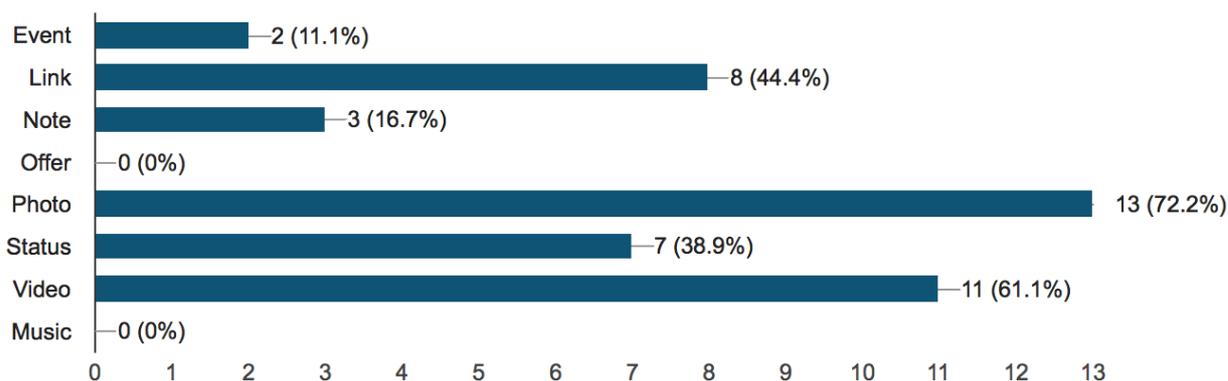


Figure 7: Please select the most effective Post Types to communicate a message in your opinion (free to select several options).

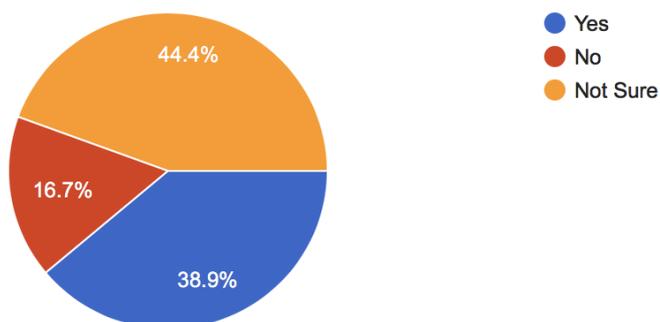


Figure 8: Does it make sense to update/re-post previous health-care messages on Facebook?

Aligned with the general strategy of the respondents to create visibility: 72% of the companies do recognize that *Photo* might be the most effective way to communicate, followed by *Video* (61%), *Link* (44%) and *Status* (39%). *Link* very often contains a picture message. The Questions 6, 7 and 8 were designed to ask for the best time slot, day and month for the organizations to communicate their messages. Evidence from the previous data analysis [5] suggests that engagement with public health care data in general does not depend on a week or a month and was supported with questionnaire replies from social media experts. Figure 8 shows 18 responses to question 9 of the questionnaire.

Answers to question 9, suggest that most companies are not sure about the benefit of re-posting previous health care content. 39% of the respondents see a real advantage in re-posting, such as a reminder to prevent recurring disease linked to seasonal outbreaks. Small group of respondents see benefit in reposting old content with new alterations. The latter is due to new followers, those who did not see the content or forgot about it, where information might still be relevant. Evidence suggests that the more frequent or the higher the span between the first post and the new update, the greater the number of likes and shares the post will receive. Post popularity is directly correlated to the increase in the time span. Figure 9 shows 18 responses to question 10 of the questionnaire. Last

but not the least organizations highlight other features that might be relevant for future research on post engagement, such as hash tag, text length, emotions in the text, wording in the title, wording in the text or all of the above. These questions allow a selection of multiple entries. 61% of the respondents think that the wording of the text can influence post visibility, followed by 50% who suggest that the wording of the title can be important. Emotions in the text and text length are supported by 33% of the answers. Respondents think that at least one of the features is important to consider when creating a post.

VI. DISCUSSION

In this section a more detailed view will be bestowed on successful companies, in terms of attracting users to their content, and least successful companies that responded to a questionnaire. Findings from our previous data analysis using clustering and supervised machine learning techniques [5] will be taken into account, together with responses to the questionnaire. Figure 10 shows research questions and possible answers to those questions in the form of a decision tree. Questions are based on both quantitative (our previous data analysis) and qualitative approaches (questionnaire based survey). The organizations *Team Novo Nordisk*, *Aldre Sagen*, *Støt Brysterne* and *Cancerfonden* organisations show a high average post engagement and social media performance statistics as found in our previous analysis [5]. Similarly, *Sociedad Latina de Hipertensión Pulmonar*, *Terveyden ja hyvinvoinnin laitos/National Institute of Health Finland*, *Anonymous* and *Astma-Allergi Danmark* are organisations with relatively low post engagement statistics and social media performance. *Team Novo Nordisk* organisation achieved high engagement and social media performance through visual strategy, consistent process implementation and paid engagement. Moreover, the company sees value in re-posting old content by tailoring it slightly and sharing as part of an old message or split into a few new messages, which is also in-line with recommendations obtained from data analyses in [5] and can be observed in Figure 11. Figure 11 displays questionnaire replies

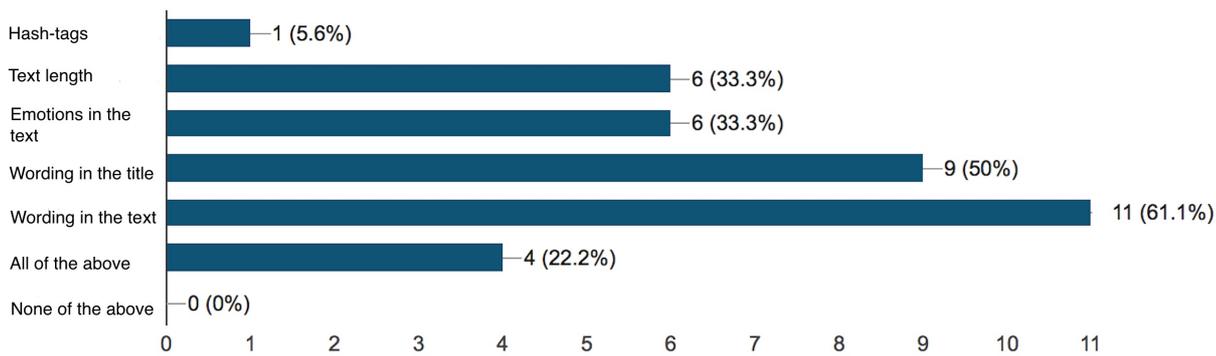


Figure 9: Do you believe any of the below can influence on post engagement/visibility?

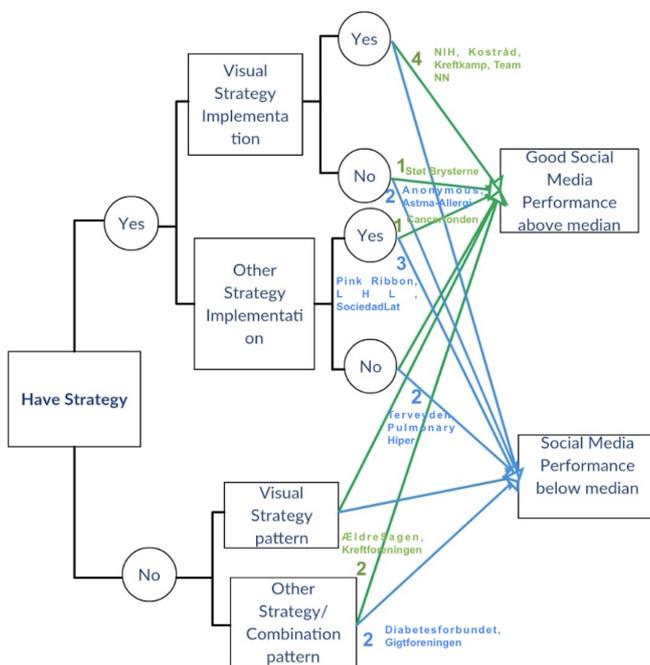


Figure 10: Overview of Research Questions and Possible Answers

by Team Novo Nordisk domain experts. *Ældre Sagen* organisation, even though they hoped for wider message spread on Facebook, either have misunderstood the question or were not sure if they had any strategy to achieve popularity. Judging from the replies they do not recognise visual post types to be effective. Moreover, they do not believe that re-posting previous content has any advantages. Evidence supports *Ældre Sagens'* questionnaire replies, as 51% of their posts are status and only 15% are represented by a Photo and a Video and 34% of the posts are represented by a Link. Contrary to the: 'No' reply to question 9 of the questionnaire, social media managers have practiced updating and re-posting old content with average lead time of 491 days, however might have done it unawares. Also 57% of their total posts were posted in 2014 and 2015, which can be attributed to their success, as there was

Timestamp	6/21/2016 20:06:00
1. Please indicate your Facebook Wall Name :	Team Novo Nordisk
2. Why did you choose Facebook to share health-care related information?	Relative popularity of social media tool and hope for wider message spread, Reach younger demographic
3. Do you have any approach to create better post visibility on Facebook?	Yes
4. Place following post types in order of time it takes to create the message in your experience/opinion (from 1 to 8: Shortest Time to Longest Time) :	Leveraging organic and paid engagement
5. Please select the most effective Post Types to communicate a message in your opinion (free to select several options) :	Status, Note, Offer, Link, Photo, Music, Video, Video
6. Please select the best Time Slot to communicate the message in your opinion (free to select several options) :	Link, Photo, Video
7. Please select the best Day of the Week to communicate the message in your opinion (free to select several options) :	04.00-10.00
8. Is there a month/s, when it is more relevant to post health-care related information for your wall? :	Tuesday, Wednesday, Saturday, Sunday
9. Does it make sense to update/re-post previous health-care messages on Facebook? :	July, August, November
10. Do you believe any of the below can influence on post engagement/visibility? :	Yes
Thank you for your time and your replies ! Please leave your comments below if any :	It's possible to repurpose existing content to share new messages
	All of the Above
	Great survey- good luck!

Figure 11: Team Novo Nordisk answers to the questionnaire

much higher attention to health care data in 2014 and 2015 than previous years (total and per company Facebook data statistic supports this finding). *Cancerfonden* believe in a good content and hope for wider message spread on Facebook. They consider Link and Video posts to be effective. However are not sure if re-posting old content creates value. Our previous data analysis supports *Cancerfondens* questionnaire reply: Link is the most effective post type in their case as seen in Figure 12 and they have relatively short lead time between the create and the update date. Visual posts constitute 20% of the content of this organisation. Figure 12 displays questionnaire replies by *Cancerfondens* domain experts. This finding is surprising as *Cancerfonden* has 'high average engagement rate' per post and high social media performance, which could be attributed to them posting interesting content. In spite of having a different strategy, the organization implemented it consistently. Regarding finding answers to our research propositions, research model in Figure 10 shows that strat-

Timestamp	6/28/2016 15:01:20
1. Please indicate your Facebook Wall Name	Cancerfonden
2. Why did you choose Facebook to share health-care related information?	Relative popularity of social media tool and hope for wider message spread
3. Do you have any approach to create better post visibility on Facebook?	Yes
If Yes, what is it?	Create good content and adapt it to the look of a Facebooks-post.
4. Place following post types in order of time it takes to create the message in your experience/opinion (from 1 to 8: Shortest Time to Longest Time):	I don't know how to answer this question. The time it takes to post on Facebook is not the issue when working with social media.
1	Link
2	Video
3	Photo
4	Status
5	Event
6	Note
7	Offer
8	Music
5. Please select the most effective Post Types to communicate a message in your opinion (free to select several options):	Link, Video
6. Please select the best Time Slot to communicate the message in your opinion (free to select several options):	10.00-16.00
7. Please select the best Day of the Week to communicate the message in your opinion (free to select several options):	Monday, Tuesday, Wednesday, Thursday, Friday
8. Is there a month/s, when it is more relevant to post health-care related information for your wall? :	It does not matter
9. Does it make sense to update/re-post previous health-care messages on Facebook? :	Not Sure
If Yes Why? :	
10. Do you believe any of the below can influence on post engagement/visibility? :	All of the Above
If None of the Above please comment :	Everything can influence on engagement. Hash-tag will probably never boost the engagement but with the other alternatives it depends from case to case.
Thank you for your time and your replies !	
Please leave your comments below if any :	

Figure 12: Cancerfondens questionnaire replies

egy existence does not necessary lead to good social media performance. Consequently **Research Proposition 2** was not supported in the Findings section. Since right strategy is more important. Moreover, all companies that had visual strategy and followed up on it consistently achieved good social media performance, therefore **Research Proposition 3** is supported by the findings from Figure 10. Among the worst performing companies *Terveyden ja hyvinvoinnin laitokset/National Institute of Health Finland*, *Anonymous* and *Astma-Allergi Danmark* had a strategy to increase performance, however they do not follow up on the strategy with a suitable process implementation continuously. Figure 13 displays questionnaire replies by domain experts from *Astma-Allergi Danmark*. According

Timestamp	7/18/2016 21:56:34
1. Please indicate your Facebook Wall Name	Astma-Allergi Danmark
2. Why did you choose Facebook to share health-care related information?	To establish a social media presence for Health Canada. Few other Government of Canada Departments had Facebook pages at the time. To establish a brand that would target parents of children 0-12 and complement our other marketing efforts at the time, as well as to drive to our website.
3. Do you have any approach to create better post visibility on Facebook?	Yes
If Yes, what is it?	We always use an image with our posts: "we are producing more video content as well: we keep abreast of algorithm changes with our Facebook Page (the Government of Canada has a dedicated Facebook Representative). We supplement our organic posts with sponsored posts to increase visibility when funds are allocated for advertising as part of specific social marketing campaigns.
4. Place following post types in order of time it takes to create the message in your experience/opinion (from 1 to 8: Shortest Time to Longest Time):	
1	Status
2	Music
3	Link
4	Offer
5	Note
6	Event
7	Photo
8	Video
5. Please select the most effective Post Types to communicate a message in your opinion (free to select several options):	Photo, Status, Video
6. Please select the best Time Slot to communicate the message in your opinion (free to select several options):	04.00-10.00, 16.00-22.00
7. Please select the best Day of the Week to communicate the message in your opinion (free to select several options):	Wednesday, Thursday, Saturday
8. Is there a month/s, when it is more relevant to post health-care related information for your wall? :	It does not matter
9. Does it make sense to update/re-post previous health-care messages on Facebook? :	Yes
If Yes Why? :	In case of specific outbreaks or travel advisories (food recalls, Zika). Also, if a post performed well organically, we will sometimes update it or promote it after the fact, to capitalize on its original success. Seasonal posts are also a good example of boxes of content that can be recycled/updated.
10. Do you believe any of the below can influence on post engagement/visibility? :	Hash-tags in the Text, Wording in the Text
If None of the Above please comment :	
Thank you for your time and your replies !	Thank you for including us in your survey. We would love to see a copy of the research report once it is published or available. Also, please ensure that you do not attribute our comments to our account, in your report. We respect our comments and observations to be included anonymously.
Please leave your comments below if any :	

Figure 13: Questionnaire replies by Astma-Allergi Danmark

to the questionnaire reply *Sociedad Latina de Hipertensión Pulmonar* had a strategy focused on analyzing success statistics from Facebook and they hoped for a wider message spread. They recognize Link and Note to be an effective

post type as shown in Figure 14 and consistently implement Link type content. Figure 14 displays questionnaire replies by *Sociedad Latina de Hipertensión Pulmonar* domain experts. Process implementation does not bring benefit if the strategy

Timestamp	6/29/2016 4:19:57
1. Please indicate your Facebook Wall Name	Sociedad Latina de Hipertensión Pulmonar
2. Why did you choose Facebook to share health-care related information?	Relative popularity of social media tool and hope for wider message spread
3. Do you have any approach to create better post visibility on Facebook?	Yes
If Yes, what is it?	Accomplish a board about ph adjusted to our event's calendar, annual goals and success statistics on social media.
4. Place following post types in order of time it takes to create the message in your experience/opinion (from 1 to 8: Shortest Time to Longest Time):	
1	Status
2	Event
3	Link
4	Note
5	Photo
6	Music
7	Video
8	Offer
5. Please select the most effective Post Types to communicate a message in your opinion (free to select several options):	Link, Note, Photo
6. Please select the best Time Slot to communicate the message in your opinion (free to select several options):	16.00-22.00
7. Please select the best Day of the Week to communicate the message in your opinion (free to select several options):	Tuesday, Wednesday, Thursday, Sunday
8. Is there a month/s, when it is more relevant to post health-care related information for your wall? :	It does not matter
9. Does it make sense to update/re-post previous health-care messages on Facebook? :	Not Sure
If Yes Why? :	
10. Do you believe any of the below can influence on post engagement/visibility? :	Emotions in the Text, Wording of the Title, Wording in the Text
If None of the Above please comment :	
Thank you for your time and your replies !	
Please leave your comments below if any :	We think hash-tags have potential in future but people do not use them right now

Figure 14: Questionnaire replies by Sociedad Latina de Hipertensión Pulmonar

is wrong. Therefore, **Research Proposition 4** can only be partially supported. *Anonymous* and *Astma-Allergi* organization understands the importance of visual strategy implementation. However, the majority of their post type messages are in the form of the link. *Anonymous* and *Astma-Allergi* organization has low social media performance and their case shows that process implementation is important in combination with the right strategy. Moreover, results from the Findings section (Question 4) suggest that focusing on time might lead to less successful social media strategy. Supporting statement that internal processes might affect the social media performance of an organization. **Research Proposition 1** is supported through Question 2 of the questionnaire, where the majority of social media and health care experts talk about the relative popularity of a social media domain and faster message spread.

VII. CONCLUSION

In this research work, we conducted a survey about the perceptions and practices of social media managers and experts in the area of public health. A continuation of our previous work [5] where we collected and analysed Facebook data from 153 health care organizations. Survey results based on 12% of responses was combined with the findings from our previous work: application of clustering and supervised learning algorithms on big social data from the official Facebook walls of these organizations.

Our findings reveal that organizations might not always have a strategy or a good approach towards sharing content on

social media. Even though, the majority recognise that visual content such as *images* and *video* might be more effective, would still choose *status* and *link*, as these are the least time consuming ways to communicate the message. The reason why few status type messages have high engagement could be due to the interesting and relevant content they contain. One of the primary findings from our survey suggests that health care companies flock to Facebook primarily due to its popularity among users and to achieve a faster message spread. Moreover, 61% of the respondents from our survey suggest that the wording in the textual content matters. 33% think that emotions in the text are important and therefore this study also recognises that there might be other factors, related to the attributes of the content, which are leading to high post performance. Therefore, as part of our future work, we aim to analyse content features (both for textual content and images), applied to Facebook dataset that contains 153 public health organizations. Furthermore, we also want to use qualitative methods such as surveys and interviews with social media managers to validate and expand our findings from content analysis with machine learning algorithms.

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