'STOP SPAMMING ME!' - Exploring Information Overload on Facebook

ABSTRACT

The problem of information overload on Facebook is exacerbating as users expand their networks. Growing quantity and increasingly poor quality of information on the Newsfeed may interfere with the hedonic experience of users resulting in frustration and dissatisfaction. In the long run, such developments threaten to undermine sustainability of the platform. To address these issues, our study adopts a grounded theory approach to explore the phenomenon of information overload on Facebook. We investigate main sources of information overload, identify strategies users adopt to deal with it as well as possible consequences. In-depth analysis of the phenomenon allows us to uncover individual peculiarities for identification of relevant information. Based on them we provide valuable recommendations for network providers.

Keywords

Information overload, social spamming, social networking sites, information relevance

INTRODUCTION

Participation in Social Networking Sites (SNSs) is an inseparable part of the Internet experience of many users worldwide. More than 400 million people actively participate on Facebook (2010), keeping each other updated about news and experiences. This shared information plays an essential role for the maintenance of weak ties – an important advantage SNSs have to offer (Ellison et al., 2007).

Whereas such SNSs as MySpace or StudiVZ have slightly diminishing trends of unique visitor numbers (CrunchBase, 2010), Facebook continuously manages to reinvent by closely following on the needs of its users. For example, by introducing the Newsfeed function (Facebook 2006), Facebook provides for platform stickiness and secures increasing user base (Facebook, 2010; CrunchBase, 2010). Indeed, Newsfeed dynamically delivers hands-on information on the actions of friends ensuring that a user always has something new upon login - a reason to come back and stay loyal: *"But if I did not have all this, I would log-in here, and then what?"* (Interview Quotation (Q)). A new way of communication emerges on Facebook - stream communication – allowing to involve even more users through commenting (Facebook, 2009b).

However, constant information updates on the Newsfeed are increasingly regarded as a double-edged sword. As networks grow (Facebook, 2010), it becomes difficult for users to identify the truly interesting information among the myriad of statements and activities of others reflected in the Newsfeed. As a result, many users experience ***information overload (IO)*** - a phenomenon of being unable to select relevant information. Taken that attention users are ready to invest in SNS activities is limited, perceived IO can lead to emotional distress and dissatisfaction (Eppler and Mengis, 2004). Users become less attentive, decrease their activities and in the worst case can drop out of Facebook. Such developments are highly undesirable as financial and social success of SNSs is largely dependent on user activity rates (Krasnova et al., 2009b). In its attempt to ensure more meaningful content delivered to the user, Facebook introduces the Livefeed (information in order of appearance) along with a modified version of the Newsfeed (summary of the most interesting activity) (Facebook, 2009a). However, as our study shows, users experience IO even on the Newsfeed.

Against this background, our aim is to identify when IO occurs on Facebook and what are its main sources and consequences. In order to achieve this we conduct 12 interviews with Facebook users and analyze the obtained data with grounded theory. The paper is structured as follows: first the background on the phenomenon of IO is provided; further the research methodology is described; in the next step the conceptual framework is presented which aims to explain many facets of the IO phenomenon; the paper is concluded with recommendations for the design of relevance algorithms for network providers.

LITERATURE REVIEW

IO hypothesis states that information processing performance of an individual correlates positively with the amount of received information up to a threshold point, after which rising information leads to a rapid decline in processing ability and eventually results in overload (Miller, 1956). This phenomenon is also known as an ***inverted u-curve*** of information processing (e.g. Eppler and Mengis, 2004), supported by empirical evidence in numerous studies (e.g. Sicilia and Ruiz, 2009). IO takes place when the information processing requirements (or information supply) exceed the information processing capacity of an individual (or information demand) (Eppler and Mengis, 2004). However, processing abilities differ from individual to individual, making it impossible to estimate a universal threshold level of information load

(Chen et al., 2009). Thus it becomes important to recognize the internal mechanisms by which people identify relevant information (McGuire, 1976). Qualitative characteristics of information, such as novelty, ambiguity, uncertainty, intensity and complexity, generally signal relevance of information (Schneider, 1987).

Consequences of IO include confusion, inability to set priorities and recall previous information (Schick et al., 1990), as well as dysfunctional effects in form of stress and anxiety (Eppler and Mengis, 2004). In e-commerce, authors repeatedly find evidence for diminishing decision quality when consumers are faced with superfluous information to be processed (e.g. Chen et al., 2009). However, research into specific causes and consequences of IO still remains limited (Davis and Ganeshan, 2009). In particular, the concept of IO is extremely underexplored in social media, including SNSs. This is surprising as communication overload occurring in online communities is found to impact group communication dynamics by dissipating the attention of users away from complex messages (Jones et al., 2004). On Facebook, Boyd (2008) identifies the concept of information invasion - the inability of users to process all incoming information due to limitations of time and cognitive ability resulting in withdrawal.

Against this background, we aim to uncover the dynamics behind subjective attitude towards quantity and quality of information on the Newsfeed on Facebook. Multiple studies routinely confirm enjoyment as major SNSs gratification and reason for use (e.g. Krasnova et al., 2009a) with shared and received information as its main source (Chen et al., 2000). Addressing the problem of IO on SNS is of paramount importance as growing quantity and increasingly poor quality of information on the Newsfeed may have serious consequences. In this respect, we aim to find an answer to the following research question: ***When does IO occur on Facebook? What are its main sources and possible consequences?***

METHODOLOGY

We use grounded theory methodology in order to explore IO on Facebook in an inductive manner (Strauss and Corbin, 1998). We choose grounded theory due to its ability to analyze qualitative data systematically, uncover the underlying relationships and generate a theory based on them. We justify our choice of methodology further by the absence of systematic research on IO in the context of SNS, as well as due to the general practice of investigating IO using qualitative analysis of surveys and interviews (Davis and Ganeshan, 2009). We pursue the 'Straussian' line of grounded theory, which requires absence of an a-priori theory and emphasizes the usage of a paradigm for axial coding (Matavire and Brown, 2008).

Data analysis was done on the basis of 12 semi-structured in-depth interviews of 30-45 minutes with Facebook users (all students aged 20-25; 6 male/6 female). The interviews included elements of an observation, as users were asked to log-in to their accounts and perform usual actions whereby the interviewer was asking precision questions in order to understand the reasoning behind them. Observation of real behavior, although constrained by the presence of the interviewer, allowed us to obtain deeper insights as it helped to free the respondents from the necessity to spend their cognitive resources on recall. The interviews were flexible in nature and did not specifically focus on the Newsfeed, but tried to uncover all facets of a usual Facebook experience. First, 8 interviews were conducted, during which the problem of IO was identified. In order to deepen the initial insights, 4 follow-up interviews with focus on the Newsfeed were carried out until theoretical saturation was achieved.

All interviews were video recorded, transcribed and subsequently analyzed with software tool atals.ti. On the first stage of analysis - open coding - categories and properties were identified by looking for patterns in the data in the process of constant comparison (Strauss and Corbin, 1998). In total, 78 categories were identified each possessing at least one property and respective dimensions. To illustrate the process of open coding consider the following example: *"The person that irritates me here most (category: affective attitude, property: annoyance, dimension: high) is my cousin's boyfriend (category: level of relationship, property: family members, dimension: cousin). He always puts these pictures of him in these poses: here I am with my guitar, here I am in this pose, and here is our concert… (category: amount of information, properties: frequency and detail, dimension: high)"* (Q). The next stage of analysis - axial coding - aimed to group categories into families and uncover the relationships between resulting categories and subcategories. The coding paradigm by Strauss and Corbin (1998) - including the phenomenon, its causal and intervening conditions, action and interaction strategies, and consequences - served as a milestone for the emerging conceptual framework. Most of the categories identified during open coding were included in the framework, however some have been omitted due to their low relevance to the phenomenon. The result of analysis - the conceptual model - helps to uncover the context in which IO occurs on SNSs.

RESULTS: CONCEPTUAL MODEL

Our data reveals that users increasingly experience IO on the Newsfeed: *"Usually in five of these I just have one real and the others are ads or spam"* (Q). Based on extensive data analysis we formulate a conceptual model of IO depicted in figure 1, which differentiates between: the characteristics of information and the network as ***causes*** of IO; the main ***phenomenon*** arising from different dimensions of attitude towards information on the Newsfeed; ***actions and strategies***

differing in their complexity and activity level; a set of ***intervening*** and ***driving*** conditions; and ***consequences*** of IO, which can have recurring impact on the causes. The model extends the framework of IO by Eppler and Mengis (2004) in that it clearly differentiates between attitudes, strategies and outcomes and explores the relationships between them.

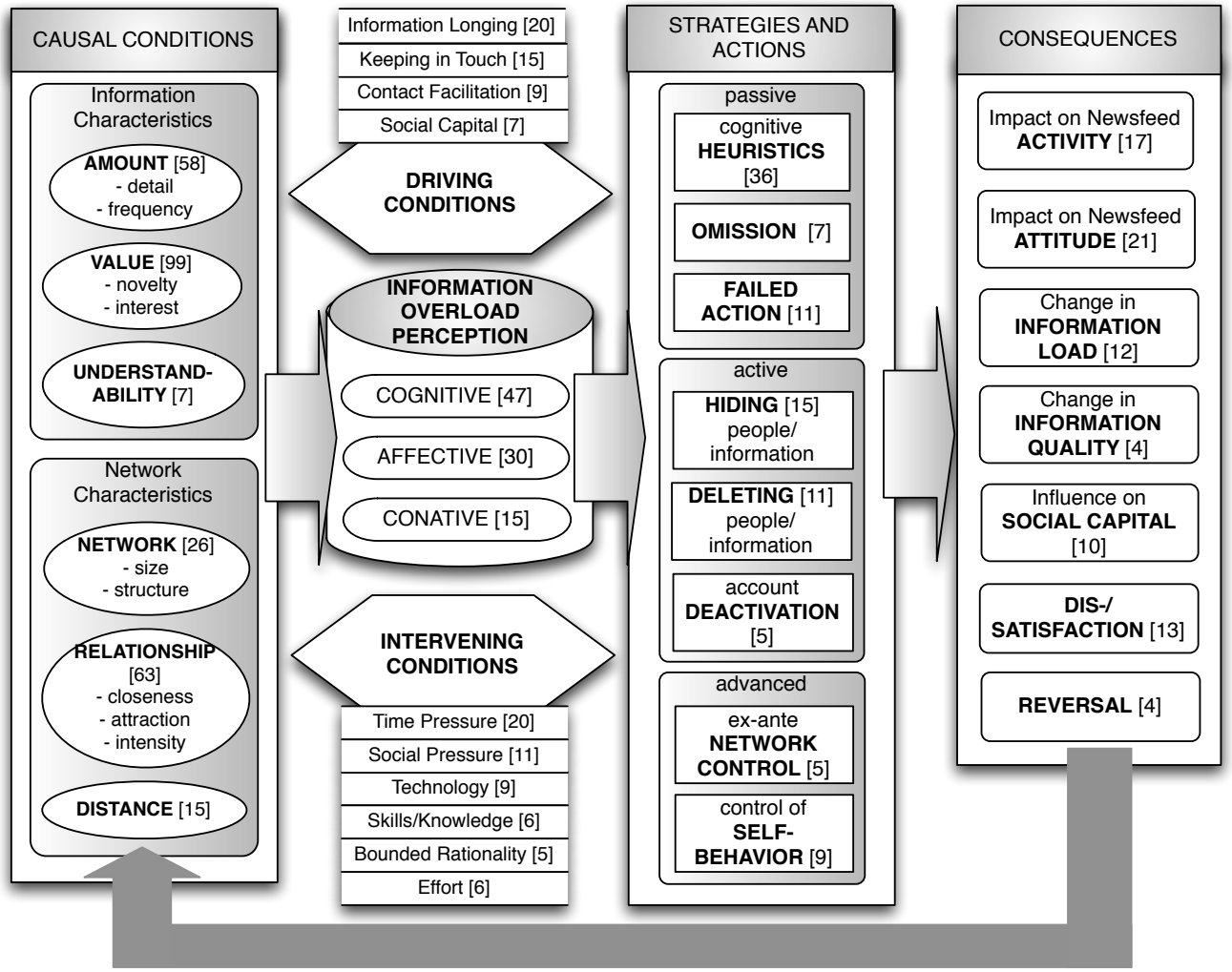

Figure 1. Conceptual Model of IO on SNSs[1]

Phenomenon: Information Overload

In this study we uncover subjective attitudes of users towards quality and quantity of information on the Newsfeed. Psychology literature differentiates between cognitive, affective and conative dimensions of attitude. Cognitive dimension refers to evaluations of the object itself, affective describes the feelings towards the object, and conative expresses a behavioral intention (Ajzen, 2005). We recognize that IO occurs when the ability of users to select relevant information is inhibited because of the high amount and low value of information on the Newsfeed.

Cognitive attitude can be identified by the evaluative statements about the information on the Newsfeed. Referring to quantity, users often feel overloaded with information: *"This is just too much"* (Q). Referring to quality, respondents mention such evaluative pairs as: 'useless – useful', 'boring – interesting', 'irrelevant – important', 'valuable – worthless'. Users are ready to invest only a certain amount of time and effort into information processing, and perceive overload if they cannot find their information timely and accordingly: *"It takes so much effort to pick out the information I am curios about, in between this and this"* (Q).

Affective attitude can be recognized by the expressions of admiration or frustration about the Newsfeed, revealed in such evaluative pairs as: 'calm – irritated', 'happy – annoyed', 'like – dislike', with most expressions having a negative connotation: *"This is really annoying to have a whole page filled with this..." (*Q).

[1] - In the figure the numbers in brackets indicate the number of times the respective concept was mentioned by participants thus hinting at the relative importance of each concept

Conative attitude refers to expressions of behavioral intentions with respect to the information on the Newsfeed, such as: *"I don't want to know"*, *"I don't want to spend my time"*, *"I should delete this"* (Q). Attitudes operate through different, but mutually influential psychological mechanisms: values shape the cognitive attitude, which in turn influences the other two dimensions (Yang and Yoo, 2004). Consider the following process of IO formation: *"This Newsfeed is somehow bad* (***affective***)*, because these things that people do fill up all the news, and the others that are really interesting, just go down* (***cognitive***)*, so I would like to filter it more* (***conative***)" (Q).

Causal Conditions

Causal conditions are conditions that lead to the development of IO (Strauss and Corbin, 1998). In our model we distinguish between information characteristics and network characteristics as major sources of IO.

Information Characteristics

We find that amount, value and understandability of information under certain circumstances can lead to perceptions of IO. Summary of possible information-based cases of IO is presented in table 1 showing distribution of quotations and examples for each category.

<table>
<tr><td colspan="2"><u>Amount</u> [14]
"You get hundred Newsfeeds every couple of hours that you don't really want to read at all"</td><td colspan="2"><u>Value</u> [28]
"She took this test and she found out that she is a little sheep on a green field… What is this? It is not even the real information, this is absolutely nothing..."</td></tr>
<tr><td><u>Detail</u> [17]
"Who is attending where, which party... Three people are now friends with five other people… This is too much for me"</td><td><u>Frequency</u> [27]
"Every second message is from Sam and most of them are not useful to me"</td><td><u>Novelty</u> [47]
"This is boring, he was at the Beatles concert, and I know it"</td><td><u>Interest</u> [24]
"James posts a lot of videos, and I watched them but I did not find them funny."</td></tr>
<tr><td colspan="4"><u>Understandability</u> [7]
"And I don't know what she is talking about, 'I feel like I never left', left what, who, when?"</td></tr>
</table>

Table 1. Information Characteristics as Sources of IO

Users are looking for immediate gratification by information best tailored to their individual perception of value and are dissatisfied when this need is not met. Information is appreciated if it has a valuable component in it, such as pictures, status updates, commented posts. However, value is highly individual-specific. Novelty and interest are major determinants of value, as recognized in previous studies (Eppler and Mengis, 2004; Schneider, 1967). Generally users look for new and important information from a wider circle of friends, engage in stalking on 'interesting' people or view content that matches their tastes.

Network Characteristics

Perceptions of overload depend on the quantitative characteristics of the network and quality of relationships with friends. Usually, not only the size and structure of one's network has an impact on IO, but also the size of friends' networks as well. By expanding the networks, the share of contacts users are truly interested in decreases and perception of IO becomes inevitable. Among the qualitative properties of relationships, level of closeness is found to be the foremost determinant of information relevance, followed by current and past communication intensity and degree of attraction. Additionally, depending on the context, geographical distance can either mitigate or exacerbate IO. Summary of possible network-based cases of information overload is presented in table 2 with distribution of quotations and examples for each category.

Dynamics between various causes of IO reveal several interesting patterns. First, combined information and network sources exacerbate the perception of IO: *"I do not want to hear that one of the people I knew 5 years ago just woke up, or somebody is tired or whatever..."*(IQ). Second, some sources can override others in their influence on IO. For example, even if combined with high relationship level, high frequency of postings can cause IO: *"This guy is my best friend in Turkey, but he is always posting this stuff like songs, or events, or when he is going to play on the radio, but I don't really pay attention as this is not important for me"* (Q).

Network	**Relationship**
Network Size [16] *"Like this girl has 700 friends and she has like hundreds of things showing here. And I don't like it"*	Level of Closeness [45] *"He is a close friend, so I trust that all this information is valuable… But this friend I hardly know, so you know…"*
Friends' Network Size [4] *"Because it's not what he posts, he was tagged, and I don't know who tagged him, probably somebody I don't know, so it's not really interesting"*	Level of Attraction [11] *"This girl is really fun, so I would probably see what's going on… she's a nice person, I like her"*
Network Structure [6] *"It's like my work colleagues, my classmates, they are my other friends and I really don't look forward to know about them"*	Communication Intensity [7] high**:** *"I check mostly the people I interact with everyday…"* low: *"I know what my classmates are up to more or less, we attend the same parties, there's not that anxiety to see…"*
Geographical Distance [15] low: *"This could be more interesting, because she is in my city…"* high: "*Important is to get updates from friends who live far away*"	

Table 2. Network Characteristics as Sources of IO

Intervening Conditions

Intervening conditions limit the impact of causal conditions on the phenomenon and thus interfere with actions and strategies (Matavire and Brown, 2008). In our study ***time pressure***, ***social pressure***, ***bounded rationality***, ***effort***, ***skills and knowledge***, as well as ***technology*** can either exacerbate the perception of overload and call for more urgent and radical measures, or moderate it and thus constrain the strategic moves. For example, time pressure can change perceptions of information relevance: "*On a hectic day I wouldn't follow the xyz I'm not really interested in… But when I have my holidays I just go and look at people*" (Q).

Driving Conditions

Driving conditions generally have a mitigating influence on the perception of IO, and thus constrain actions and strategies. Consistent with previous findings, factors such as information longing (Boyd, 2008), keeping in touch and facilitating contact (Krasnova et al., 2010), social capital (Ellisson et al., 2007) emerge as relevant driving conditions. For example, information longing can diminish the perceptions of overload: *"I have a lot of friends, and I barely communicate with them. It is just for convenience, you always get the information…"* (Q). Timely information facilitates contact and assists in obtaining social capital referring to value that stems from relationships with others: *"Maybe if I read something interesting like this, I will contact them and ask for help…"*(Q).

Strategies and Actions

In order to deal with information overload, users apply different information processing strategies. Whereas passive strategies do not demand a lot of effort, active strategies require user involvement and have a direct impact on the network. Following continuous experiences with IO, advanced strategies can be employed. Table 3 summarizes identified strategies and presents example quotations.

Cognitive heuristics, or relying on simple persuasive cues to identify relevant information, is usually employed in conditions of low motivation and limited ability to process the incoming information, as supported by evidence (Sicilia and Ruiz, 2009). Depending on individual preferences and experience, Facebook users rely on friend-based, distance-based, interest-based, self-centered or explicit cues. Another important strategy – hiding – effectively helps overcome the problem of social pressure as opposed to deleting a person: *"If I delete him, he might think 'he does not want to know me anymore or what', but that function 'hide' is great"* (Q). A logical solution to IO would be to promote self-responsibility for posting behavior, but, unfortunately, is hardly implementable: *"It's useless. Even if I don't share it, somebody else would share it two days later, or maybe shared one month earlier*" (Q).

passive	**Cognitive heuristics**	Friend-based*: "Usually I start with checking my close friends, or the people I like most... And then I check what else is going on"*
		Distance-based: *"It would be the other way round when I am in India, I would definitely give preferences to my friends who are in Germany because you want to know more about them since you're not with them"*
		Information-based: *"This could be something more interesting because she is talking about classes or some event they are planning, so it's interesting for me to look at it"*
		Explicit: *"I have my criteria, I will not click on the videos, especially if they are longer than one minute"*
		Self-centered: *"I'm going through the whole as I said, but not as much as I check and expect comments to my pictures"*
	Omission	*"It's boring. I just start sometimes, and I don't even finish, because I am not interested in this guy, what he is doing"*
	Failed action	*"I did not hide all those application things, although they don't apply to me at all"*
active	**Hiding people/information**	*"I just go and hide the people because I really don't want updates about them"*
	Deleting people/information	*"And what I also regularly do, I check my friends list and I delete people "*
	Account deactivation	*"I can deactivate it, so it can keep me from logging back in, because some things really irritate me, especially if you see them every day"*
advanced	**Ex-ante network control**	*"I want to keep the number of people limited, because then in the Newsfeed you have lots of stuff from people you don't even know"*
	Control of self-behavior	*"I try not to share that much information, so that it's not polluted"*

Table 3. Strategies and Actions of Dealing with IO

Various intervening and driving conditions complicate the implementation of strategies. For example, intentions usually remain unfulfilled due to absence of necessary skills and unwillingness to invest effort: *"I do not hide them. I do not know, how that works. Maybe that would be a good idea. I am too lazy"* (Q). On the positive side, information longing can constrain account deactivation: *"Sometimes it is getting on my nerves so much that I think of deleting my account, but then I am too curious about the others"* (Q). Bounded rationality leads users to rely on certain heuristics when weighing the benefits and costs of adding another contact to their list: *"If I don't like the person, of course I don't accept, but if I don't care, or I just know him, I accept… You do not know how much he will post anyway"* (Q) – thus complicating the ex-ante network control.

Consequences

Action and interaction strategies may lead to a set of positive or negative, direct or indirect, latent or vivid outcomes. Failure of strategies to deal with IO usually leads to reduced levels of activity on the Newsfeed: *"I realized that I don't often go through all this, only if I have nothing else to do*" (Q). Repeating inability of the Newsfeed to provide users with relevant information changes user attitudes to the Newsfeed and urges them to turn to more traditional means of communication: *"I don't really pay attention to the Newsfeed anymore, because if there is something very important, they can contact me directly to make sure I get the message"* (Q). The disregard of the Newsfeed as a reliable source of information tarnishes its intended intermediary role: being less personal than a direct message and more private than a general blog.

Action and interaction strategies can exert indirect influence on individual social capital. When users delete or even hide

others, the probability to obtain social capital in the future drastically decreases: *"If I am interested in this person, if I think that I will connect them again, then I don't hide. Only the people from the history, which I am not interested after all, but still spamming too much"* (Q). However, anticipation of future benefits and needs is usually constrained by incomplete information and bounded rationality.

Even though perceived change in information load can be achieved as a result of several strategies, information quality rarely improves: *"After you cleaned up your network did you feel the difference? - Not really. Well, maybe there is less posting, but still kind of like yeah…"* (Q). Ironically, even after action reversal users often face the same IO: *"I want to see what is going on, maybe something new happened, then I activate it back and after two minutes I realize that nothing new happened, same people writing the same useless messages around"* (Q). Finally, inability to cope with the network may result in feelings of lost control and dissatisfaction: *"I have like 500 friends... It is a lot, way too much to know who they are…"* (Q).

MANAGERIAL IMPLICATIONS

Individual information filtering tools to relieve IO (Chen et al., 2009) already exist on Facebook, which allow to differentiate users into groups and set preferences for information presentation. However, users rarely utilize them due to ignorance, lack of skills, constraints of time and unwillingness to undertake effort: *"I would not put so much effort in creating those groups, I am lazy…"* (Q). In fact, users desire tools that help them filter information with least effort possible (Ariely, 2000), urgently calling for some sort of intelligent filtering of the information on the Newsfeed without user interference: *"If they would introduce some kind of relevance measurement, which would work automatically, I don't want to be involved in this"* (Q). Acknowledging the fact that Facebook has already done first steps in this direction by differentiating between Newsfeed and Livefeed, more changes are needed to ensure relevant content is delivered to the user at all times.

Design of intelligent filtering mechanisms rests on the problem of identification of individual perceptions on what is considered relevant at a specific point in time. Our study shows that relevant information usually originates from: 1) close friends at different geographical distances; 2) wider circles of friends with matching interests; and 3) any friends who share new and important information. User browsing and communication history can deliver valuable insights on what was considered relevant in the past and help predict future attitudes. Moreover, certain static information such as basic profile, fan pages and group memberships can be used to identify preferences. Location can be inferred from the profile and through usage of SNSs on mobile devices. In order to determine the novelty of information, such 'buzz' words could be searched for as: 'moving', 'marriage', 'daughter/son', 'new', etc. Based on these insights complex machine learning algorithms can be designed to ensure more relevant information is provided to users.

CONCLUSION

The study identifies the context in which IO occurs on Facebook by applying grounded theory methodology. We find that users themselves are a major source of IO, as they maintain large networks of loosely related and emotionally distant acquaintances. Being unable to anticipate and control the actions of others, as well as constrained by network functionality, users can hardly deal with IO on the individual level. This calls for global measures on the part of the provider. By learning from past behavioral patterns and integrating user preferences, intelligent filters could provide SNS users with relevant information and thereby improve their experience on the platform. The follow-up study should include practical solutions for the design of such mechanisms and as such offers an exciting venue for further research.

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