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Unfriend or ignore tweets?: A time series analysis on Japanese Twitter users suffering from information overload

Yuichi Sasaki ^{a,*}, Daisuke Kawai ^b, Satoshi Kitamura ^a^a Department of Communication Studies, Tokyo Keizai University, 1-7-34 Minami-cho, Kokubunji-shi, Tokyo 185-8502, Japan^b Interfaculty Initiative in Information Studies, The University of Tokyo, 7-3-1 Hongo, Bunkyo-ku, Tokyo 113-0033, Japan

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ABSTRACT

In recent years, with increased opportunities to post content on social media, a number of users are experiencing information overload in relation to social media use. This study addresses how Japanese Twitter users suffering from information overload cope with their stress, focusing on two actions: (1) The “unfriending” activities and (2) The changes in tweet processing methods. Objective data, such as numbers of friends, were collected through Twitter’s open Application Programming Interfaces (APIs), and subjective data, such as perceived information overload and tweet processing methods, were collected through a web-based survey as a panel dataset ($n = 778$). The results demonstrated that although users experience information overload, they continue to increase their number of friends, and that the users who experience information overload modify their usage habits to avoid seeing all received tweets. In short, users do not choose a strategy to reduce the absolute number of received tweets, but only a strategy that involves changing the processing method of the received tweets.

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1. Introduction

By 2020, the total amount of digital data generated all over the world is expected to reach 40 ZB, fifty times as much as that in 2010 (Gantz & Reinsel, 2012). The amount of digital data accumulated in the databases of major companies is expected to increase to as much as 8.6 ZB in 2015, up from 1.2 ZB in 2010. 91% of these data are considered to be unstructured data, and it has been revealed that 68% of these were supplied by consumers (Smith, 2014). One of the reasons why the amount of data generated by the consumers is increasing is because the Web 2.0 Service (O’Reilly, 2005) has spread widely and rapidly (Bawden & Robinson, 2009). People are uploading data such as texts, photos, and videos to user-centered Internet services more frequently than before. These services have been given the term “social media” and accessing and uploading has become a popular daily practice. In the United States of America in 2013, 73% of adults that used the Internet used social media and 42% of these were users of multiple social media

(Duggan & Smith, 2014). In Japan in 2014, 42% of people over six years old, and 65% for the age of twenties, utilized social media (Ministry of Internal Affairs and Communications, Japan, 2014).

A number of studies have shown that a certain proportion of social media users believe themselves to be experiencing information overload (Bontcheva, Gorrell, & Wessels, 2013; Bucher, Fieseler, & Suphan, 2013; Kwak, Chun, & Moon, 2011; Laumer, Mailer, & Weinert, 2013; Sasaki, Kawai, & Kitamura, 2015). Lee, Son, and Kim (2016) reported that three stressors of overload (i.e., information, communication, and system feature overload) influence SNS fatigue. Lee et al. (2016), measured all variables such as SNS fatigue, three stressors, and SNS characteristics (i.e., information characteristics and system characteristics) by analyzing subjective answers of survey respondents. This was because they approached their structural analyses of SNS fatigue by referring to the transactional theory of stress and coping (TTSC). In contrast with their approach, the study herein applies a combination of the “classic view” and the “subjective view” (Eppler & Mengis, 2004) of information overload, both of which have been discussed in the academic discipline of business administration. In short, we measure information overload through the subjective answers of survey respondents and we consider that not only the internal psychological processes but also the amount of information received influence the perception of information overload. Studies

Abbreviations: API, Application programming interface; IOL, Perceived information overload; MOU, Months of use; NOF, Number of friends; RRR, Relative risk ratio; RT, Retweet; TPM, Tweet processing methods.

* Corresponding author. Tel.: +81 42 328 7920.

E-mail address: yssk@tku.ac.jp (Y. Sasaki).

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taking into account the number of friends on Facebook (Laumer et al., 2013), or on Twitter (Kwak, Moon, & Lee, 2012, 2011; Sasaki et al., 2015) as the determinants of information overload can be considered as applying this approach.

Since large numbers of social media users are enjoying increased opportunities to send messages, these users are becoming exposed to information overload. To cope with this situation, a content recommendation algorithm has been introduced as a default setting on the Facebook homepage, *News Feed*, and this automatically reduces the level of content and enhances the relevancy of the content displayed on the page (Facebook, 2011). Namely, the system characteristics influence information characteristics on Facebook. Twitter also recognized users' IOL (Information overload), and its users are now able to arrange tweets by those they wish to view first using the "lists" feature (Stone, 2009). However, as the Twitter homepage, *Timeline*, does not employ a contents recommendation algorithm, it shows all of the tweets posted by users' friends,¹ the most recent at the top.² Specifically, Twitter prepares an environment where users can use their own initiative to control the amount of information to be processed. Thus, two strategies to reduce their perceived information overload on Twitter can be logically considered. The first is that users reduce the absolute quantity of tweets received, and the second is to effect a change in the method of processing tweets received. The users control the posting side for the former, and the receiving side for the latter.

The importance of this study is defined in relation to previous studies into the propagation of information that mainly focused on Twitter. In these studies, researchers revealed the actual status of information spreading by analyzing large amounts of user log data (Bakshy, Hofman, Mason, & Watts, 2011, 2012; Bernstein, Bakshy, Burke, & Karrer, 2013; Cha, Haddadi, Benevenuto, & Gummadi, 2010; Goel, Watts, & Goldstein, 2012; Kwak, Lee, Park, & Moon, 2010; Lerman & Ghosh, 2010). These studies are important as media studies and are also very useful for those in marketing businesses to acquire the amount of dispatched information estimated by these models. However, as it is quite impossible to obtain the variables of users' tweet processing methods by analyzing log data, these studies were forced to ignore this aspect. If a user RTs (retweets) a tweet, it means that the user has read the original tweet. However, it is unclear how many tweets and RTs are read by the receiving users. On the contrary, this study focuses on users' tweet processing methods and, through conducting panel data analysis, the importance of users' tweet processing methods is verified. It is reasonable to believe that information overload can be experienced on social media. Therefore, the importance of understanding users' tweet processing methods, and how much information is not accessed by users on social media is increasing.

Thus, this study attempts to answer the following research question.

RQ: How do users of SNS, which do not have an algorithm to reduce the amount of information users receive, manage their perceived information overload?

In examining this research question, we conducted a time series analysis on Twitter users who consider themselves to be suffering from information overload. A small number of studies have

analyzed (dis)continued use of Twitter, citing uses and gratifications framework (Coursaris, Van Osch, Sung, & Yun, 2013; Johnson & Yang, 2009; Liu, Cheung, & Lee, 2010). A study on an improvement of Facebook algorithms (Koroleva & Röhler, 2012) has also been conducted; however, we cannot find any study conducting time series analysis on SNS users who are perceiving information overload.

2. Related works and hypotheses

2.1. Information overload

The term "information overload" became widely known after it was used by Toffler (1970) in his book, *Future Shock*. The primary interest of disciplines such as management information systems, organization science, and consumer research is how the decision making of an individual varies with the amount of information to which he or she is exposed. The "classic" definition of information overload was explained using the following formula: information processing requirements > information processing capacities (Eppler & Mengis, 2004). The terms "requirements" and "capacities" in this definition can be measured in terms of available time. "Requirements" refers to a given amount of information that must be processed within a certain period. Researchers have found a positive correlation between the quality of an individual's decisions and the amount of information he or she receives, however, this is only true up to a certain amount of information and, if further information is provided beyond this point, the quality of decisions will rapidly decline (Chewning & Harrell, 1990; Schroder, Driver, & Streufert, 1967). This finding is connected to the "classic" definition of information overload.

Another perspective defines information overload based on subjective experience. In this "subjective" view (Eppler & Mengis, 2004), the crucial factors of information overload extend beyond the amount of information received, also including feelings of stress, confusion, pressure, and anxiety that may be experienced by the individual who is exposed to the information (Haksever & Fisher, 1996; Malhotra, 1982; O'Reilly, 1980). Accordingly, proponents of this view have used interviews or survey methods to measure the subjective feelings of information recipients, as opposed to experiments to measure the load time of information processing. In relation to consumers' information processing abilities, the amount of information processing an individual can cope with differs depending on the consumer's amount of prior knowledge and experience (Bettman & Park, 1980; Payne, Bettman, & Johnson, 1988). In addition, significant individual differences were found in the subjective efforts involved in information processing (Bettman, Johnson, & Payne, 1990). The study herein applies a combination of the "classic view" and the "subjective view" (Eppler & Mengis, 2004) of information overload. In short, we measure information overload through the subjective answers of survey respondents and, concurrently, we consider that the amount of information received influences the perception of information overload.

2.2. Information overload on social media

Some researchers have focused on information overload on social media. Bontcheva et al. (2013) reported that 21% of British SNS users and 34% of British Twitter users feel that they receive too much content from the services. Sasaki et al. (2015) reported that 27% of Japanese users who use Twitter daily feel that they receive too many tweets almost everyday. These reports show that a certain proportion of social media users are suffering from information overload.

¹ In this paper, we use the word 'friend' for an account that a user is following instead of the term "following," which appears on Twitter's site. This word usage is based on the commands for Twitter's developer open APIs described in the methodology section.

² From August 2014, Twitter began adding certain tweets onto users' timeline that were not posted by the users' friends (Ong, 2014; Twitter, 2014). However, at the time our two surveys were conducted, users were only exposed to tweets from their friends.

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