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# THE COST OF SHARING: THE EFFECT OF SHARING INCLINATION ON INFORMATION OVERLOAD

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*Research*


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## Abstract


*Current research on social media emphasizes that sharing information comes with great benefits to the individual who shares. In this paper, we adopt a different perspective by arguing that individuals with a high inclination to share information through social media also incur substantial cognitive costs. In particular, we hypothesize that during two phases of the sharing process, information appraisal and asynchronous interactivity, the sharer is confronted with information processing requirements that considerably draw on his or her limited cognitive capacity and thus increase the likelihood of experiencing information overload. We furthermore argue that this effect is more pronounced for individuals with a high compared to low need for cognition because they feel particularly motivated to process information. Our hypotheses are supported by a large survey-generated dataset (n=30,392) from six countries. We additionally find a positive direct effect of need for cognition on information overload. We discuss contributions to conversations on information sharing, information overload, and need for cognition research in the context of social media and we highlight managerial implications of our findings.*



*Keywords: Information overload, Information sharing, Need for cognition, Social media*

# 1 Introduction

With the advent of social media technologies, the sharing of information has more than ever gained prominence in every-day life. As Kaplan and Haenlein (2010) proclaim, "social media are all about sharing and interaction" (p. 66). Indeed, the largest social network site alone, Facebook, has over 1.4 billion members sharing at least 4.7 billion pieces of content every day (Facebook, 2013, 2015). In past years, scholars have greatly emphasized the wide range of benefits that are derived from sharing information with others through social media. Information sharing has, for instance, been found to help individuals build stronger interpersonal relationships (Chai et al., 2011; Lee and Ma, 2012; Ma et al., 2014; Nov et al., 2010) and gain social status and reputation (Hsu and Lin, 2008; Kim, 2016; Lu and Hsiao, 2007; Pi et al., 2013; Taddicken, 2014; Ting et al., 2014).

However, while the benefits of information sharing are well explored, scholars have devoted considerably less attention to studying the potential disadvantages that individuals with a high sharing inclination might incur. In addition, when doing so, such research has almost exclusively focused on costs for organizations. It has not focused on the cognitive costs for individuals for sharing information through social media. The disadvantages that have been studied to date can be broadly categorized into two types: one pertaining to the time and effort that have to be invested to share information and the resulting opportunity cost (Haas et al. 2015; Hew and Hara 2007; Sun et al. 2014), and the other based on the public goods dilemma (Dawes, 1980; Thorn and Connolly, 1987), according to which sharing of information items may result in a loss of knowledge power and competitive advantage (Casimir et al., 2012; Gray, 2001; Kankanhalli et al., 2005).

In this paper, we aim to address this gap by integrating research on information sharing with the literature on information overload to argue that a critical caveat of a person's inclination to share information through social media is information overload. The concept of information overload has repeatedly emerged in the social media literature as a relevant potential adverse consequence of social media use. A great number of scholars have suggested that social media users may suffer from information overload as a result of the large network of social connections they maintain on these platforms and the corresponding influx of messages which is unstructured and of varying quality (Gomez-Rodriguez et al., 2014; Hiltz and Plotnick, 2013; Laumer and Weinert, 2013; Maier et al., 2012; Shrivastav et al., 2012; Weinert et al., 2012; Yates and Paquette, 2011). As Koroleva et al. (2010) put it for the case of Facebook: "information overload occurs when the ability of users to select relevant information is inhibited because of the high amount and low value of information " (p. 4). The mentioned prior studies suggest the great relevance that information overload effects have in the context of social media. However, prior research deals with overload only from the perspective of the information recipient who is exposed to shared information through social connections, not the person who shares such information.

Our paper expands this perspective by arguing that information overload may also occur when sharing information through social media technologies. We construct a theoretical model of the two phases immediately preceding and following the act of sharing. Before sharing, individuals proactively scrutinize whether a given information item is worth sharing, a process we term "information appraisal." After sharing, they cognitively process the feedback on the shared information, which is made possible by the interactivity of today's social media technology (Boyd and Ellison, 2008; Hiltz and Turoff, 1985; Jones et al., 2004; Kaplan and Haenlein, 2010). Both the information appraisal and interactive feedback processing activities require expending substantial cognitive effort. Since individuals' cognitive capacity is limited (Lang, 2000; Miller, 1956), expending such cognitive effort in information processing activities may, in turn, lead to information overload due to inadequate resources for processing the mental load from the information (Cook, 1993; Eppler and Mengis, 2004; O'Reilly, 1980; Payne, 1976). We hence suggest that the more individuals are inclined to share information, the more likely they are to experience information overload.

As a major extension of our central hypothesis, we incorporate the psychological literature on individuals' need for cognition (NFC), i.e., their intrinsic motivation to cognitively engage with information (Cacioppo et al., 1996). The concept of need for cognition may be particularly relevant in a social media context as previous research on a related concept, need for orientation, has suggested that it serves as a predictor of information overload for Twitter users (Lee and Oh, 2013). In our study, we propose that the effect of sharing inclination on information overload is more pronounced for individuals with a high NFC because they can be expected to process more information and thus more likely reach cognitive saturation compared to low-NFC individuals.

We test our hypotheses with data gathered in 2013 from 30,392 survey respondents from six countries. Both data analysis on the full sample and a robustness test on a smaller subsample (n=4,000) support our hypotheses. Additionally, we find that NFC also increases the likelihood of information overload irrespective of the individual's sharing inclination.

Our paper makes three major contributions. First, to the best of our knowledge, our study is the first to explore the relationship between information sharing inclination and information overload in the context of social media. The current literature on information sharing has provided much insight into the benefits for the sender and the receiver (Kim, 2016; Lee and Ma, 2012; Lu and Hsiao, 2007; Ma et al., 2014). Research on cognitive costs and information overload, in turn, carefully outlines how limited cognitive capacity negatively affects individuals, but focuses on fairly passive information recipients, thereby neglecting individuals with a high inclination to actively share information using today's social media technologies. What remains largely underexplored is the potential negative impact of sharing on the information sender. Exploring this impact is vital, however, as it directly relates to the core interactive features of the current social media environment (Boyd and Ellison, 2008; Kaplan and Haenlein, 2010), which has undergone a paradigm shift moving from relatively few institutionalized content providers to a state in which every individual Internet user may actively engage in information creation and sharing on platforms such as Twitter (Shi et al., 2014). With this paper we thus address a crucial gap and extend the current realm of the literature at the intersection of information sharing and information overload.

Second, we advance the theoretical understanding of information sharing. Specifically, we draw on established theories to develop a model that specifies the phases of the information sharing process in the digital age. By breaking down the different elements of the sharing process, we can isolate and thus better understand the cognitive demands and their potential adverse effects to which individuals are exposed in the process of sharing. As is typical in attempts to understand particular cognitive processes that are not easily observed, we do not specifically measure the two steps in our model. We do, however, test hypotheses about implications of the model pertaining to information overload. Third, we add to the literature on NFC in the context of information systems by providing empirical evidence for one of its potential costs, an issue which has received growing attention during the last decade (Petty et al., 2009).

The remainder of the paper is organized as follows: First, we review the scholarly literature on information sharing. Based on this, we develop our hypotheses with regard to information overload and need for cognition. We then outline our methodological approach and summarize the results. Finally, we discuss the implications of our work and our contributions and outline further avenues for research.

## 2 Information Sharing Inclination and Its Benefits

The focus of this paper is on an individual's information sharing inclination. We define *information sharing inclination* as an individual's positive attitudes and intentions towards digitally sharing information. Information refers to items such as news, opinions, knowledge, or personal experiences. Information can either be generated by the sharer or forwarded from another source. We choose such a broad definition to reflect prior scholarly research which focuses on individuals' intentions (Bock et al., 2005; Chow and Chan, 2008; Lee and Ma, 2012) and considers a wide array of social media contexts such as sharing news in social media (Lee and Ma, 2012), updating weblogs (Lu and Hsiao, 2007), and posting photos on online social communities (Nov et al., 2010).

While research on information sharing has been well-established in the organizational and psychological literature for a long time, it has gained even greater relevance with the advent of social media technologies. Traditionally, individuals passively consumed institutionally-created media content via broadcast media such as television or radio (Lee and Ma, 2012). Users were limited in generating content or interacting with and giving feedback to the content provider (Ha and James, 1998). In contrast, today's social technologies allow for more flexible and much faster, even real-time, information dissemination and exchange (Shi et al., 2014). They facilitate the sharing of and exposure to a wide variety of niche information (Lu and Hsiao, 2007).

Most scholars view sharing as a positive phenomenon which provides substantial benefits and should thus be encouraged. With respect to social media, scholars have predominantly highlighted three types of benefits: First, sharing facilitates social relationships. Individuals interact with other members of social media networks because it may lead to the creation or strengthening of interpersonal relationships which they consider valuable. A number of studies have shown such expected benefits strongly motivate individuals to share through social media (Chai et al., 2011; Lee and Ma, 2012; Ma et al., 2014; Nov et al., 2010). Second, individuals expect these interpersonal relationships and the interactions triggered by sharing information to enhance their social status and personal reputation (Hsu and Lin, 2008; Kim, 2016; Lu and Hsiao, 2007; Pi et al., 2013; Taddicken, 2014; Ting et al., 2014). And third, expectations of reciprocity may constitute a benefit of information sharing in social media interactions (Chai et al., 2011; Cheng and Chen, 2011).

While our study does not intend to call into question the substantial benefits from sharing, we do suggest that it comes with costs, particularly for the individuals who share. Such costs for individuals have been less thoroughly explored in academic research to date. In particular, research has been lacking with respect to social media. Indeed, existing studies have largely focused on the costs of digital information sharing to organizations such as the actual attention, time, and effort which have to be allocated to codify and share information as well as the resulting opportunity cost, i.e. resources that potentially could be used for other value-enhancing activities (Haas et al. 2015; Hew and Hara 2007; Sun et al. 2014). A second dimension of costs is based on the public goods dilemma (Dawes, 1980; Thorn and Connolly, 1987) suggesting that individuals who share may give up the knowledge power and competitive advantage that the possession of such information entails within the respective organizational context (Casimir et al., 2012; Gray, 2001; Kankanhalli et al., 2005).

# 3 Information Overload

*Information overload* is generally defined as a condition in which information processing requirements exceed the processing capacities of an individual (Eppler and Mengis, 2004). It occurs because humans only possess a limited capacity for cognitively processing information. In his early influential study, Miller (1956) suggested that approximately seven (plus or minus two) information items can be processed and retained at the same time. Other authors have shown that this limited capacity model is also applicable in a media context (Lang, 2000). Specifically, individuals allocate a finite set of processing resources to encoding, storing, and retrieving media messages. When the resources required to properly process the information outweigh individuals' available cognitive resources, their processing suffers and information overload ensues. Overload occurs when the quantity of information exceeds the individual's capacity to process it (Galbraith, 1974; O'Reilly, 1980). It can be further exacerbated by information characteristics such as quality, usefulness, ambiguity, and complexity (Grisé and Gallupe, 1999; Keller and Staelin, 1987; Plumlee, 2003; Schneider, 1987).

Information overload is particularly detrimental because it triggers negative subjective feelings, which, in turn, influence the ability of individuals to best utilize the received information. Overloaded individuals suffer from cognitive strain, stress, technostress, and pressure (Farhoomand and Drury, 2002; Malhotra, 1982; Schick et al., 1990; Speier et al., 1999; Tarafdar et al., 2007), as well as lower levels of motivation and satisfaction (Grisé and Gallupe, 1999; Jacoby, 1984). As a result, they may ignore relevant information, have a greater tolerance for errors, conduct analyses more superficially, and make poorer decisions overall (Farhoomand and Drury, 2002; Jacoby, 1984; Malhotra, 1982; Schultze and Vandenbosch, 1998; Sparrow, 1999; Speier et al., 1999).

Scholars have suggested that information overload may play a substantial role in social media environments. Koroleva et al. (2010) suggest that Facebook users are exposed to information overload due to the large networks of connections they maintain. In a similar vein, Shrivastav et al. (2012) find that Facebook users are prone to information overload the more frequently they visit the platform. In another study of Facebook users, Maier et al. (2012) examine the related concept of social overload. They find that some users are prone to experiencing social overload when being exposed to a large number of messages from their connections on the platform. As a result, they express dissatisfaction and discontinuance intentions with the platform to a larger degree. Likewise, for Twitter, Gomez-Rodriguez et al. (2014) examine information processing and forwarding behavior and show that Twitter users experience information overload beyond a certain number of incoming tweets from the users they follow. Two other studies (Hiltz and Plotnick, 2013; Yates and Paquette, 2011) specifically examine overload through social media with respect to emergency and crisis management situations where a large amount of information may simultaneously flow through social media channels.

However, to date such studies have largely focused on potential overload effects affecting individuals who receive, not share, information. We are not aware of any study which examines whether the actual sharing of information through social media may likewise lead individuals to experience information overload. This paper aims to address this gap.

# 4 Linking Information Sharing and Information Overload

To explicitly link information sharing inclination and information overload, we first develop a model of the information sharing process, which is depicted in Figure 1. At the heart of our theorizing are the two phases that immediately precede and follow the act of sharing: information appraisal and asynchronous interactivity. We argue that these two phases can be cognitively demanding and thus may lead to information overload. The higher individuals' inclination to share information, the more frequently they go through these two phases and, thus, the more likely they are to experience information overload.

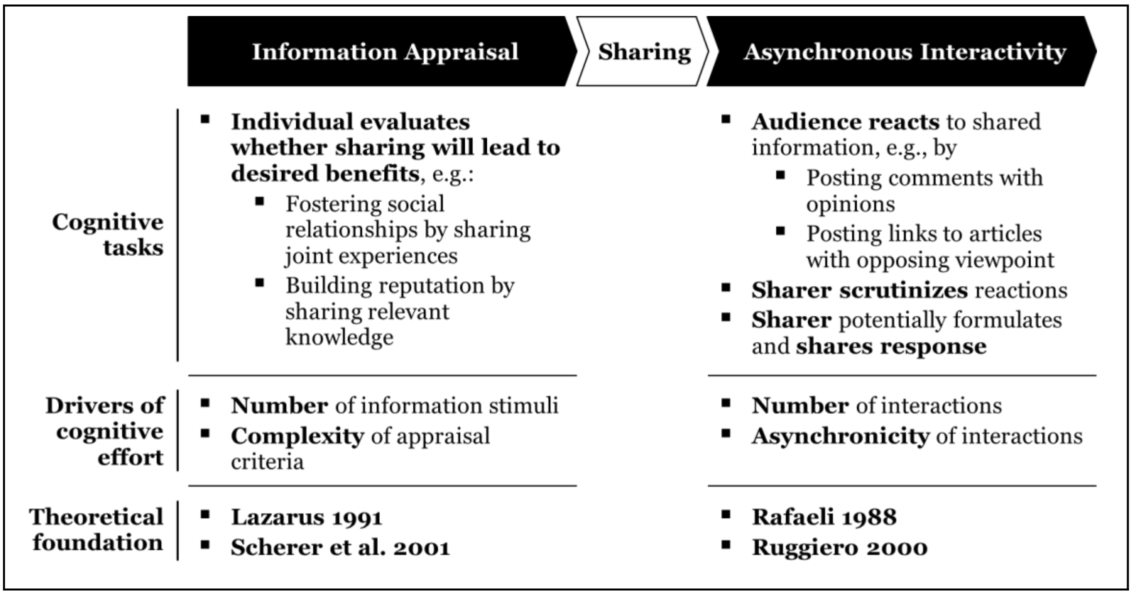


*Figure 1. Drivers of Cognitive Effort During the Process of Sharing*

## 4.1 Information appraisal

In deciding whether or not to share a given piece of information, individuals first evaluate whether a specific information item is worth sharing. We refer to this evaluation as information appraisal. As outlined above, individuals are more likely to assess a piece of information as worthy of sharing if they expect that such sharing brings about desired benefits, such as new or enhanced social relationships and reputation. Individuals can thus be expected to consciously or unconsciously assess information items according to a set of appraisal criteria (e.g., relevance and novelty for an intended audience) and evaluate whether the sharing of such information items may help them attain the desired benefits.

Our concept of information appraisal builds on the well-established theory of cognitive appraisal which states that individuals continuously appraise and actively make sense of their environment and events to which they are exposed (Lazarus, 1991; Scherer et al., 2001). They cognitively assess how physical and social environmental factors and events affect their well-being and how to best react to them. Likewise, in an information environment, individuals are not just passive consumers of media content. Rather, they also actively construct meaning from and interpret the information to which they are exposed (Fiske, 1987; Garrison, 1988). For example, they assess and filter information to distinguish between relevant and non-relevant items when navigating everyday media sources (Savolainen, 2007). Such content selection is crucial given today's proliferation of low-quality, user-generated content, especially in social media (Bawden and Robinson, 2008). The process of content selection in today's media environment implies that individuals must assess the relevance of an increasing number of information stimuli received from a myriad of sources.

Our model suggests that the likelihood of experiencing information overload is predicted not only by the number of information stimuli to be assessed during the phase of information appraisal, but also by the complexity of individuals' appraisal criteria and, ultimately, the individual's inclination to share information. The required cognitive effort is a function of the complexity of individuals' appraisal criteria. The more complex the appraisal criteria for assessing information stimuli, the greater the cognitive load and thus the subsequent likelihood of experiencing information overload. Furthermore, individuals with a high inclination to share information more often go through the information appraisal phase and thus more strongly engage with information stimuli as they proactively assess their worthiness for sharing. This process is cognitively demanding and draws from the limited mental resources available (Lang, 2000). As a consequence, individuals with a high inclination to share need to expend a greater amount of cognitive effort compared to individuals who have a low inclination to share and a propensity to merely consume information.

## 4.2 Asynchronous interactivity

Once individuals have shared information, they enter a second phase, namely that of asynchronous interactivity. In this phase, individuals receive audience reactions to the information they have shared. These reactions may include comments with opinions or postings with links to articles that carry an opposing viewpoint. Sharing individuals then scrutinize these reactions and potentially formulate and share responses.

Such interactivity is one of the core elements that distinguishes digital social media from traditional media (Ruggiero, 2000) and has been conceptualized as the extent to which communication exchanges are related to previous transmissions or messages (Rafaeli, 1988). Importantly, what often differentiates interactions via social media from interactions carried out face-to-face is their asynchronicity, or the fact that messages can be staggered in time (Ruggiero, 2000). In social networks such as Facebook or Twitter, such asynchronous interactivity is reflected in the ability to provide comments, "likes" or "retweets" as reactions to shared information at any point in time (Boyd and Ellison, 2008; Dunne et al., 2010). Indeed, such mechanisms for "interaction and feedback are critical elements of all social media" (Kaplan and Haenlein, 2010, p. 66).

We suggest that the activities during the asynchronous interactivity phase expose individuals to cognitive information processing needs which, in turn, increase the risk of suffering from information overload. These processing needs are driven both by the number of interactions as well as their degree of asynchronicity. First, individuals with a higher inclination to share information through social media can be expected to be involved in a greater number of interactions and receive more audience reactions (interactivity) compared to individuals with a lower inclination to share. These interactions increase individuals' cognitive demands to absorb the high frequency of messages and filter out relevant from irrelevant content (Jones et al., 2004). Likewise, research shows that message threads exacerbate these cognitive demands vis-à-vis individual messages (Lewis and Knowles, 1997). Second, unlike synchronous face-to-face or telephone conversations, asynchronous communications may increase the likelihood that sharing individuals are exposed to numerous ongoing interactions simultaneously. The fact that received messages are not necessarily sequential and may address multiple topics may trigger information overload (Hiltz and Turoff, 1985). Moreover, the overload effect is more pronounced, the greater the number of disparate ideas or concepts that are discussed (Grisé and Gallupe, 1999), which may often be the case, especially in social network newsfeeds.

To conclude, we argue that individuals with a high inclination to share information frequently go through two information processing phases – information appraisal and asynchronous interactivity – before and after the sharing process. The processing in both phases may contribute to information overload. We thus postulate the following hypothesis.

> *H1: Individuals with a higher inclination to digitally share information experience information overload to a greater extent than those with a lower inclination.*

# 5 Moderating Effect of Need for Cognition

Several individual differences are likely to influence information overload (Malhotra, 1984; O'Reilly, 1980; Rutkowski et al., 2013). One important difference may be individuals' motivation to expend cognitive effort. By definition, information overload only occurs when an individual tries to process an amount of information that exceeds the individual's information processing capacity (Eppler and Mengis, 2004). While it is well-established that individuals differ in information processing capacity, i.e., the amount of information they *can* process (Neisser et al., 1996), we also expect individuals to differ in the amount they *want* to process. This is relevant in the context of information sharing, as individuals have substantial discretion regarding how much of the available information they want to process before and after sharing. Hence, we expect that the amount of information individuals attend to during the sharing process depends on their motivation to expend cognitive effort.

Individuals' motivation to expend cognitive effort (Cacioppo et al., 1996) has been conceptualized as need for cognition (Petty et al., 2009). *Need for cognition (NFC)* is commonly defined as an individual's "tendency to engage in and enjoy effortful cognitive activity" (Cacioppo et al., 1996). Individuals ranking high in NFC are more likely to "seek, acquire, think about and reflect back on information" to make sense of their world (Cacioppo et al., 1996); in other words, they have a high intrinsic motivation to think (Cacioppo et al., 1986). As such, high-NFC individuals are less likely to rely on heuristics, peripheral cues, and external stimuli such as opinions and behaviors of others than low-NFC individuals (Axsom, Yates, and Chaiken 1987; Chaiken 1987).

NFC may be a concept specifically relevant to social media research. Previous social media research has explored a related concept, namely the need for orientation (Lee and Oh, 2013). In a media context, need for orientation (NFO) is conceptualized as the extent of information seeking behavior and media consumption by an individual (Matthes, 2006). In a study on Twitter usage, Lee and Oh suggest that individuals high in NFO may be more likely to be exposed to information overload. As they note, "while pursuing information more aggressively to satisfy their stronger desire for orienting cues, high NFOs might have become overwhelmed by the constant influx of information as they spent more time on Twitter" (p. 759). As such, we deem NFC to be potentially similarly related to social media use, and, in particular, sharing behavior.

In their review of more than 100 studies, Cacioppo and colleagues (1996) found that NFC plays a significant role as a moderator across a range of dependent and independent variables. In particular, many of these studies, as well as later studies, support the existence of individual differences in NFC and its consequences with regard to information processing. For example, scholars found that high- compared to low-NFC individuals have a higher intrinsic motivation to engage in cognitive tasks (Thompson et al., 1993). In addition, high-NFC individuals demand and scrutinize more information than low-NFC individuals (Verplanken et al., 1992) and are more likely to use media for information gathering (Cacioppo et al. 1996). Moreover, high correlations between the NFC scale and various curiosity measures have been found (Olson et al., 1984).

As sharers exhibit different levels of NFC, we also expect them to expend varying amounts of cognitive effort on information appraisal and dealing with asynchronous interactivity. During the appraisal phase, for example, a high-NFC individual is poised to think about and scrutinize more carefully whether an information item is worth sharing than a low-NFC individual (e.g., in terms of relevance and validity). In contrast, low-NFC individuals, who tend to be receptive to heuristics and peripheral cues, are likely to base their appraisal on the reputation of the information source or the popularity of the content. In this way they can limit their cognitive effort. During the asynchronous interactivity phase, sharers can also interact with their audience to different degrees. For example, we expect high-NFC sharers to read and analyze reactions (e.g., a link to an article with a different viewpoint) from their audience and eventually formulate and share a response. They thus voluntarily engage in an effortful cognitive process. In contrast, we expect a low-NFC sharer to be more likely to reduce cognitive effort by not following up on the reactions or doing so only briefly.

In conclusion, we expect the effect of information sharing inclination on information overload to be weaker when the sharer has a low NFC and stronger when the sharer has a high NFC. We thus predict a moderating effect of need for cognition on the relationship between sharing inclination and information overload in the following hypothesis.

> *H2: The positive effect of sharing inclination on information overload is amplified by an individual's need for cognition.*

# 6 Methodology

## 6.1 Data sample

We tested our hypotheses with data from a total of 30,392 respondents gathered by comScore, a market-research company. The data was gathered in 2013 via an interactive online survey. Participants originated from the UK, Russia, Germany, Spain, France, and Italy. The participants were recruited via an opt-in procedure through website banners, email campaigns and other approaches, and thus had to actively agree to take part in the marketing research.

Responses were only included in the final dataset if they completed the full survey and were not identified as biased. Responses were considered to be biased if they: (1) incorrectly answered the attention check question included in the survey design; (2) completed the survey too rapidly to be able to have sincerely considered the survey questions; (3) were "straight-liners" (e.g., always selected the first answer); or (4) completed an excessive amount of other surveys around the time the survey was taken. Less than two percent of respondents had to be eliminated from the dataset.

The sample contained 14,853 female and 15,539 male respondents. The age groups 18-32 and 53-64 each accounted for 25 percent of the respondents. The remaining respondents were aged 33-52. Fourteen percent of the respondents lived in a single household, whereas 41% of the respondents lived in a household with children. Approximately 30% of respondents used the Internet for personal reasons for less than 5 hours per week, 50% between 5 and 16 hours and 20% more than 16 hours.

## 6.2 Measures

### 6.2.1 Information overload

Four items measure the degree of information overload. They measure respondents' agreement with four statements on the subject on a Likert scale ranging from 1 = "strongly disagree" to 7 = "strongly agree." The statements represent symptoms commonly associated with information overload in the literature (Eppler and Mengis, 2004) and are based on a scale developed by Rutkowski and Saunders (2010). They reflect media sources that deliver stimuli that might lead respondents to experience a state of information overload. Survey participants were asked to which degree they agreed or disagreed with statements on whether (1) the amount of digital information they receive increases the likelihood of them making mistakes; (2) they are concerned about not being able to process the most important pieces of information; (3) they feel overwhelmed by the amount of information they receive; and (4) they feel pressured to deal with everything delivered by digital communication technologies.

Similar to other studies (e.g., Holton and Chyi, 2012; O'Reilly, 1980; York, 2013), we employ a self-report measure of information overload because overload is a perceptual phenomenon. As Milord and Perry (1977, p. 133) state "the necessary condition for overload is whether or not the individual feels overloaded rather than whether or not he is required to process x bits of information." Moreover, self-report measures have been shown to correlate with other measures of overload (Malhotra, 1982).

#### 6.2.2 Sharing inclination

Sharing inclination is also measured using a four-item construct. In line with extant literature we focus on measuring persistent attitudes and intentions around sharing, not actual sharing behavior (Bock et al., 2005; Chow and Chan, 2008; Lee and Ma, 2012). Two items measure how inclined respondents are to share information about their personal lives on social network sites. They were asked whether they post many details about their personal lives on social networks and whether they enjoy updating each other about their lives with friends. The remaining two items were targeted at measuring their inclination to share knowledge-based information not concerned with their personal lives. They were asked whether they often contribute content to websites (e.g., blog posts, product reviews, comments) and whether they would be interested to share their opinions with companies on brands and products via social networks.

#### 6.2.3 Need for cognition

To measure the need for cognition of our respondents, we use the NFC scale developed by Cacioppo and Petty (1982). Although the original scale contains 34 items, scholars commonly make use of shorter NFC scales (Cacioppo et al., 1996). Similar to Bizer, Krosnick, Petty, Rucker and Wheeler (2000) we use a two-item NFC scale to limit overall questionnaire length in order to ensure a high number and quality of responses (Galesic and Bosnjak, 2009). Participants were asked to which degree they agreed or disagreed with statements on whether (1) they prefer their lives to be filled with puzzles they must solve; and (2) they prefer complex to simple problems.

To test our two-item index of need for cognition, we replicated previous findings on the relationship between NFC and various demographic variables. In line with extant literature, we found that our NFC index is gender neutral (Cacioppo and Petty, 1982). Furthermore, we also confirmed the positive and significant correlation between need for cognition and level of education, which was found in earlier studies (Davis et al., 1993; Spotts, 1994).

### 6.3 Psychometric properties

To evaluate convergent and discriminant validity of our constructs, as well as model fit, we performed an exploratory and confirmatory factor analysis on randomly split subsamples (n=15,196). The exploratory factor analysis using Maximum Likelihood Estimation and Varimax rotation with Kaiser normalization revealed two factors with eigenvalues > 1 and one factor with an eigenvalue of 0.98. We hence decided to keep the all three factors (Hair et al., 2009).

We assessed the convergent validity of our constructs by evaluating factor loadings, Average Variance Extracted (AVE), and reliability values obtained from the confirmatory factor analysis. All factor loadings are above the suggested threshold of 0.5, with five items even exhibiting loadings above 0.7 (Hair et al., 2009). All factor loadings are significant at $p < 0.001$. Further, the AVE for Perceived Information Overload (0.47) and Sharing Inclination (0.45) are only slightly below the suggested threshold value of 0.5, which is commonly used to assert good convergence (Fornell and Larcker, 1981). As depicted in Table 1, reliability was assessed using Cronbach's Alpha and composite reliability (CR), both of which are well above the threshold of 0.7 and consequently indicating good reliability for all three factors (Hair et al., 2009). While two constructs are slightly below the suggested AVE-threshold, all other tests suggest good convergent validity. We therefore conclude that convergent validity of our factors is sufficient.

We tested discriminant validity by checking the fulfilment of the Fornell-Larcker criterion. As depicted in Table1, the square root of the AVE for all factors is larger than the correlations between the constructs, thus suggesting good discriminant validity (Hair et al., 2009).

| Factor | Cronbach's Alpha | CFI | CR | Mean | SD | 1 | 2 | 3 |
|---|---|---|---|---|---|---|---|---|
| 1 Perceived Information Overload | 0.81 | 0.99 | 0,78 | 3,58 | 1,54 | **0.69** | | |
| 2 Need for Cognition | 0.78 | - | 0.74 | 3,51 | 1,54 | 0.37 | **0.77** | |
| 3 Sharing Inclination | 0.79 | 0.99 | 0.76 | 2,78 | 1,32 | 0.38 | 0.32 | **0.67** |
| Notes: 1. N = 30,392 2. Square root of AVEs are bolded and in the diagonal | | | | | | | | |

*Table 1. Factor Correlation Matrix, Cronbach's Alpha, CFI, CR and square root of AVE*

The confirmatory factor analysis reveals a good overall model fit. The comparative fit index (CFI) of 0.97 exceeds the threshold of 0.93 (Byrne, 1994). Also the Root Mean Square Error of Approximation (RMSEA) of 0.06 suggests good model fit (Hair et al., 2009).

### 6.4 Control variables

Prior research on information overload leads us to believe that demographic variables such as age, gender and country of residence, as well as indicators for socioeconomic success such as occupation, annual income and education, could possibly confound our results (Holton and Chyi, 2012; Ji et al., 2014; Klausegger et al., 2007; Williamson and Eaker, 2012; York, 2013). Thus, we controlled for these variables. Occupation is measured in broad categories of current state of employment (e.g., "employed full-time" or "student"), while education is measured as the highest level of education received.

Furthermore, we controlled for browsing activity on social networks and other websites, as well as for total Internet usage in hours. Controlling for social network browsing activity is particularly vital to our model as it enables us to eliminate the possibility that the experienced degree of information overload is merely induced by increased social network browsing activity (Beaudoin, 2008).

### 6.5 Robustness checks for common method bias

As all of our data was gathered through a single survey, the data is, by definition, potentially susceptible to common method or same-source variance (Campbell and Fiske, 1959; Cote and Buckley, 1987). To alleviate such concerns we conducted two tests. Harman's single factor test (Podsakoff and Organ, 1986) revealed that a single factor accounted for 40 percent, and thus less than the majority, of variance in our data. In addition, we followed Podsakoff et al. (2003) who suggest testing for common method bias by introducing an unmeasured latent method factor (common latent factor) into the factor model and then comparing the models with and without the latent factor. We did so and found only minor differences between the standardized parameters in all paths of the model. Thus, both tests we conducted indicate that our model is not adversely affected by common method bias.

## 7 Results

Table 2 contains summary statistics and pair-wise correlations for all variables used in our model. To test for multicollinearity, we calculated the mean variance inflation factor, which at 2.55 is well below the suggested threshold of 10.0 (Kutner, 2004).

The regression results of our models are summarized in Table 3. Model 1 is our control model. Model 2 tests hypothesis H1, which predicts sharing inclination to drive information overload. As anticipated, the coefficient of sharing inclination is positive and highly significant at $p < 0.001$. Thus, we find support for H1. Cohen's (1988) guidelines indicate that the size of the effect of sharing inclination on information overload is large ($\omega^2$=0.14). Models 3, 4 and 5 test our second hypothesis H2. Interestingly, the direct effect of NFC on information overload, as apparent in Model 3, is positive, significant ($p < 0.001$) and large ($\omega^2$=0.11). In Model 5, the interaction term of sharing inclination and NFC also has a positive and significant coefficient. Thus, we find support for H2. However, the effect size for the moderating variable ($\omega^2$=0.004) is very low.

To further validate our results, we re-ran all models on a smaller randomly generated subsample (n=4,000). This robustness check yielded results very similar to those obtained from the full sample.

| Variables | Mean | SD | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 Perceived Information Overload | 3,58 | 1,54 | 1 | | | | | | | | | | | | | | |
| 2 Need for Cognition | 3,51 | 1,54 | 0.37 * | 1 | | | | | | | | | | | | | |
| 3 Sharing Inclination | 2,78 | 1,32 | 0.4 * | 0.36 * | 1 | | | | | | | | | | | | |
| 4 Age | 42,16 | 12,24 | -0.09 * | -0.13 * | -0.27 * | 1 | | | | | | | | | | | |
| 5 Gender | 1,49 | 0,50 | 0,00 | -0.03 * | -0.01 | -0.05 * | 1 | | | | | | | | | | |
| 6 Income | 2,17 | 1,09 | 0.09 * | 0.2 * | 0.1 * | -0.02 * | -0.13 * | 1 | | | | | | | | | |
| 7 Education | 3,21 | 1,33 | 0.06 * | 0.11 * | 0.07 * | -0.12 * | 0.01 * | 0.24 * | 1 | | | | | | | | |
| 8 Browsing Activity | 18,65 | 9,92 | 0.17 * | 0.21 * | 0.47 * | -0.37 * | -0.03 * | 0.17 * | 0.15 * | 1 | | | | | | | |
| 9 Internet Usage | 3,46 | 0,63 | 0.04 * | 0.12 * | 0.17 * | -0.05 * | -0.09 * | 0.05 * | 0.05 * | 0.2 * | 1 | | | | | | |
| 10 Employed full time | 0,54 | 0,50 | 0.06 * | 0.11 * | 0.09 * | -0.17 * | -0.22 * | 0.33 * | 0.17 * | 0.15 * | 0.01 * | 1 | | | | | |
| 11 Employed part time | 0,14 | 0,35 | 0.01 * | 0,00 | 0.02 * | -0.06 * | 0.15 * | -0.08 * | -0.04 * | 0,00 | -0.03 * | -0.44 * | 1 | | | | |
| 12 Homemaker | 0,08 | 0,27 | -0.02 * | -0.02 * | -0.01 * | -0.01 | 0.25 * | -0.09 * | -0.09 * | -0.03 * | -0.01 | -0.31 * | -0.12 * | 1 | | | |
| 13 Retired | 0,09 | 0,28 | -0.05 * | -0.06 * | -0.14 * | 0.43 * | -0.05 * | -0.07 * | -0.06 * | -0.19 * | -0.01 | -0.34 * | -0.13 * | -0.09 * | 1 | | |
| 14 Unemployed | 0,11 | 0,32 | -0.04 * | -0.07 * | -0.01 | -0.07 * | 0.01 | -0.25 * | -0.07 * | -0.04 * | 0.02 * | -0.39 * | -0.14 * | -0.1 * | -0.11 * | 1 | |
| 15 Other employment | 0,04 | 0,19 | -0.02 * | -0.03 * | -0.02 * | 0.04 * | 0,00 | -0.07 * | -0.01 | -0.01 * | 0.01 | -0.22 * | -0.08 * | -0.06 * | -0.06 * | -0.07 * | 1 |
| *p < 0.05 | | | | | | | | | | | | | | | | | |

*Table 2. Descriptives and Correlations (n=30,392)*

| Variables | Model 1 | | Model 2 | | Model 3 | | Model 4 | | Model 5 | |
|---|---|---|---|---|---|---|---|---|---|---|
| Browsing Activity | 0.02*** | (0.00) | -0.01*** | (0.00) | 0.01*** | (0.00) | -0.01*** | (0.00) | -0.01*** | (0.00) |
| Age | -0.00 | (0.00) | 0.01*** | (0.00) | -0.00 | (0.00) | 0.00*** | (0.00) | 0.00*** | (0.00) |
| Gender[a)] | 0.02 | (0.02) | 0.00 | (0.02) | 0.04* | (0.02) | 0.02 | (0.02) | 0.02 | (0.02) |
| Internet Usage | 0.02 | (0.01) | -0.07*** | (0.01) | -0.04** | (0.01) | -0.10*** | (0.01) | -0.09*** | (0.01) |
| Income | 0.04*** | (0.01) | 0.01 | (0.01) | 0.01 | (0.01) | 0.00 | (0.01) | -0.00 | (0.01) |
| Education | 0.03*** | (0.01) | 0.04*** | (0.01) | -0.01 | (0.01) | 0.01 | (0.01) | 0.01 | (0.01) |
| *Occupation* | | | | | | | | | | |
| Part time | 0.03 | (0.03) | 0.01 | (0.02) | 0.03 | (0.02) | 0.02 | (0.02) | 0.02 | (0.02) |
| Homemaker | -0.12** | (0.04) | -0.11** | (0.03) | -0.09** | (0.03) | -0.09** | (0.03) | -0.09** | (0.03) |
| Retired | -0.08* | (0.04) | -0.06 | (0.03) | -0.04 | (0.03) | -0.04 | (0.03) | -0.04 | (0.03) |
| Unemployed | -0.14*** | (0.03) | -0.12*** | (0.03) | -0.10*** | (0.03) | -0.10*** | (0.03) | -0.10*** | (0.03) |
| Other employment | -0.09 | (0.05) | -0.06 | (0.04) | -0.06 | (0.05) | -0.04 | (0.04) | -0.05 | (0.04) |
| Sharing Inclination | | | 0.49*** | (0.01) | | | 0.39*** | (0.01) | 0.24*** | (0.02) |
| Need for Cognition | | | | | 0.35*** | (0.01) | 0.25*** | (0.01) | 0.16*** | (0.01) |
| NFC x Sharing Inclination | | | | | | | | | 0.04*** | (0.00) |
| Adjusted $R^2$ | 0.05 | | 0.18 | | 0.15 | | 0.23 | | 0.23 | |
| $\Delta R^2$ | | | 0.13 | | -0.03 | | 0.08 | | 0.00 | |
| F-Value | 92.59*** | | 313.01*** | | 232.51*** | | 399.34*** | | 385.67*** | |
| Notes: 1. a) Male=0, Female=1 2. Occupation variables are dummies; country dummies included in all models 3. Calculated using OLS regressions; *p < 0.05, **p < 0.01, ***p < 0.001 | | | | | | | | | | |

*Table 3. Regression Results (n=30,392)*

# 8 Discussion

The purpose of this study is to shed light on a potentially severe downside of information sharing in the social media age: information overload. We find that individuals with a greater inclination to share information experience a higher degree of information overload. The hypothesized moderating effect of NFC on this relationship is significant but minimal in size. Furthermore, we find a large direct effect suggesting that high-NFC individuals generally experience greater information overload when using digital media than low-NFC individuals.

Our study makes three primary contributions: (1) We connect the previously unlinked concepts of information sharing and information overload in a social media environment; (2) we introduce a theoretical model which elucidates the cognitive processes that individuals are exposed to during the two phases of information sharing; (3) and we advance the understanding of need for cognition in the context of the current interactive social media environment.

First, and most notably, we add to the ongoing conversations on both information sharing and information overload in social media. On the one hand, most research on information sharing previously has emphasized its benefits, such as fostering social relationships and building social status (Kim, 2016; Lee and Ma, 2012; Lu and Hsiao, 2007; Ma et al., 2014). On the other hand, while prior social media research has emphasized that information overload is a highly relevant to social media users (Gomez-Rodriguez et al., 2014; Hiltz and Plotnick, 2013; Koroleva et al., 2010; Laumer and Weinert, 2013; Maier et al., 2012; Shrivastav et al., 2012; Weinert et al., 2012; Yates and Paquette, 2011), it has only focused on fairly passive information recipients. Unfortunately, scholars have not adequately addressed how those two constructs interrelate and, consequently, how the individual who shares information through social media is affected by cognitive costs, in general, and information overload, in particular. With this paper, we aim to contribute to such an understanding by integrating the two literature streams. Doing so more accurately reflects current media realities, which have dramatically changed over the past decades. In the past, individuals were only passive consumers of institutionally-created information as very few individuals were in a position to create and diffuse information to large audiences (Lee and Ma, 2012). Nowadays, however, media has undergone a paradigm shift with digital technologies allowing every individual to become actively engaged by sharing information and subsequently receiving feedback on the shared information on platforms such as Facebook or Twitter (Shi et al., 2014). Consequently, we contend that contemporary information overload research would benefit from revisiting its premises and that it is thus paramount to also consider the sharing individual and to incorporate the interactive and asynchronous characteristics which are at the heart of today's social media technologies (Boyd and Ellison, 2008; Jones et al., 2004; Kaplan and Haenlein, 2010; Ruggiero, 2000). Our findings embed this paradigm shift in information diffusion and consumption into research by showing that information overload is substantially driven by active engagement with content rather than just its passive consumption as has been emphasized in prior research.

Second, to the best of our knowledge our study is the first to develop a theoretical model that specifies the actual phases of the information sharing process in the digital age. In this regard, we extend and integrate established theoretical models on cognitive appraisal and interactivity. We build on the theory of cognitive appraisal (Lazarus, 1991; Scherer et al., 2001) and apply it in a new context, namely to conceptualize how individuals appraise information stimuli through the lens of information sharing. Specifically, we argue that individuals, when interpreting information, take into account whether sharing a certain piece of information helps to attain desired benefits. Moreover, we integrate theories on interactivity (Rafaeli, 1988) and asynchronicity (Ruggiero, 2000) which, in combination, closely reflect key characteristics of today's social media technologies (Boyd and Ellison, 2008; Kaplan and Haenlein, 2010). This enables us to paint a comprehensive, theory-grounded picture detailing how individuals appraise information before sharing and how they cognitively deal with post-sharing interactions. By theoretically isolating the detailed steps that take place during the sharing process, we can better understand the different cognitive demands that result from information sharing. Consequently, we challenge scholars' current predominantly positive view of information sharing in social media. In contrast to this dominant view, we propose that scholars should also acknowledge the substantial cognitive costs associated with information sharing. Consequently, we provide a more balanced understanding of information sharing.

Lastly, our work contributes to the extensive literature on need for cognition. Our findings support the view that information overload has to be acknowledged as a cost of NFC. While the hypothesized moderating effect of NFC was found significant but minimal in size, the direct effect of NFC on information overload was found to be much larger. This suggests that the strong intrinsic motivation of high-NFC individuals to seek and scrutinize information generally impacts their online behavior, irrespective of their inclination to actively share information. In other words, high NFC also increases the likelihood of suffering from information overload for individuals who more passively consume content online. Our findings, thus, contribute to a growing stream of research exploring potential costs of high NFC, such as false memory (Graham, 2007), limited group discussion productivity (Henningsen and Henningsen, 2004), or decreased efficiency in reaching group consensus (Briñol et al., 2005). Moreover, they corroborate previous findings on a related concept, need for orientation, which has been found to predict information overload for Twitter users (Lee and Oh, 2013).

Our research also highlights important managerial implications. On the one hand, firms increasingly utilize digital social networks in their communication with customers. In particular, they rely on multipliers and opinion leaders to share their messages and thus help companies increase their communication reach, promote their products or services, and give them feedback (e.g., on their market offering or brand positioning). Our research highlights that there might exist the inherent risk of these customers suffering from information overload. Consequently, overloaded customers might experience negative emotions which they might attribute to the product or firm or they may misunderstand promotional information and thus fail to act as effective multipliers. On the other hand, firms also increasingly introduce internal social sharing platforms with the objective of transforming employees' tacit knowledge into explicit organizational knowledge (Grant, 1996). In fact, according to surveys, 72 percent of companies use at least one type of social technology to facilitate dissemination of information (Bughin et al., 2011). Our findings suggest that these knowledge carriers might suffer from information overload when they are overly pressured to share knowledge. This represents a problem as such excessive information sharing and the following information overload may possibly lead to deteriorating cognitive performance such as too much tolerance for errors (Sparrow, 1999) or reduced decision-making quality (Jacoby, 1984; Malhotra, 1982). Firms thus need to find a balance between encouraging information sharing and limiting information overload and its adverse effects. This echoes findings by other researchers (Hemp, 2009; Hiltz and Plotnick, 2013; Koroleva, 2012) who have already highlighted the necessity for effective filtering and ranking algorithms which aim to counter to inflow of large amounts of information which is unstructured and of varying quality and relevance.

Our findings regarding NFC also highlight another dilemma firms are facing: High-NFC individuals might not only represent particularly valuable but also particularly vulnerable resources for firms. Such individuals are intellectually curious, thoroughly scrutinize available information, and actively incorporate different viewpoints into their analysis (e.g., Cacioppo et al., 1996). Thus, they are arguably their firms' most valuable customers and employees: They could be expected to provide more helpful and comprehensive feedback and they possess a greater amount of relevant knowledge than low-NFC individuals. However, our research suggests that they are also the most vulnerable to information overload.

## 8.1 Limitations and future research

Like every empirical study, our research has limitations. First, despite testing for common method variance, we cannot fully rule out measurement context effects, as our dependent and independent variable are measured at the same time, using the same medium (Podsakoff et al., 2003). While our survey-based approach allowed us to test our hypotheses on a large cross-national sample, future research could complement our findings by undertaking a related study with small-sample experiments.

Second, although potential concerns of reverse causality are incidental from a theoretical perspective because both sharing inclination and NFC are relatively stable attitudes (Bock et al., 2005; Chow and Chan, 2008; Lee and Ma, 2012), we encourage scholars to scrutinize our results with longitudinal data.

Third, we see potential in improving the measurement scales we used. Albeit being common practice (e.g. Bizer et al., 2000), we acknowledge that using a shortened NFC scale might compromise the validity and reliability of the measurement. Thus, replications of this study could benefit from utilizing the full NFC scale. Likewise, the scale for sharing inclination may profit from more explicitly reflecting the cognitive rather than behavioral nature of the dimensions we proposed in our theoretical model.

Fourth, we sought to develop a comprehensive theoretical model of the sharing process and the associated cognitive demands individuals face, but focused the empirical part of the study on testing the implications of this model related to information overload rather than explicitly testing the two phases in our model. While this is typical in trying to understand cognitive processes that are not easily observed, future research could greatly contribute by empirically scrutinizing the proposed phases. Future researchers may resort to different research methods to do so and employ, e.g., controlled experiments.

Finally, an additional opportunity for future research is to test whether different types of shared information have varying effects on information overload. It appears promising to study whether, for example, sharing vacation pictures on social media has a different effect on information overload compared to sharing a political opinion. We would expect the latter to be more complex and controversial, and hence require more cognitive effort than the former in the phases of information appraisal and asynchronous interactivity, and thus, more likely to lead to information overload.

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