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Information sharing as strategic behaviour: the role of information display, social motivation and time pressure

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ABSTRACT

In today's knowledge economy, given the increasing number of online collaborative platforms, it is even more important to understand and manage the sharing of information. Although it is widely accepted that technological design affects how people use a platform, it is a real challenge to constantly stimulate information sharing (IS), also because individuals often behave strategically, that is, share relatively unimportant information, but keep the important private information for themselves. This research aims to understand how people's motivations and aspects of communication technology interact to affect IS. Specifically, we expand the view of IS as strategic behaviour by investigating (1) how social motivation (prosocial vs. pro-self) and time pressure (high vs. low), interactively, impact strategic IS and (2) how technological features (push- vs. pull-information display) can increase the sharing of private information. Across two experiments, we found that push-information displays increase the sharing of private information. This held especially for individuals with a prosocial motivation. Additionally, we found that actual and not perceived time pressure impacts (private) IS. Implications for technological design choices and knowledge management are discussed.

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Strategic information sharing; technological feature; push-information display; pull-information display; social motivation; time pressure

1. Introduction

Oftentimes perceived as power, knowledge is a precious intangible asset and key to competitive advantage (Davenport and Prusak 1998; Grant 1996). In our knowledge economy, the increasing number of online collaborative platforms is progressively dependent on individuals' information sharing (IS) behaviour. Organisations, for instance, invest in technology, in knowledge management systems, to facilitate and encourage knowledge sharing. However, many knowledge-sharing projects fail because people often tend to keep important knowledge to themselves (Akhavan, Jafari, and Fathian 2005), sharing more often information that is generally known (e.g. Stasser and Titus 1985). We argue that this is because IS is strategic behaviour influenced by *motivations* and want to investigate whether *technology* can help to overcome this problem.

Steinel, Utz, and Koning (2010) developed *the information pooling game* to investigate the impact of *social motivation* on strategic information sharing (SIS) such as sharing several pieces of relatively unimportant information but keeping the important private information for oneself. Using different reward systems to manipulate social motivation, they found that individuals with a prosocial motivation shared more private and more important information than individuals with a pro-self motivation who strategically shared public and unimportant information to create a cooperative impression and concealed or even lied about their private and important information (Steinel, Utz, and Koning 2010). Firstly, our aim is to extend this line of research on the role of motivational processes by testing the generalisability of these findings from an abstract lab experiment to a more complex setting involving more and actual information. Secondly, we want to examine the role of time pressure as a situational factor. The practical justification for considering time pressure is that in our fast-paced society, people often have to make decisions under time pressure, and especially then the sharing of tacit or private information would be relevant. From a theoretical perspective, previous research has shown that time pressure lowers decision quality in groups, in the laboratory as well as in actual teams (Bowman and Wittenbaum 2012; Chong et al. 2012; De Dreu 2003), supposedly because time pressure increases the need for cognitive closure (NFCC), that is, the desire to reach quick decisions in

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ambiguous situations (Webster and Kruglanski 1994). Moreover, the motivated information processing in groups (MIP-G) model (De Dreu, Nijstad, and Van Knippenberg 2007) predicts that social motivation and epistemic motivation such as NFCC, separately and, most importantly, in interaction, affect information processing and sharing in groups. However, these predictions have not been tested in the domain of SIS yet. The present research is going to fill this gap. Thirdly, building on research that stresses the role of technology as opportunity next to motivational factors (Kettinger et al. 2015), we examine whether a push design (vs. a pull design) can increase the sharing of private important information. Web2.0 technologies (e.g. social networking sites) push-information into newsfeeds or streams and offer more subtle sharing options (e.g. 'Share' buttons). Sophisticated information push-delivery systems based on intelligent search technologies can provide tailored, important information, matching predefined criteria (Pedley 1999) or users' preferences (Chen and Tai 2003), whereas pull-information systems require much more time and effort to find relevant information. How information has been accessed might also influence how readily it is shared; hence, we investigate, interactively, the role of technology, social and epistemic motivations. In the following subsections, we elaborate on what SIS is and review the most relevant literature on social motivation, time pressure and technological features.

1.1. Strategic information sharing

The studies using the traditional information sampling paradigm (Brodbeck et al. 2007; Schulz-Hardt et al. 2006; Stasser and Titus 1987; Wittenbaum, Hollingshead, and Botero 2004) explain IS behaviour as a consequence of cognitive biases (Mesmer-Magnus and DeChurch 2009; Reimer, Reimer, and Czienskowski 2010; Stasser and Stewart 1992; Stasser and Titus 1985). In this respect, a fairly large body of research (e.g. Osatuyi, Hiltz, and Fjermestad 2012; Stasser and Titus 1987; Stasser, Vaughan, and Stewart 2000; Winquist and Larson 1998) showed that people are more likely to share information that is known to all members than information that is unique (i.e. known by one/some member(s) only). Although empirical research has largely studied IS in cooperative contexts, in these studies, it was not possible to disentangle cognitive and motivational processes. When an individual said (s)he did not share a piece of information because (s)he did not consider it as important, it was unclear whether this is really true (a cognitive bias) or whether this is just a self-justification of strategic withholding of information. Previous research has also shown that people lie, deceive (Steinel and De Dreu 2004) and spin preference-consistent information, indicating that motivational aspects also play a role in IS (Scholten et al. 2007). Our focus is on these motivational aspects underlying SIS and we use a new paradigm developed by Steinel, Utz, and Koning (2010) to study SIS. More specifically, we investigate how motivational aspects affect especially not only the *quality*, but also the *quantity* of information individuals share.

SIS has not been explicitly defined in prior papers (Osatuyi, Hiltz, and Fjermestad 2012; Steinel, Utz, and Koning 2010; Toma and Butera 2009), although they all studied IS in mixed-motive situations. We understand SIS as *the individual behaviour of deliberately sharing a particular type of information as a motivated response to an implicit expectation (or explicit request) of sharing information*. Thus, we focus on situations such as team decision-making where members – for example, because they bring in different expertise – are expected to share at least some information. We further assume that team members are aware of the value of the information they (privately) own. For instance, individuals may consciously and deliberately choose to share important and private information positively impacting the collective outcome, or unimportant information just to make cooperative impressions, not contributing at all or even worsening the collective outcome.

1.2. The effects of social motivation on IS

In their information pooling paradigm, Steinel, Utz, and Koning (2010) varied the importance (important vs. less important) and sharedness (public vs. private) of information. Each participant had 12 pieces of information, 6 private (from their own network) and 6 public (e.g. from the Internet); half of the information was labelled as important, the other half as less important. Subjects were presented only with labels (e.g. information #424, important, private) and not with actual information (Steinel, Utz, and Koning 2010). If a person in this situation does not share the private important information, it can only be due to motivational reasons, but not due to a cognitive bias such as misjudging the importance of a piece of information. By telling participants how many pieces of information were needed to solve the task at hand, an anchor for cooperative behaviour based on the equality norm was created (Messick 1993). Findings showed that individuals' social motivation (prosocial vs. pro-self) affected both the amount – that is, a main effect of social motivation indicated that prosocials shared more information than pro-selfs – and *type* of information shared – that is, interaction effects between social motivation and information importance and sharedness, respectively, indicated that prosocials shared more private and

more important information than pro-selfs who strategically shared more of their public and unimportant information – inspiring new directions researching IS as *strategic behaviour* (Osatuyi, Hiltz, and Fjermestad 2012; Steinel, Utz, and Koning 2010; Toma and Butera 2009). We want to test the generalisability of these findings in a more complex situation with more and actual information. We expect to conceptually replicate the basic findings of Steinel, Utz, and Koning (2010):

H1: Prosocials[1] share more information than pro-selfs.

H2: Prosocials share more (a) private and (b) important information than pro-selfs.

1.3. The effects of time pressure on IS

Either in offline or in online work settings, people are expected to make decisions under time pressure and in the presence of deadlines. Time pressure detracts individuals from their core responsibilities (Van Den Hooff 2012) and a large body of literature has shown that it negatively impacts performance (e.g. Bowman and Wittenbaum 2012), the quality of decision-making (e.g. Edland 1994; Hahn, Lawson, and Lee 1992; Scholten et al. 2007), negotiation outcomes (e.g. De Dreu 2003), etc. These studies did not explicitly measure IS, but decision quality or negotiation outcomes depend on the type of information shared. Thus, there is some indirect evidence that time pressure influences IS. Furthermore, time pressure is one of the reasons for not sharing enough information (Ko, Kirsch, and King 2005; Li 2010). For instance, studies on virtual teams (e.g. Lipnack and Stamps 1997; McGrath 1990) have repeatedly found that time constrains influence knowledge sharing and its antecedents such as trust and relationship building (e.g. Jarvenpaa, Knoll, and Leidner 1998; Jarvenpaa and Leidner 1999; Li 2010).

It can be expected that less information is shared when there is less time to do so. However, there is also a more psychological explanation. Time pressure is supposed to increase individuals' NFCC, that is, the desire to reach quick decisions. NFCC is defined as a person's motivation with respect to information processing and judgement (Webster and Kruglanski 1994); it is one of the main antecedents of epistemic motivation and it depends on the perceived sufficiency of the information that is already available to the decision-maker (De Dreu, Nijstad, and Van Knippenberg 2008). According to the MIP-G model (De Dreu, Nijstad, and Van Knippenberg 2008), besides social motivation, epistemic motivation also influences information processing in groups. People who want to come to a quick decision are less motivated to elaborate and discuss many pieces of information and will, therefore, also share less pieces of information. Our next hypothesis is, therefore, formulated as follows:

H3: People under high time pressure share less information than people under low time pressure.

No study to date examined the joint impact of social motivation and time pressure on SIS. We argue that high time pressure would lead to a smaller effect of social motivation on IS. SIS assumes that people carefully process information and decide strategically which pieces of information they want to share, depending on their current goal. Under high time pressure, individuals are less able to process all the information and make the decisions about the best strategy. Under low time pressure, individuals have all the time to think carefully about which pieces of information to share; the effects of social motivation should be stronger under low time pressure:

H4: The effect of social motivation, that is, that prosocials share (a) more private and (b) more important information than pro-selfs, is more pronounced under low time pressure than under high time pressure.

1.4. The effects of technology on IS

Motivation is an important factor explaining SIS. However, to better understand the sharing behaviour, technology also needs to be considered since it constitutes the opportunity to share information (Kettinger et al. 2015). Previous research argues that technology may either enable or hinder online IS (Hsu and Lin 2008; Paroutis and Al Saleh 2009), but most of the empirical literature considered technology from a broad perspective: a database context (e.g. Bordia, Irmer, and Abusah 2006), computer-mediated communication (e.g. Van Den Hooff and De Ridder 2004), knowledge management systems (e.g. Cabrera, Collins, and Salgado 2006), social media platforms (e.g. Vuori and Okkonen 2012) or electronic knowledge repositories (e.g. Kankanhalli, Tan, and Wei 2005). Only recently, research has started to examine the effects of *specific* technological features on building and supporting knowledge-sharing communities (Kraut et al. 2012; Leonardi and Treem 2012; Ren and Kraut 2014; Treem and Leonardi 2012).

In this paper, we focus on information display. More specifically, we compare a pull design with a push design as nowadays, when using the Internet, information can flow from the source to the consumer in two fundamental ways: (a) *information pull*, where a consumer or user takes (or is given) the initiative to get it, or (b) *information push*, where a supplier takes (or is given) the initiative to deliver it (e.g. rich site summary (RSS) feeds). When pulling information from different sources on the Internet, individuals invest more time, energy, and more physical

(e.g. clicking) and cognitive (e.g. judging information by relevance) effort. Once they have acquired the information, they may develop a sense of ownership for that particular information and be reluctant to share it. In contrast, push-information systems (e.g. news feeds sorted by relevance) require less from the individual in terms of effort and time investments and ownership feelings are less likely to develop. Thus, how information has been accessed and the time and effort required to get the information might influence how readily, how much and what type of information people are willing to share. In line with this reasoning, we argue that more information will be shared in a push-information display situation than in a pull-information display situation. Our hypothesis is formulated as follows:

> *H5*: Individuals share more information in the push-information display situation than in the pull-information display situation.

Moreover, we also argue that the design moderates the effects of social motivation on SIS. In general, in the pull-information display situation, individuals have to pull the various pieces of information actively from various folders. This procedure is somewhat clumsy and requires more (cognitive) effort; people might already forget some pieces of information while opening the next folder. The push design provides a clearly structured overview over the available information, making it easier to make strategic decisions. Whether people indeed share more of their private information or decide to keep it for themselves, however, depends then on their social motivation. Thus, we expect:

> *H6*: The effect of social motivation, that is, that prosocials share (a) more private and (b) more important information than pro-selfs, is more pronounced in the push-information display condition than in the pull-information display condition.

To test these hypotheses, we conducted two experiments. Experiment 1 looked at the joint effects of social motivation (prosocial vs. pro-self), time pressure (high vs. low) and technological features (push- vs. pull-information display) on SIS. Using a simpler experimental design, Experiment 2 aimed to replicate the findings on the technological features and focused more specifically on time pressure and the role of NFCC as a potential underlying mechanism.

2. Experiment 1

2.1. Method

2.1.1. Participants and design

One hundred and twenty-five university students (53 males, 72 females; mean age 22.3 years, SD = 5.22, range 17–65 years) took part in the study and received 3.5 Euros (approx. 5 US dollars) in return for their participation. The experiment had a 2 (information display: push vs. pull information) × 2 (social motivation: prosocial vs. pro-self) × 2 (time pressure: high vs. low) between subjects design; information importance (important vs. unimportant) and sharedness (public vs. private) were varied as within-subjects factors.

2.1.2. Procedure

Upon arrival in the laboratory, each participant was escorted to an isolated cubicle and seated in front of a desktop computer via which (s)he received all the instructions; the entire study was programmed in Authorware and participants were randomly assigned to the experimental conditions. Participants read that the research is about creativity and the purpose is to assess the extent to which mystery-solving skills can lead to the expression of creative behaviour. Participants were instructed that the first part of the study was about solving a mystery of a stolen painting. Following the structure of the mystery-solving task used by, for example, Steinel, Utz, and Koning (2010), we developed the story of the Mona Lisa painting displayed at and subsequently stolen from the Louvre Museum in Paris. Participants read that the second part (which actually did not take place) is an interactive creativity session. Further, they were told that they are collaborating via a computer network in a three-person group. Each participant first received pieces of information about the crime. Participants were told that the received information will help them solve only part of the mystery and that the mystery may be solved completely through the exchange of information with the other group members. Each piece of information could be shared with the other group members by pressing either a 'Share' or an 'E-mail' button. Once pressed, the participant could see either a screen with a message confirming the sharing of that piece of information (in case of pressing the 'Share' button) or a screen where the participant could write a message to the sender(s), the piece of information being already attached to that message (in case of pressing the 'E-mail' button). Subsequently, the participant was redirected to the initial main screen with information. Participants were led to believe that IS was synchronous given the lab setting, the inter-connected computers and the proximity of the other participants (see Figure 1). While sharing, the participants were informed that they will see and discuss the shared information after the sharing phase. After the IS task was completed, participants filled in a questionnaire containing the manipulation checks. After that, they were debriefed, thanked and paid. The experimenter, for pilot-testing

Figure 1. Laboratory setting and the display of the desktop computers.

reasons, asked the first five participants, at the end of their participation, whether they could easily follow the instructions and perform the task. All five participants had a similar understanding of the study and reported no structural or content-wise suggestions after completing it; the study continued, therefore, running in its initial form and the first five participants were added to the final student sample used for analyses.

2.1.3. Independent variables

Information sharedness was manipulated by displaying information pieces under the label of either public or private information. Participants were told that their private information came from a French professional detective and that no other group member can see it; the public information was said to come from the Internet and that all group members received it.

To manipulate *information importance*, we first pretested 28 pieces of information in terms of importance: 5 independent raters were asked to go over 28 pieces of information about the mystery of the stolen Mona Lisa painting in order to find out (1) the real name of the thief and (2) the four reasons for stealing the painting. They were asked to mark each piece of information in terms of importance (i.e. considering the extent to which it was helpful or not at all helpful for finding the thief and the reasons). Out of the 28 pieces of information, all 5 raters agreed on 19 pieces of information as being either important (i.e. 8 pieces) or unimportant (i.e. 11 pieces). As some pieces of information contained more words than others, we decided to split them to create additional ones: 3 more for unimportant (up to 14 pieces in total) and 2 more for important (up to 10 pieces in total); 4 new important information pieces were added (up to 14 pieces in total), making sure they contained important cues (identity, motive, arrests, etc.) as the ones rated previously as important. In the actual study, all 28 pieces of information were then displayed under the label of either important (i.e. 14 task-relevant information pieces) or unimportant (i.e. 14 task-irrelevant information pieces) information; labels were visible only in the push-information display condition. One example of unimportant information is: 'Everyone had been talking about the glass panes that museum officials at the Louvre had put in front of several of their most important paintings'. One example of important information is: 'Soon after he placed the ad, Geri received a letter dated November 29 (1913) that stated the writer was in possession of the stolen *Mona Lisa*'. The two factors (i.e. sharedness and importance) were manipulated orthogonally, resulting in (a) 7 pieces of public important information (i.e. 279 words), (b) 7 pieces of public unimportant information (i.e. 295 words), (c) 7 pieces of private important information (i.e. 245 words) and (d) 7 pieces of private unimportant information (i.e. 227 words).

Information display was manipulated by comparing two types of information display: push *versus* pull. In the *push-information* condition, all the information was displayed on one computer screen in a tailored manner. More specifically, the pieces of information labelled as important or unimportant were displayed under either public or private sections of information, respectively. In the *pull-information* condition, the important and unimportant information were stored in public and private folders; the information was not tailored (i.e. labelled as important or unimportant) anymore and participants had to pull it by clicking the folder. Also, to make it more effortful, access to private folders was delayed by shortly

displaying a loading-page screen informing participants that the system enables access to the private folder.

Social motivation was manipulated by the incentive structure (Steinel, Utz, and Koning 2010; Utz and Steinel 2008). Participants in the *prosocial motive* condition were told that if *the group* solves the mystery, each group member will be rewarded with 39 Euros (the price for a Paris Museum 2-day pass); participants in the *pro-self motive* condition were told that *the group member* who solves the mystery will be rewarded with 39 Euros.

In the *high time pressure* condition, participants were told the group (member) has 10 minutes (pretests indicated that this is a good time allocation for the high time pressure condition) to solve the mystery and a clock was displayed on the screen; it was made explicit for them that 'once the time expires, an automatic window will pop up with further instructions'. Participants in the *low-time pressure* condition were told that the group (member) has as much time as it (s/he) needs to solve the mystery; no clock was displayed on the screen and there was no cut-off time for performing the task. As participants did not actually receive the reward for solving the mystery, we randomly selected one winner and paid out the 39 Euros after the data collection was completed. This was announced at the end of the experiment, immediately after the participants were debriefed.

2.1.4. Dependent measures

Sharing of information is the dependent variable (DV)[2] in this study. The number of shared pieces of each type of information (important-public, unimportant-public, important-private and unimportant-private) was used for scoring the provision of information.

The manipulation check items for *social motivation* were adapted from Beersma et al. (2003). Thus, the manipulation check item for prosocial motivation was 'It was important for me to solve the mystery as a group'. The manipulation check item for pro-self motivation was 'I was competing with the others on my group in order to solve the mystery'. Answers were given on a 7-point Likert-type scale, ranging from (1) *Disagree strongly* to (7) *Agree strongly*.

The manipulation check items for *time pressure* were adapted from Edland (1994): (1) 'How much time pressure did you feel when reading and sharing the information?' and (2) 'How fast did you need to make your decisions?' Answers were given on a 7-point Likert-type scale, ranging from (1) *No time pressure* to (7) *Great time pressure* and from (1) *Not at all fast* to (7) *Very fast*, respectively. Additionally, to account for the real time spent on the task, *actual time used* was also measured using the system variable for time available in Authorware.

No manipulation check items were used for the manipulation of *information display* (O'Keefe 2003). Perdue and Summers (1986) argue that when the independent variable is concrete and observable (e.g. price and colour), it is relatively simple to confirm that it was manipulated as intended (O'Keefe 2003) and that its statistical significance should not be a concern; the push- and pull-information conditions were clearly different and were used accordingly.

2.2. Results

2.2.1. Manipulation checks

A multivariate analysis of variance (ANOVA) with *social motivation* as the independent variable and the two manipulation check items as DVs showed a significant overall effect, F (2, 122) = 127.45, $p < .001$, $\eta_p^2 = 0.67$. Prosocials indicated that it was more important to solve the mystery as a group than pro-selfs ($M = 5.14$, SD = 1.69 vs. $M = 2.58$, SD = 1.29; F (1,123) = 90.50, $p < .001$, $\eta_p^2 = 0.42$). Pro-selfs indicated that they were competing more with the others in the group to solve the mystery than prosocials ($M = 4.76$, SD = 1.70 vs. $M = 1.92$, SD = 1.19; F (1,123) = 116.34, $p < .001$, $\eta_p^2 = 0.49$). The social motivation manipulation was thus successful.

A multivariate ANOVA with time pressure as the independent variable and the two manipulation check items as DVs showed a significant overall effect, F (2, 122) = 8.77, $p < .001$, $\eta_p^2 = 0.13$. Participants felt more time pressure in the high time pressure condition than participants in the low time pressure condition ($M = 4.86$, SD = 1.71 vs. $M = 3.54$, SD = 1.83; F (1,123) = 17.35, $p < .001$, $\eta_p^2 = 0.12$). Participants in the high time pressure condition tended also to feel that they need to make their decision faster than participants in the low time pressure condition ($M = 4.27$, SD = 1.63 vs. $M = 3.70$, SD = 1.64; F (1,123) = 3.67, $p = .058$, $\eta_p^2 = 0.03$). Thus, we consider the time pressure manipulation as successful.

2.2.2. Descriptive statistics and intercorrelations

Table 1 shows the means, standard deviations and intercorrelations of the manipulated and measured variables. In line with previous research (Steinel, Utz, and Koning 2010), there was a strong positive correlation between social motivation and the provision of private important information; a negative correlation was found between time pressure and the provision of private important information as well as a strong negative correlation between time pressure and actual time used.

Table 1. Means, standard deviations and intercorrelations of the dependent measures and independent variables.

	Variable	*M*	SD	1	2	3	4	5	6	7	8
1.	Information Display	0.50	0.50	–							
2.	Social Motivation	0.50	0.50	−0.04	–						
3.	Time Pressure	0.51	0.50	0.04	−0.01	–					
4.	Provision of Public Unimportant Information	0.64	1.64	0.05	0.07	−0.14	–				
5.	Provision of Public Important Information	1.85	2.26	0.13	0.13	−0.13	0.53**	–			
6.	Provision of Private Unimportant Information	0.87	1.83	−0.09	0.07	−0.17	0.63**	0.59**	–		
7.	Provision of Private Important Information	2.20	2.47	−0.09	0.28**	−0.24**	0.37**	0.69**	0.40**	–	
8.	Actual time used (in seconds)	565.20	314.04	0.03	0.03	−0.34**	0.28**	0.26**	0.21*	0.21*	–

Notes: Information Display is recoded from the experimental manipulation (0 = push-information display, 1 = pull-information display. Social Motivation is recoded from the experimental manipulation (0 = pro-self motivation, 1 = prosocial motivation). Time Pressure is recoded from the experimental manipulation (0 = low time pressure, 1 = high time pressure).

**$p < .01$.

*$p < .05$.

2.2.3. Information sharing

Instead of performing an ANOVA, which is usually the most appropriate method when the groups of observations are created by categorical independent variables (Iversen and Norpoth 1987), to test the current hypotheses, a mixed analysis of covariance (ANCOVA) was performed: *information display* (push- vs. pull-information display), *social motivation* (prosocial vs. pro-self) and time pressure (high vs. low) were used as between-subjects factors and *information importance* (important vs. unimportant) and *information sharedness* (public vs. private) were used as within-subject factors; *actual time used* was included as a covariate.[3] Using ANCOVA allowed us to determine the covariation between the actual time used and the sharing of information, removing the variance associated with the actual time used from the sharing of information scores, prior to determining whether the differences between the experimental condition means were significant (Rutherford 2001).

The main effects of information importance, F (1, 116) = 10.79, $p < .01$, $\eta_p^2 = 0.09$, and information sharedness, F (1, 116) = 6.83, $p < .05$, $\eta_p^2 = 0.06$, showed that more important ($M = 4.05$, SD = 4.35) than unimportant ($M = 1.51$, SD = 3.13) and more private ($M = 3.07$, SD = 3.62) than public ($M = 2.49$, SD = 3.43) information was revealed. In line with H1, a significant main effect of social motivation, F (1, 116) = 4.25, $p < .05$, $\eta_p^2 = 0.04$, showed that prosocials shared more information than pro-selfs ($M = 6.76$, SD = 6.90 vs. $M = 4.34$, SD = 6.19). In line with what was predicted in *H2a*, the significant two-way interaction between information sharedness and social motivation, F (1, 116) = 4.06, $p < .05$, $\eta_p^2 = 0.03$, indicated that prosocials shared significantly more private information than pro-selfs ($M = 3.87$, SD = 3.88 vs. $M = 2.26$, SD = 3.16, t [123] = −2.55, $p < .05$). No significant difference was found between prosocials and pro-selfs with regard to the public information (M = 2.89, SD = 3.56 vs. $M = 2.08$, SD = 3.27, t [123] = −1.32, $p = .19$, *ns*). Furthermore and in line with *H2b*, a two-way significant interaction between information importance and social motivation, F (1, 116) = 5.19, $p < .05$, $\eta_p^2 = 0.04$, indicated that prosocials shared significantly more important information than pro-selfs ($M = 5.02$, SD = 4.54 vs. $M = 3.06$, SD = 3.94, t [123] = −2.57, $p < .05$), but did not differ from pro-selfs in sharing unimportant information ($M = 1.75$, SD = 3.07 vs. M = 1.27, SD = 3.19, t [123] = −0.84, $p = .40$, ns).

In contrast to *H3*, the main effect of time pressure was not significant, F (1, 116) = 2.17, $p = .14$, $\eta_p^2 = 0.02$. However, and even more interesting, we found a significant two-way interaction between information sharedness and time pressure, F (1, 116) = 5.06, $p < .05$, $\eta_p^2 = 0.04$. People under low time pressure shared significantly more private information than people under high time pressure ($M = 4.00$, SD = 4.10 vs. $M = 2.19$, SD = 2.85, t [123] = 2.86, $p < .01$); no significant differences were found with regard to public information ($M = 3.02$, SD = 4.12 vs. $M = 1.98$, $SD = 2.54$, t [123] = 1.68, $p = .10$) and the interaction between time pressure and information importance, F (1, 116) = 0.79, $p = .38$, $\eta_p^2 = 0.01$, ns.

Actual time used yielded a significant main effect, F (1, 116) = 6.59, $p < .05$, $\eta_p^2 = 0.05$. Not surprisingly, as can be seen in Table 1, the more time people spent on the task, the more information they shared. However, there was no support for *H4a-b*, as there was no significant three-way interaction between social motivation, time pressure and information importance, F (1, 116) = 0.04, $p = .85$, $\eta_p^2 = 0.00$, *ns*, or information sharedness, F (1, 116) = 0.42, $p = .52$, $\eta_p^2 = 0.00$, ns, respectively.

Although the main effect of information display was not significant, F (1, 116) = 0.00, $p = .97$, $\eta_p^2 = 0.00$, ns, providing no support for *H5*, we found a two-way interaction between information sharedness and information display, F (1, 116) = 13.80, $p < .001$, $\eta_p^2 = 0.11$. Significantly more private than public information was shared in the push-information condition ($M = 3.44$, SD = 3.78 vs. $M = 2.11$, SD = 3.33, t [62] = −4.42, $p < .001$). No significant difference was found between private and public information in the pull-information condition ($M = 2.69$,

SD = 3.44 vs. $M = 2.87$, SD = 3.51, t [61] = 0.68, $p = .50$, ns).

In line with *H6a*, the three-way significant interaction (Figure 2) between information sharedness, social motivation and information display, F (1, 116) = 9.21, $p < .01$, $\eta_p^2 = 0.07$, indicated that prosocials shared more private information than pro-selfs ($M = 4.48$, SD = 3.79 vs. $M = 2.30$, SD = 3.47, t [61] = −2.38, $p < .05$) in the push-information condition, but not in the pull-information condition ($M = 3.20$, SD = 3.93 vs. $M = 2.22$, SD = 2.90, t [60] = −1.12, $p = .27$, ns). No significant difference was found between prosocials and pro-selfs for public information neither in the push- ($M = 2.24$, SD = 3.16 vs. $M = 1.97$, SD = 3.55, t [61] = −0.33, $p = .75$, ns) nor in the pull-information condition ($M = 3.60$, SD = 3.88 vs. $M = 2.19$ vs. 3.03, t [60] = −1.60, $p = .11$, ns). *H6b* was not supported, F (1, 116) = 0.13, $p = .73$, $\eta_p^2 = 0.00$, ns. Also, as can be seen in Figure 2 (i.e. the first two black bars), only prosocials in the push-information display condition shared significantly more private than public information ($M = 4.48$, SD = 3.79 vs. $M = 2.24$, SD = 3.16, t [32] = −4.94, $p < .00$). All other main and interaction effects were non-significant, $F's < 0.12$, p's > .73, η_p^2's < .00 (Figure 2).

2.3. Discussion

In this experiment, we conceptually replicated and extended the findings of Steinel, Utz, and Koning (2010) in a more complex setting using actual and a bigger amount of pieces of information (i.e. individuals received 28 instead of 12 pieces of information). We found that social motivation influenced information pooling such that individuals with a prosocial motivation shared more important information than individuals with a pro-self motivation. At the same time, individuals with a prosocial motivation shared significantly more private information than individuals with a pro-self motivation; overall, prosocials shared more information than pro-selfs.

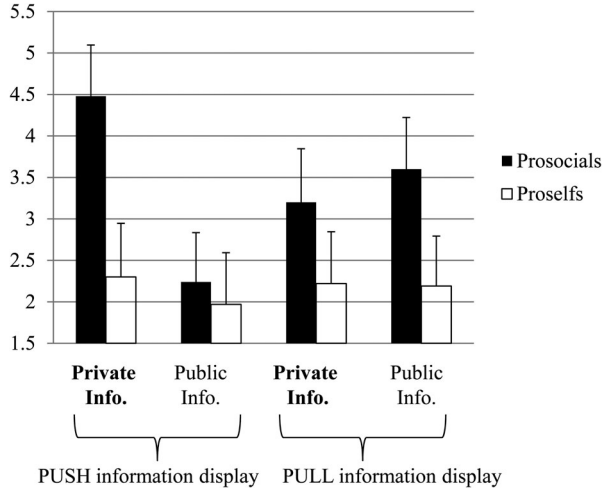

Figure 2. The mean number of the public and private pieces of information shared as a function of technological feature (push- vs. pull-information display) and prosocialness (prosocial vs. pro-self motivation).

More important, the results showed that information display influences SIS. The main effect of information display was not significant; instead, an even more interesting two-way interaction between information display and sharedness of information emerged. In the push-information display condition, significantly more private than public information was shared. However, this effect was found for prosocials only. In other words, the push-information display brought out the best in prosocials without worsening the behaviour of pro-selfs. Prosocials acted towards their motivational drivers as they did not have to spend time 'sorting' the information out of the amount of mixed (i.e. important and unimportant) information. In the pull-information display condition, respondents had to judge the importance of the information by themselves as it is usually the case in pull-information systems (Pedley 1999). It is interesting to note that the overall amount of information shared by pro-selfs was low and that information displays did not play a role. In other words, pro-selfs seem to be 'immune' and do not act upon the new technological advancements that facilitate the access to more relevant information. Nevertheless, the interaction of design with sharedness of information is very encouraging because it demonstrates that a technological invention can stimulate mainly the sharing of private information – the information that is often much needed to find the best solution. We aim to replicate this interaction between display and sharedness of information (H7) in Experiment 2.

For time pressure, we also did not find a simple main effect, but an interaction with sharedness of information: time pressure mainly affected the sharing of private information; time pressure also correlated negatively with the provision of private important information (Table 1). The actual time used correlated positively with all four types of information. These results point out that time pressure might have even more detrimental effects on IS than often assumed. It does not simply lead to lower overall levels of sharing, but hinders especially the sharing of private information that is much needed for optimal decision-making.

A more psychological explanation for this effect of time pressure is the increased NFCC in the high time pressure condition. People high in NFCC want to reach quick decisions and are aversive of ambiguity and uncertainty; consequently, they share less information because more

information might increase ambiguity and prolong the decision-making process. People low in NFCC are more tolerant towards ambiguity and uncertainty; they might, therefore, share the private information even if it challenges the seemingly obvious solution and increases, therefore, ambiguity. Time pressure has often been used to experimentally manipulate NFCC (Bechtoldt et al. 2010; Chirumbolo et al. 2004; De Dreu et al. 2011; Pierro, Kruglanski, and Raven 2012). However, in the present study we are not able to say whether the effects of time pressure are driven by actual time pressure or indeed by the higher NFCC in the high time pressure condition because the high time pressure groups had less time and time also affected IS. Thus, to be able to disentangle the two explanations, in Experiment 2 we avoid this confound by giving both groups the same amount of time, but framing this amount either as ample time or as too little time (De Dreu 2003). Another limitation is that this study used a mystery story. Even people in the pro-self condition might have been motivated to find the thief (see Steinel, Utz, and Koning (2010) for higher IS rates in a murder mystery). In Experiment 2, we use a different cover story involving a truly mixed-motive situation: people who need help in applying for a scholarship, but compete at the same time with other applicants. To reduce the complexity of the design and because the effect of social motivation on IS has been demonstrated repeatedly (Steinel, Utz, and Koning 2010; Toma and Butera 2009), we drop social motivation from the second experiment.

3. Experiment 2

3.1. Method

3.1.1. Participants and design

Seventy-one university students (25 males, 46 females; mean age 19.6 years, SD = 2.10, range 17–26 years) took part in the study and received 3.5 Euros (approx. 5 US dollars) in return for their participation. The experiment had a 2 (information display: push- vs. pull-information display) × 2 (perceived time pressure: high vs. low) design; information importance (important vs. unimportant) and sharedness (public vs. private) were varied as within-subjects factors.

3.1.2. Procedure

As in Experiment 1, upon arrival in the laboratory, each participant was escorted to an isolated cubicle and seated in front of a desktop computer via which (s)he received all the instructions. Participants read that the research is about how people prepare for an application and how they process information. In particular, they were told to imagine studying a semester abroad, that Victoria University, Melbourne, Australia, was their study destination and that they were connected via the computer with two other students, also interested in studying at the same university. Task instructions were formulated in a way to create a mixed-motive situation. To induce a cooperative motivation, each participant was also told to imagine that the other two students were fellow students from the same semester and that they all study and work together on various assignments. In order to prepare, they communicate via the computer, collaborate and help each other to increase each other's chances of having a successful application. To induce, at the same time, a competitive motivation, participants were told that they will be required to send individual applications that should reflect a good quality because, due to their popularity, Australian universities usually receive more applications than places available.

The study was presented as structured in two phases. In the first phase, participants were provided with pieces of information meant to help them prepare a successful study-abroad application. For each piece of information, participants could press a 'Share' button to share information with the others; after the message confirming the sharing, the participant was redirected to the initial main screen with information. Participants were told that they would see the information everyone shared and will then discuss about an optimal strategy for the scholarship application in the second phase (which actually did not take place). After the information-sharing task was completed, participants filled in a questionnaire containing the manipulation checks. After that, they were debriefed, thanked and paid. Similar to Experiment 1, the experimenter, for pilot-testing reasons, asked the first five participants, at the end of their participation, whether they could easily follow the instructions and perform the task. All five participants had a similar understanding of the study and reported no structural or content-wise suggestions after completing it; the study continued running in its initial form and the first five participants were added to the final student sample used for analyses.

3.1.3. Independent variables

Information sharedness was manipulated as in Experiment 1. The participants were told that the public information was accessible to all three group members and, this time, that it was collected from the Australian University website and that it was about the requirements and application procedure (e.g. deadlines, and documents needed). The private information was accessible to them only and the participants were told to consider that they gathered this information themselves by talking with other people on Facebook, with friends who had similar experiences and even with one professor; they

all provided information (e.g. tips and suggestions) about the scholarship application.

Information importance was manipulated as in Experiment 1, but was not signalled by labels anymore. As in Experiment 1, a total of 28 pieces of information were used; they were no longer pretested in terms of importance as the distribution clearly distinguished between important and unimportant ones: the unimportant information was not related to the application process itself as it referred to Melbourne as a city, its inhabitants, the economy, social life, courses' evaluation, etc. On the other hand, the important information referred to application forms, deadlines, fees, language test requirements for application, details that the motivation letter or the Curriculum Vitae should contain, etc. One example of unimportant information is: 'Melbourne is the second most populous city in Australia. Based in Melbourne, Victoria University is a public university and one of the best education systems in the world'. One example of important information is:

> Don't forget to add your hobbies in your CV. The most important thing is not to list them only. Give few details on how frequent you enjoy your hobbies and how did you discover them. Don't make it too long but this information should be in there.

Similar to Experiment 1, two factors (i.e. sharedness and importance) were manipulated orthogonally, resulting in (a) 7 pieces of public important information (i.e. 318 words), (b) 7 pieces of public unimportant information (i.e. 285 words), (c) 7 pieces of private important information (i.e. 324 words) and (d) 7 pieces of private unimportant information (i.e. 279 words).

Information display was manipulated as in Experiment 1. We used a different *time pressure* manipulation. Following De Dreu's (2003) approach, we specifically told participants in both time pressure conditions that they have 10 minutes to complete the task: (1) in the high time pressure condition, participants were told that 10 minutes is often quite tight to spend on the screen with information, whereas (2) in the low time pressure condition participants were told that 10 minutes is more than enough to spend on the screen with information. In both conditions, they were also told that a clock displayed on the screen will keep track of time and that once the allotted time expires, an automatic window will pop up with further instructions.

3.1.4. Dependent measures

Sharing of information was scored as in Experiment 1. Also as in Experiment 1, no manipulation check items were used for the manipulation of the *information display* (O'Keefe 2003) and the push- and pull-information conditions were used accordingly. Three manipulation check items for perceived time pressure were adapted from De Dreu (2003) (e.g. 'Did you feel you had sufficient time to read and share the information?'). Answers are given on a 7-point Likert-type scale, ranging from (1) *Not at all* to (7) *Very much*. As in Experiment 1, *actual time* spent on the task was measured.

3.2. Results

3.2.1. Manipulation checks

Although a multivariate ANOVA with perceived time pressure as the independent variable and the three manipulation check items as DVs showed a non-significant overall effect, F (3, 67) = 1.88, p = .14, $\eta_p^2 = 0.08$, univariate effects were (marginally) significant. A marginally significant effect for the first item, F (1,69) = 3.43, p = .07, $\eta_p^2 = 0.05$, indicated that participants in the high time pressure condition felt that they had less sufficient time to read and share the information than participants in the low time pressure condition (M = 5.25, SD = 1.57 vs. M = 5.91, SD = 1.44). A significant effect for the second item, F (1,69) = 4.20, p = .04, $\eta_p^2 = 0.06$, indicated that participants in the high time pressure condition felt more under time pressure while reading and sharing the information than participants in the low time pressure condition (M = 3.86, SD = 1.76 vs. M = 3.00, SD = 1.78). A marginally significant effect for the third item, F (1,69) = 3.53, p = .06, $\eta_p^2 = 0.05$, indicated that while reading and sharing the information, the time left was a concern more for participants in the high time pressure condition than for those in the low time pressure condition (M = 3.83, SD = 1.58 vs. M = 3.14, SD = 1.52). Due to the overall pattern, we considered the manipulation of perceived time pressure as successful.

3.2.2. Descriptive statistics and intercorrelations

Table 2 shows the means, standard deviations and intercorrelations of the manipulated and measured variables. The main finding was a negative correlation between information display and the provision of private important information, indicating that less private information was shared in the pull-information display condition than in the push-information display condition.

3.2.3. Information sharing

Preliminary analysis indicated that conditions did not differ with regard to the actual time people spent on the task, F (1, 66) = 0.07, p = .79, $\eta_p^2 = 0.00$, and that time also did not correlate with IS; the actual time

Table 2. Means, standard deviations and intercorrelations of the dependent measures and independent variables.

	Variable	*M*	SD	1	2	3	4	5	6	7
1.	Information display	0.48	0.50	–						
2.	Perceived time pressure	0.51	0.50	0.04	–					
3.	Provision of public unimportant information	2.08	1.66	0.09	−0.17	–				
4.	Provision of public important information	2.96	2.29	0.02	0.08	0.31**	–			
5.	Provision of private unimportant information	2.59	1.62	−0.14	−0.04	0.53**	0.45**	–		
6.	Provision of private important information	3.17	2.06	−0.26*	0.04	0.18	0.51**	0.45**	–	
7.	Actual time used (in seconds)	425.33	139.29	0.01	−0.02	−0.11	0.05	−0.06	0.18	–

Notes: Information display is recoded from the experimental manipulation (0 = push-information display, 1 = pull-information display). Perceived time pressure is recoded from the experimental manipulation (0 = low time pressure, 1 = high time pressure).
**$p < .01$.
*$p < .05$.

variable was, therefore, left out from further analyses. A mixed ANOVA was performed, with *information display* (push- vs. pull-information display) and *perceived time pressure* (high vs. low) as between-subjects factors and *information importance* (important vs. unimportant) and *information sharedness* (public vs. private) as within-subject factors.

The main effects of information importance, F (1, 67) = 11.51, $p < .01$, $\eta_p^2 = 0.15$, and sharedness, F (1, 67) = 4.54, $p < .05$, $\eta_p^2 = 0.06$, showed that more important ($M = 6.13$, SD = 3.78) than unimportant ($M = 4.68$, SD = 2.87) and more private ($M = 5.76$, SD = 3.13) than public ($M = 5.04$, SD = 3.21) information were revealed. The main effect of perceived time pressure was not significant, F (1, 67) = 0.01, $p = .93$, $\eta_p^2 = 0.00$; none of the interaction effects involving time pressure was significant, all F's < 2.19, ns.

We replicated the two-way interaction between information sharedness and information display, F (1, 67) = 8.65, $p < .01$, $\eta_p^2 = 0.11$. Again, in line with H7, significantly more private than public information was shared in the push-information condition ($M = 6.49$, SD = 3.19 vs. $M = 4.86$, SD = 3.13, t [36] = −3.13, $p < .01$). Also, as can be seen in Figure 3, significantly more private information was shared in the push-information display condition than in the pull-information-display condition (t [69] = 2.09, $p < .05$). All other main and interaction effects were non-significant, F's < 0.68, p's > .41, η_p^2's < .01 (Figure 3).

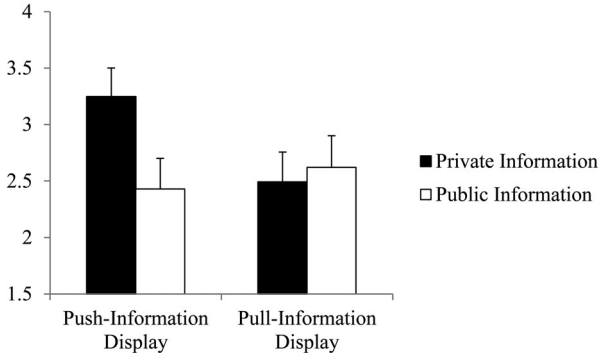

Figure 3. The mean number of the public and private pieces of information shared as a function of technological feature (push- vs. pull-information display).

3.3. Discussion

Experiment 2 replicated the significant interaction found in Experiment 1, between information display and sharedness: findings indicated that the push design mainly increased the sharing of private information (i.e. H7 is supported). Moreover, this significant interaction has been found while using a mixed-motive scenario that, differently from Experiment 1, did not contain a strong moral component (i.e. finding the thief) and, therefore, extended findings' applicability to more real (i.e. educational) settings.

With regard to the overall type of information shared and in line with what we found in Experiment 1, the main effects of information importance and sharedness showed that, in general, more important and more private information was revealed. These results are in line with prior studies (Bowman and Wittenbaum 2012; Steinel, Utz, and Koning 2010) also challenging the generalisability of the information sampling bias (Stasser and Titus 1985; Stasser, Vaughan, and Stewart 2000).

The predicted main effect of *perceived* time pressure was not significant and *perceived* time pressure did not also interact with information sharedness. These results indicate that it is *actual* time pressure (Experiment 1) rather than *perceived* time pressure (Experiment 2) that drives the effects. Nevertheless, by showing that it is not NFCC that drives the effects of actual time pressure, this second experiment contributes to the deeper understanding of the underlying processes, inspiring further theoretical development (Reis and Judd 2014).

4. General discussion

In two experiments, we examined the separate and joint impact of social motivation, perceived (vs. actual) time pressure and technological features on SIS. Our main

Table 3. Hypothesis-testing results.

No.	Hypothesis	Results	
		Study 1	Study 2
H1.	Prosocials share more information than pro-selfs.	Supported	Not tested
H2.	Prosocials share more (a) private and (b) important information than pro-selfs.	Supported	Not tested
H3.	People under high time pressure share less information than people under low time pressure.	Not supported[a]	Not supported
H4.	The effect of social motivation, that is, that prosocials share (a) more private and (b) more important information than pro-selfs, is more pronounced under low time pressure than under high time pressure.	Not supported	Not tested
H5.	Individuals share more information in the push-information display situation than in the pull-information display situation.	Not supported	Not supported
H6.	The effect of social motivation, that is, that prosocials share (a) more private and (b) more important information than pro-selfs, is more pronounced in the push-information display condition than in the pull-information display condition.	H6a Supported H6b Not supported	Not tested
H7.	More private than public information is shared in the push-information display condition than in the pull-information display condition.	Supported	Supported

[a]The non-hypothesised interesting results were as follows: people under low time pressure shared significantly more private information than people under high time pressure; no significant differences were found with regard to public information.

finding is that the push design, compared with the pull design, increases the sharing of private information. This finding applies especially to individuals who are prosocially motivated. We also consolidate the perspective of information pooling as a motivated process by demonstrating once more that social motivation, also in interaction with how information is displayed (push vs. pull design), plays an important role in IS. Findings with regard to time pressure indicate that actual time pressure, and not perceived time pressure, impacts the sharing of information; in other words, SIS can be better understood through the lens of actual time pressure than via induced NFCC (Table 3 provides a summary of the hypothesis-testing results). Overall, this paper innovatively bridges social psychology and information systems literature to examine how psychological and technological variables affect SIS.

4.1. Theoretical and practical implications

The current findings have several important theoretical and practical implications. Our first main finding refers to how technological features affect SIS. Particularly, we detected a complex interplay between information display, information sharedness and social motivation. Prosocials (vs. pro-selfs) shared more private than public information in the push- but not in the pull-information display condition, indicating that information display can affect the information-sharing behaviour of individuals with a prosocial motivation. Experiment 2 replicated the central finding that the push design mainly affects the sharing of private information. From a theoretical perspective, we advance research in the field of communication and technology and in the field of information systems by showing how push vs. pull designs, as specific aspects of technology, impact SIS, also in the light of social motivation. This approach comes to complement previous studies (e.g. Bordia, Irmer, and Abusah 2006; Vuori and Okkonen 2012) that investigated technology from a broad perspective (e.g. knowledge-sharing repositories), ignoring also how specific technological features essentially affect the type of information people share. The interplay we found between individual motivations and what technology affords is a valuable addition to the literature on information and knowledge sharing (Witherspoon et al. 2013), since it empirically demonstrates that IS is as much an interpersonal as a technological process (Fulk and Yuan 2013). Moreover, research on how people attribute own motivations to the technology they use (Duggan 2016) may benefit from the insight that push designs stimulate only prosocials to share their private information. The fact that we replicated the central finding when social motivation was no longer a factor in Experiment 2 – that is, the push design mainly affects the sharing of private information – (1) adds to the relatively recent literature on SIS (Steinel, Utz, and Koning 2010; Utz, Muscanell, and Goeritz 2014) showing that individual motivations moderate the effects of technology and (2) might also explain why previous studies – which did not empirically test these interactions – found that even the new technologies (e.g. enterprise social media) constrain human–human interaction in online collaborative environments (e.g. Leonardi, Huysman, and Steinfield 2013). We argue that people might feel less ownership for private information if they receive it without much effort as is the case with the push display. Individual motivations play a vital role in IS as suggested also by our second main finding that refers to how social motivation affects SIS. Particularly, we found that prosocials shared more important and more private information than pro-selfs; overall, prosocials shared more information than pro-selfs. From a *theoretical perspective*, we advance the relatively recent line of research on SIS (Steinel, Utz, and Koning 2010; Toma and Butera 2009; Utz, Muscanell, and Goeritz 2014) by replicating

the effects of social motives, while also considering the technological aspects of sharing as well as time pressure. In the light of our findings, studies on prosocialness and cooperation theory might benefit from examining complementarily other specific technological features (e.g. rewarding system with points per groups of members) in the sense of identifying more effective ways to stimulate collaborations and valuable sharing among users. Thus, the current findings are a valuable addition to previous studies (Ren et al. 2012; Ren and Kraut 2014; Ren, Kraut, and Kiesler 2007) that have examined the translation of social psychological theories (e.g. of group identity and interpersonal bonds) into specific technological features (e.g. group profile page, group communication channels) to design and develop online collaborative platforms, to strengthen member attachment. We also advance the literature on human–computer interaction because present findings showed how well push technology responds to prosocially motivated users' needs. Finally, our third main finding refers to how time pressure affects SIS. Particularly, we demonstrated that actual time pressure is detrimental because it mainly affects the sharing of private information. We further showed that these effects are not driven by NFCC that should have been increased given the perceived time pressure (De Dreu et al. 2011). From a *theoretical perspective*, we advance the understanding of time pressure *versus* NFCC as a situation- and person-related factor, respectively, in the MIP-G model (De Dreu, Nijstad, and Van Knippenberg 2008). Particularly, by disentangling between the effect of actual and perceived time pressure, our findings help to consolidate previously studied processes such as information processing in negotiation, innovation or group creativity. For instance, De Dreu et al. (2011) showed that negotiators under high time pressure were less likely to revise their unfounded fixed-pie perceptions during negotiations and, therefore, reached less integrative agreements. Future research should also look at other factors that might be induced by time pressure, such as attentional focus, selectivity or stress (Kelly and Karau 1999; Maule and Edland 1997), which might also explain why we found no main effects of time pressure and information display but specific interactions of these factors with information sharedness.

From a *practical perspective*, our first main finding suggests the design of push IS platforms is effective because it seems to motivate prosocials to reveal more unshared information. Although it did not increase IS of pro-selfs, it also did not decrease it; we thus recommend the use of push-IS platforms. Moderators of online collaborative platforms, if existent, should also implement ways (e.g. surveys) to assess members' social value orientations which can significantly inform expectations with regard to IS, interaction and community participation. Secondly, since we found that prosocials shared more important and more private information than pro-selfs, managers of online collaborative platforms can use studies on prosocialness and cooperation theory to integrate specific technological features (e.g. rewarding system with points per groups of members), triggering collaborations and valuable sharing among users. Pro-selfs were unaffected by the display in Experiment 1, but note that we manipulated prosocial and proself orientation simply by varying the bonus structure. To stimulate the sharing of the unique information, managers should stress the cooperative aspects of the task and reduce selfish motives, for instance, by rewarding team performance. Rewarding team performance triggers levels of interdependence with other members that motivate members to apply cooperative norms (Steinel, Utz, and Koning 2010) and reach high levels of social identification (De Cremer and Van Vugt 1999). Implementing a rewarding system with points per groups of members should yield similar outcomes. Similarly, topic-centred online groups provide optimal conditions for self-categorisation and social identification (Utz 2003). Thirdly, since actual time pressure and not induced NFCC was found to be detrimental to sharing of private information, online platform designers should try to (1) avoid time pressure by not displaying time-related icons or devices (e.g. clocks) or (2) at least make deadlines less salient in accomplishing task responsibilities for instance, by assigning a timekeeper or person to manage the planning of activities who can inform, periodically, on the progress expected to be made by the team. A third option would be to increase visibility of those individuals who are able to cope with work requirements under time pressure by means of illustrative icons that suggest availability in terms of time spent on the task.

4.2. Limitations and strengths

Firstly, we acknowledge that using a student sample may limit the generalisability of the findings to other (professional) populations. However, we are mainly interested in the effects of the three factors and therefore *manipulated*, via experiments, social motivation, time pressure and information display. Thus, we are confident that the main findings would hold in an organisational setting of professionals too. Secondly, one might argue that students, as frequent users of social media, are more familiar with sharing information. However, this should mainly affect the amount of information shared by other populations, but not the pattern; at the same

time, professionals in organisations, inevitably, are already users of social media. Thirdly, participants in both studies did not actually interact with other participants and this may pose a threat to the external validity of this research. However, participants were told that the interaction will take place after the information-sharing task, so this factor should not influence the results. Fourthly, the sample size was small, reducing the power of the studies. However, we replicated the basic finding across both studies, so we are confident that our findings are valid and robust.

An important strength of our research is the experimental approach used in the two studies as most related research is predominantly survey-based or qualitatively oriented (Witherspoon et al. 2013). The latter methodological approaches make it difficult to detect causal relationships, especially when it comes to such a sensitive topic as withholding important private information. Another strength lies in the advancement the current studies made by bridging social psychology studies and the larger field of human–computer interaction. This has been made possible by firstly detecting a complex interplay between information display, information sharedness and social motivation (i.e. prosocials (vs. pro-selfs) shared more private than public information in the push-, but not in the pull-, information display condition) and then by replicating one of the most important findings: the push design mainly affects the sharing of private information. Our findings are timely and relevant also because we retrieve more and more information via feeds, be it via RSS or Twitter. Current findings can inform collaboration norms and design alternatives related to how information is displayed, to encourage contributions within online collaborative platforms, building also on how social psychological theories can be translated into specific technological features (e.g. Ren et al. 2012).

4.3. Future research directions and conclusions

Follow-up studies should shed more light on the underlying processes of SIS. We assumed, but did not explicitly test, that the push design affects the sense of information ownership. When people put more effort in acquiring information, they might be more reluctant to give it away. Future studies should explicitly test this explanation. Additionally, future research could explore other underlying processes which tackle the differences between push- and pull-information displays. Empirical studies should tap into current findings to assess whether effort in accessing information is more associated with pull- than with push-information displays.

The effect of time pressure on SIS seems not to be driven by NFCC; other NFCC manipulations (e.g. via process accountability and environmental noise) could be used to substantiate this finding. More important, future research could test the role of other potential mediators of the time pressure effect such as attentional focus or selectivity. Furthermore, current research could be extended by also considering power aspects and investigating, in addition, how employees behave according to their position. One reason is not only because power is part of the MIP-G model and that pro-selfs, for instance, value power (De Dreu, Nijstad, and Van Knippenberg 2008), but also because knowledge is oftentimes perceived as power and, naturally, power relationships exist and develop in various online and offline work settings. Research could also look at how various ways of information display and time pressure impact IS between leaders and followers, or to investigate SIS for people who are either prosocial or pro-self motivated and, at the same time, have a powerful (vs. powerless) position. Another extension would be to look at possible downsides of push-information such as information overload. People might also withhold information because they do not want to overwhelm other people with clutter.

The current research looked at the role of motivation and opportunity, thus covering only two components of the motivation–opportunity–ability (MOA) theoretical framework (Kettinger et al. 2015; Siemsen, Roth, and Balasubramanian 2008) that has been adopted in knowledge-sharing research to better understand knowledge sharing. Since the MOA framework suggests to also consider an individual's ability (Siemsen, Roth, and Balasubramanian 2008) to share information, future research should include this third component as well (Kettinger et al. 2015). To conclude, these are the first studies that clearly demonstrated how social motivation and time pressure impact SIS and how technology can increase the sharing of private information, in the light of these psychological factors. These first promising results open up many interesting avenues for future research.

Notes

1. Social motives can either be due to individual differences in social value orientation (Van Lange et al. 1997) or may be situationally cued, for instance, by providing group or individual incentives for performance (De Dreu, Nijstad, and Van Knippenberg 2008). Empirical studies that either manipulated (Steinel, Utz, and Koning 2010; Toma and Butera 2009) or measured (Utz, Muscanell, and Goeritz 2014) social motivation brought consistent evidence to demonstrate that IS is a strategic behaviour. Conceptually, it should not therefore matter whether social motivation is chronically or temporarily

salient. For simplicity reasons, we use the terms 'prosocials' and 'pro-selfs', although we manipulate social motivation.

2. As previously mentioned, group members could press either a 'Share' or an 'E-mail' button. In all, 83.2% of the participants never or only once used the 'E-mail' button, while only 37.6% of the participants never or only once used the 'Share' button. Therefore, the sum of the information pieces shared by pressing either one or the other button was used as DV.
3. We controlled for the actual time used since more information can be shared when there are no time constraints. An exploratory test, F (1, 117) = 15.86, $p < .00$, showed that participants under high (vs. low) time pressure took less time to complete the task ($M = 460.82$, SD = 182.74 vs. $M = 674.71$, SD = 380.71). Moreover, participants under low time pressure took on average somewhat more than 10 minutes (600 seconds), confirming that the time limit of 10 minutes indeed imposed some pressure without making the task unsolvable.

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References

Akhavan, P., M. Jafari, and M. Fathian. 2005. "Exploring Failure-Factors of Implementing Knowledge Management Systems in Organizations." *Journal of Knowledge Management Practice* 6: 1–8. Retrieved from http://www.tlainc.com/articl85.htm.

Bechtoldt, M. N., C. K. W. De Dreu, B. A. Nijstad, and H.-S. Choi. 2010. "Motivated Information Processing, Social Tuning, and Group Creativity." *Journal of Personality and Social Psychology* 99 (4): 622–637. doi:10.1037/a0019386.

Beersma, B., J. R. Hollenbeck, S. E. Humphry, H. Moon, D. E. Conlon, and D. R. Ilgen. 2003. "Cooperation, Competition, and Team Performance: Towards a Contingency Approach." *Australian Journal of Psychology* 55: 115–115. Retrieved from Go to ISI://WOS:000186983200498.

Bordia, P., B. E. Irmer, and D. Abusah. 2006. "Differences in Sharing Knowledge Interpersonally and via Databases: The Role of Evaluation Apprehension and Perceived Benefits." *European Journal of Work and Organizational Psychology* 15 (3): 262–280. doi:10.1080/13594320500417784.

Bowman, J. M., and G. M. Wittenbaum. 2012. "Time Pressure Affects Process and Performance in Hidden-Profile Groups." *Small Group Research* 43 (3): 295–314. doi:10.1177/1046496412440055.

Brodbeck, F. C., R. Kerschreiter, A. Mojzisch, and S. Schulz-Hardt. 2007. "Group Decision Making Under Conditions of Distributed Knowledge: The Information Asymmetries Model." *Academy of Management Review* 32 (2): 459–479. Retrieved from Go to ISI://WOS:000245465400010.

Cabrera, A., W. C. Collins, and J. F. Salgado. 2006. "Determinants of Individual Engagement in Knowledge Sharing." *International Journal of Human Resource Management* 17 (2): 245–264. doi:10.1080/09585190500404614.

Chen, C. T., and W. S. Tai. 2003. "An Information Push-Delivery System Design for Personal Information Service on the Internet." *Information Processing & Management* 39 (6): 873–888. doi:10.1016/s0306-4573(02)00045-6.

Chirumbolo, A., S. Livi, L. Mannetti, A. Pierro, and A. W. Kruglanski. 2004. "Effects of Need for Closure on Creativity in Small Group Interactions." *European Journal of Personality* 18 (4): 265–278. doi:10.1002/per.518.

Chong, D. S. F., W. Van Eerde, C. G. Rutte, and K. H. Chai. 2012. "Bringing Employees Closer: The Effect of Proximity on Communication When Teams Function Under Time Pressure." *Journal of Product Innovation Management* 29 (2): 205–215. doi:10.1111/j.1540-5885.2011.00890.x.

Davenport, T. H., and L. Prusak. 1998. *Working Knowledge: How Organizations Manage What They Know*. Boston, MA: Harvard Business School Press.

De Cremer, D., and M. Van Vugt. 1999. "Social Identification Effects in Social Dilemmas: A Transformation of Motives." *European Journal of Social Psychology* 29 (7): 871–893. doi:10.1002/(sici)1099-0992(199911)29:7<871::aid-ejsp962>3.0.co;2-i.

De Dreu, C. K. W. 2003. "Time Pressure and Closing of the Mind in Negotiation." *Organizational Behavior and Human Decision Processes* 91 (2): 280–295. doi:10.1016/s0749-5978(03)00022-0.

De Dreu, C. K. W., B. A. Nijstad, M. N. Bechtoldt, and M. Baas. 2011. "Group Creativity and Innovation: A Motivated Information Processing Perspective." *Psychology of Aesthetics Creativity and the Arts* 5 (1): 81–89. doi:10.1037/a0017986.

De Dreu, C. K. W., B. A. Nijstad, and D. Van Knippenberg. 2007. "Motivated Information Processing in Group Judgment and Decision Making." *Personality and Social Psychology Review* 12 (1): 22–49. doi:10.1177/1088868307304092.

Duggan, G. B. 2016. "Applying Psychology to Understand Relationships with Technology: From ELIZA to Interactive Healthcare." *Behaviour & Information Technology* 1–12. doi:10.1080/0144929X.2016.1141320.

Edland, A. 1994. "Time Pressure and the Application of Decision Rules – Choices and Judgements among Multiattribute Alternatives Scandinavian." *Journal of Psychology* 35 (3): 281–291. doi:10.1111/j.1467-9450.1994.tb00952.x.

Fulk, J., and Y. C. Yuan. 2013. "Location, Motivation, and Social Capitalization via Enterprise Social Networking." *Journal of Computer-Mediated Communication* 19 (1): 20–37. doi:10.1111/jcc4.12033.

Grant, R. M. 1996. "Toward a Knowledge-based Theory of the Firm." *Strategic Management Journal* 17: 109–122. Retrieved from Go to ISI://WOS:A1996WK18900009.

Hahn, M., R. Lawson, and Y. G. Lee. 1992. "The Effects of Time Pressure and Information Load on Decision Quality." *Psychology and Marketing* 9 (5): 365–378.

Hsu, C.-L., and J. C.-C. Lin. 2008. "Acceptance of Blog Usage: The Roles of Technology Acceptance, Social Influence and Knowledge Sharing Motivation." *Information & Management* 45 (1): 65–74. doi:10.1016/j.im.2007.11.001.

Iversen, G. R., and H. Norpoth. 1987. *Analysis of Variance*. Thousand Oaks, CA: Sage.

Jarvenpaa, S. L., K. Knoll, and D. E. Leidner. 1998. "Is Anybody Out There?" *Journal of Management Information Systems* 14 (4): 29–64. Retrieved from http://search.ebscohost.com/login.aspx?direct=true&db=bsh&AN=686763&site=ehost-live.

Jarvenpaa, S. L., and D. E. Leidner. 1999. "Communication and Trust in Global Virtual Teams." *Organization Science* 10 (6): 791–815. doi:10.1287/orsc.10.6.791.

Kankanhalli, A., B. C. Y. Tan, and K. K. Wei. 2005. "Contributing Knowledge to Electronic Knowledge Repositories: An Empirical Investigation." *Mis Quarterly* 29 (1): 113–143. Retrieved from Go to IS://WOS:000227199900006.

Kelly, J. R., and S. J. Karau. 1999. "Group Decision Making: The Effects of Initial Preferences and Time Pressure." *Personality and Social Psychology Bulletin* 25 (11): 1342–1354. doi:10.1177/0146167299259002.

Kettinger, W. J., Y. Li, J. M. Davis, and L. Kettinger. 2015. "The Roles of Psychological Climate, Information Management Capabilities, and IT Support on Knowledge-sharing: An MOA Perspective." *European Journal of Information Systems* 24 (1): 59–75. doi:10.1057/ejis.2013.25.

Ko, D. G., L. J. Kirsch, and W. R. King. 2005. "Antecedents of Knowledge Transfer from Consultants to Clients in Enterprise System Implementations." *Mis Quarterly* 29 (1): 59–85. Retrieved from Go to ISI://WOS:000227199900004.

Kraut, R. E., P. Resnick, S. Kiesler, M. Burke, Y. Chen, N. Kittur, and J. Riedl. 2012. "Building Successful Online Communities: Evidence-based Social Design." Massachusetts Institute of Technology.

Leonardi, P. M., M. Huysman, and C. Steinfield. 2013. "Enterprise Social Media: Definition, History, and Prospects for the Study of Social Technologies in Organizations." *Journal of Computer-Mediated Communication* 19 (1): 1–19. doi:10.1111/jcc4.12029.

Leonardi, P. M., and J. W. Treem. 2012. "Knowledge Management Technology as a Stage for Strategic Self-presentation: Implications for Knowledge Sharing in Organizations." *Information and Organization* 22 (1): 37–59. doi:10.1016/j.infoandorg.2011.10.003.

Li, W. 2010. "Virtual Knowledge Sharing in a Cross-cultural Context." *Journal of Knowledge Management* 14 (1): 38–50. doi:10.1108/13673271011015552.

Lipnack, J., and J. Stamps. 1997. *Virtual Teams: Reaching Across Space, Time and Organizations with Technology*. New York: John Wiley and Sons.

Maule, A. J., and A. C. Edland. 1997. "The Effects of Time Pressure on Human Judgement and Decision Making." In *Decision Making: Cognitive Models and Explanations*, edited by R. Ranyard, R. W. Crozier, and O. Svenson, 189–204. London: Routledge.

McGrath, J. E. 1990. "Time Matters in Groups." In *Intellectual Teamwork: Social and Technological Foundations of Cooperative Work*, edited by J. Galegher, R. Kraut, and C. Egido, 23–61. Hillsdale, NJ: Lawrence Erlbaum.

Mesmer-Magnus, J. R., and L. A. DeChurch. 2009. "Information Sharing and Team Performance: A Meta-analysis." *Journal of Applied Psychology* 94 (2): 535–546. doi:10.1037/a0013773.

Messick, D. M. 1993. "Equality as a Decision Heuristic." In *Psychological Perspectives on Justice. Theory and Applications*, edited by B. A. Mellers, and J. Baron, 11–31. New York: Cambridge University Press.

O'Keefe, D. J. 2003. "Message Properties, Mediating States, and Manipulation Checks: Claims, Evidence, and Data Analysis in Experimental Persuasive Message Effects Research." *Communication Theory* 13 (3): 251–274. doi:10.1111/j.1468-2885.2003.tb00292.x.

Osatuyi, B., S. R. Hiltz, and J. Fjermestad. 2012. "The Impact of Importance and Distribution on Information Exchange in Team Decision Making: Preliminary Results." IEEE, 45th Hawaii International Conference on System Sciences, Maui, Hawaii, USA. doi:10.1109/HICSS.2012.568.

Paroutis, S., and A. Al Saleh. 2009. "Determinants of Knowledge Sharing Using Web 2.0 Technologies." *Journal of Knowledge Management* 13 (4): 52–63. doi:10.1108/13673270910971824.

Pedley, P. 1999. "Intranets and Push Technology: Creating an Information-sharing Environment." Aslib, The Association for Information Management and Information Management International.

Perdue, B. C., and J. O. Summers. 1986. "Checking the Success of Manipulations in Marketing Experiments." *Journal of Marketing Research* 23 (4): 317–326. doi:10.2307/3151807.

Pierro, A., A. W. Kruglanski, and B. H. Raven. 2012. "Motivational Underpinnings of Social Influence in Work Settings: Bases of Social Power and the Need for Cognitive Closure." *European Journal of Social Psychology* 42 (1): 41–52. doi:10.1002/ejsp.836.

Reimer, T., A. Reimer, and U. Czienskowski. 2010. "Decision-Making Groups Attenuate the Discussion Bias in Favor of Shared Information: A Meta-Analysis." *Communication Monographs* 77 (1): 121–142. doi:10.1080/03637750903514318.

Reis, T. H., and C. M. Judd. 2014. *Handbook of Research Methods in Social and Personality Psychology*. 2nd ed. New York: Cambridge University Press.

Ren, Y., F. M. Harper, S. Drenner, L. Terveen, S. Kiesler, J. Riedl, and R. E. Kraut. 2012. "Building Member Attachment in Online Communities: Applying Theories of Group Identity and Interpersonal Bonds." *Mis Quarterly* 36 (3): 841–864. Retrieved from Go to ISI://WOS:000307606300010.

Ren, Y., and R. E. Kraut. 2014. "Agent-based Modeling to Inform Online Community Design: Impact of Topical Breadth, Message Volume, and Discussion Moderation on Member Commitment and Contribution." *Human-Computer Interaction* 29 (4): 351–389. doi:10.1080/07370024.2013.828565.

Ren, Y., R. Kraut, and S. Kiesler. 2007. "Applying Common Identity and Bond Theory to Design of Online Communities." *Organization Studies* 28 (3): 377–408. doi:10.1177/0170840607076007.

Rutherford, A. 2001. *Introducing ANOVA and ANCOVA – A GLM Approach*. London: Sage.

Scholten, L., D. Van Knippenberg, B. A. Nijstad, and C. K. W. De Dreu. 2007. "Motivated Information Processing and Group Decision-making: Effects of Process Accountability

on Information Processing and Decision Quality." *Journal of Experimental Social Psychology* 43 (4): 539–552. doi:10.1016/j.jesp.2006.05.010.

Schulz-Hardt, S., F. C. Brodbeck, A. Mojzisch, R. Kerschreiter, and D. Frey. 2006. "Group Decision Making in Hidden Profile Situations: Dissent as a Facilitator for Decision Quality." *Journal of Personality and Social Psychology* 91 (6): 1080–1093. doi:10.1037/0022-3514.91.6.1080.

Siemsen, E., A. V. Roth, and S. Balasubramanian. 2008. "How Motivation, Opportunity, and Ability Drive Knowledge Sharing: The Constraining-factor Model." *Journal of Operations Management* 26 (3): 426–445. doi:10.1016/j.jom.2007.09.001.

Stasser, G., and D. Stewart. 1992. "Discovery of Hidden Profiles by Decision-making Groups – Solving a Problem Versus Making a Judgement." *Journal of Personality and Social Psychology* 63 (3): 426–434. doi:10.1037/0022-3514.63.3.426.

Stasser, G., and W. Titus. 1985. "Pooling of Unshared Information in Group Decision-making – Biased Information Sampling During Discussion." *Journal of Personality and Social Psychology* 48 (6): 1467–1478. doi:10.1037//0022-3514.48.6.1467.

Stasser, G., and W. Titus. 1987. "Effects of Information Load and Percentage of Shared Information on the Dissemination of Unshared Information During Group Discussion." *Journal of Personality and Social Psychology* 53 (1): 81–93. doi:10.1037//0022-3514.53.1.81.

Stasser, G., S. I. Vaughan, and D. D. Stewart. 2000. "Pooling Unshared Information: The Benefits of Knowing how Access to Information is Distributed among Group Members." *Organizational Behavior and Human Decision Processes* 82 (1): 102–116. doi:10.1006/obhd.2000.2890.

Steinel, W., and C. K. W. De Dreu. 2004. "Social Motives and Strategic Misrepresentation in Social Decision Making." *Journal of Personality and Social Psychology* 86 (3): 419–434. doi:10.1037/0022-3514.86.3.419.

Steinel, W., S. Utz, and L. Koning. 2010. "The Good, the Bad and the Ugly Thing to Do When Sharing Information: Revealing, Concealing and Lying Depend on Social Motivation, Distribution and Importance of Information." *Organizational Behavior and Human Decision Processes* 113 (2): 85–96. doi:10.1016/j.obhdp.2010.07.001.

Toma, C., and F. Butera. 2009. "Hidden Profiles and Concealed Information: Strategic Information Sharing and Use in Group Decision Making." *Personality and Social Psychology Bulletin* 35 (6): 793–806. doi:10.1177/0146167209333176.

Treem, J. W., and P. M. Leonardi. 2012. "Social Media Use in Organisations: Exploring the Affordances of Visibility, Editability, Persistence, and Association." Communication Yearbook, 36.

Utz, S. 2003. "Social Identification and Interpersonal Attraction in MUDs." *Swiss Journal of Psychology* 62 (2): 91–101. doi:10.1024//1421-0185.62.2.91.

Utz, S., N. Muscanell, and A. S. Goeritz. 2014. "Give, Match, or Take: A New Personality Construct Predicts Resource and Information Sharing." *Personality and Individual Differences* 70: 11–16. doi:10.1016/j.paid.2014.06.011.

Utz, S., and W. Steinel. 2008. "Strategic Information Sharing: The Effects of Information Sharedness, Information Relevance and Social Motivation." *International Journal of Psychology* 43 (3–4): 727–728. Retrieved from Go to ISI://WOS:000259264308567.

Van Den Hooff, B. 2012. "Why Won't You Just Tell Me How It Works? Factors Affecting Knowledge Hoarding in Organizations." Paper presented at the annual meeting of the International Communication Association, Sheraton Phoenix Downtown, Phoenix, AZ Online. 2014-06-12 from http://citation.allacademic.com/meta/p552846_index.html.

Van Den Hooff, B., and J. A. De Ridder. 2004. "Knowledge Sharing in Context: The Influence of Organizational Commitment, Communication Climate and CMC use on Knowledge Sharing." *Journal of Knowledge Management* 8 (6): 117–130. doi:10.1108/13673270410567675.

Van Lange, P. A. M., W. Otten, E. M. N. De Bruin, and J. A. Joireman. 1997. "Development of Prosocial, Individualistic, and Competitive Orientations: Theory and Preliminary Evidence." *Journal of Personality and Social Psychology* 73 (4): 733–746. doi:10.1037/0022-3514.73.4.733.

Vuori, V., and J. Okkonen. 2012. "Knowledge Sharing Motivational Factors of Using an Intra-Organizational Social Media Platform." *Journal of Knowledge Management* 16 (4): 592–603. doi:10.1108/13673271211246167.

Webster, D. M., and A. W. Kruglanski. 1994. "Individual-differences in Need for Cognitive Closure." *Journal of Personality and Social Psychology* 67 (6): 1049–1062. doi:10.1037/0022-3514.67.6.1049.

Winquist, J. R., and J. R. Larson. 1998. "Information Pooling: When it Impacts Group Decision Making." *Journal of Personality and Social Psychology* 74 (2): 371–377. doi:10.1037//0022-3514.74.2.371.

Witherspoon, C. L., J. Bergner, C. Cockrell, and D. N. Stone. 2013. "Antecedents of Organizational Knowledge Sharing: A Meta-Analysis and Critique." *Journal of Knowledge Management* 17 (2): 250–277. doi:10.1108/13673271311315204.

Wittenbaum, G. M., A. B. Hollingshead, and I. C. Botero. 2004. "From Cooperative to Motivated Information Sharing in Groups: Moving Beyond the Hidden Profile Paradigm." *Communication Monographs* 71 (3): 286–310. doi:10.1080/0363452042000299894.