USERS' TRUST BUILDING PROCESSES DURING THEIR INITIAL CONNECTING BEHAVIOR IN SOCIAL NETWORKS: BEHAVIORAL AND NEURAL EVIDENCE

Research-in-Progress

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Abstract

Social networking sites (SNSs) are a ubiquitous phenomenon in today's society and their economic and social impact is high. However, despite the fact that many SNSs provide increasingly more system features to boost social networking, there is also an increasing concern about trust. Users' trust is important for a long-term oriented and successful SNS, based on a lively connecting behavior in SNSs. Nevertheless, so far only a limited number of studies investigated users' trust perceptions that are an important antecedent of connecting behavior in SNSs. We conducted a behavioral study, as well as a brain imaging experiment, to explore trustworthiness judgments in SNSs in order to better understand how pictures and textual information influence users' initial connecting behavior. Preliminary results of this research-in-progress paper show that both pictures and textual information have strong influence on trustworthiness judgments, and these judgments are processed differently in the users' brains.

Keywords: Social networks, trust/online trust, information processing, decision-making/makers

Introduction

In today's society, social networking sites (SNSs) are a ubiquitous phenomenon, and their economic impact is high (Efimova 2004; Kelleher and Miller 2006). SNSs, particularly innovative sites like Facebook, LinkedIn, or Xing, enable people to create virtual profiles to link to each other, with the goal to share information (Boyd and Ellison 2007). These sites provide various ways to communicate and interact with other users (Boyd 2007; Benevenuto et al. 2012), making possible the establishment of social relationships. Moreover, these sites have the potential to satisfy various human needs, such as people's desire for the latest information (e.g., Haselmann et al. 2010; Bakshy et al. 2012). Additionally, SNSs can provide social value beyond the users' individual benefits (Krasnova et al. 2010; Winkelmann and Bertling 2011). Thus, fostering connectivity between users is necessary for a lively and productive social network.

Considering the significance of SNSs in today's society, it is important to investigate the determinants of users' connecting and networking behavior. However, so far only a limited number of studies analyzed possible determinants of users' network construction behavior (e.g., Ellison 2007; Krasnova et al. 2010; Koroleva et al. 2011). Methodologically, these studies were either based on interviews, or they derived data directly from social networks. Despite the insights that these studies have revealed, they cannot fully explain *why* people behave as they do in social networks. Based on interviews and observation of behavior, it is not always possible to gain insights into behavioral antecedents (e.g., beliefs and attitudes). Specifically, it is difficult to comprehensively explain human behavior because processes regulating users' networking and connecting behavior do not necessarily reach the level of consciousness. In other words, in specific situations it might be difficult for humans to provide good introspective accounts about their perceptions and behavior. Perceptions and behavior in online environments, particularly in trust situations, are phenomena which are strongly affected by automatic and hence often unconscious processes (e.g., Gefen 2003; Dimoka 2010; Hubert et al. 2012; Riedl et al. 2010; Riedl et al. 2012).

As social behavior and its determinants such as the construct of trust are often described as latent and primarily unconscious processes (Bechara and Damasio 2005; Dimoka et al. 2012), it is difficult to investigate users' social online behavior purely by means of survey and interview. For example, recent evidence shows that individual focal brain structures significantly determine personal online social network size (Kanai et al., 2012). Hence, by drawing upon methods from the nascent field of NeuroIS, particularly brain imaging technology (e.g., Dimoka et al. 2012; Riedl et al. 2010), the present article has the following major aim:

> *Exploring the initial trust building cognitive and affective processes in SNS with the help of functional magnetic resonance imaging (fMRI) in order to better understand trust development underlying users' initial connecting behavior in social networks.*

The fMRI method is used for investigation of brain activation differences between two or more experimental tasks. Specifically, we analyzed the brain activity patterns of skilled Internet users during their connecting behavior in SNSs. In the context of this study, connecting is the act of making social contacts based on specific system features (e.g., a specific button to connect to another user).

Theoretical Background and Hypotheses Development

Initial Trust-Based Connectivity Behavior in Social Online Networks

All innovative SNSs provide features for communication and interaction (Boyd 2007; Benevenuto et al. 2012), and several functions exist for relationship building. Specifically, social networks offer public or semi-public user profiles and an explicit way to connect with each other (Boyd and Ellison 2007). One major concern for social networks is determining where to draw the boundary lines that define the beginning and ending of relationships (Child and Petronio 2011). Despite the fact that many SNSs provide increasingly more system features to boost social networking, there is also an increasing concern about security, privacy, and trust (Johnson et al. 2011). While security and privacy are often issues that can be addressed by technical solutions, building up trust among users is a less technical issue. However, trust is important for a stable, long-term oriented and successful SNS (Fogel and Nehmad 2009).

The meaning of trust in users' connecting behavior can have two forms: (1) initial trust-based connectivity (i.e., whether person x wants to connect with person y) and (2) ongoing trust-based connectivity (i.e.

whether person x and person y want to stay connected over time) (Lee & Choi 2011). Thus, while experience affects ongoing trust-based connectivity, it does not have an influence on initial connectivity (Lee & Choi 2011). The focus of this research-in-progress paper is on investigation of the *initial phase of connecting behavior*.

Despite some first insights into users' initial connecting behavior (e.g., Krasnova et al. 2010; Koroleva et al. 2010), to the best of our knowledge, the role of perceived trustworthiness in the context of contact request judgment has not been studied so far. Specifically, it is unclear how pictures and textual information in contact requests affect connecting behavior. One possible reason for this research deficit is that both the cognitive and affective processes underlying these acceptance decisions are typically not directly observable. Rather, they are latent and primarily unconscious (e.g., Bechara and Damasio 2005; Dimoka et al. 2012). Consequently, it is hardly possible to investigate these processes by means of survey and interview alone.

Hypotheses Development

Different studies from various research fields have shown that human pictures have a strong effect on trustworthiness evaluations (see, for example, in the IS context Riedl et al. 2011). Importantly, it has been demonstrated that perception of a human face can influence an individual's judgment about characteristics of this person (e.g., trustworthiness) after 100ms exposure time (e.g., Willis and Todorov 2006). Thus, the human face contains a significant amount of information. Without facial information, assessment of another individual's characteristics is difficult, particularly if this other person is an unknown individual. Human pictures, therefore, seem to have strong influence on affective processes, which, in turn, are expected to have an influence on trust-building in social interaction (thereafter *affective trust*). Against this background, we derived the following hypothesis:

H1. Contact request receivers evaluate user profiles with a human picture significantly more trustworthy than user profiles without such a picture.

However, we also assume that in the initial connection phase in SNSs, in which users' have no information about the other user who requests for connection, textual information might also have strong influence on user profile judgment. However, in contrast to information derived from another user's picture, it is likely that textual information is processed less emotional and more knowledge-driven. Thus, affective processes and their influence on trustworthiness evaluation are less important; *cognitive trust* should be more relevant for textual information (Johnson and Grayson 2005). It is assumed that more textual information can reduce the level of uncertainty in decision making (Lipshitz and Strauss 1997; Riedl et al. 2010). Therefore, we state the following two hypotheses:

H2a. Contact request receivers evaluate user profiles with positive textual information significantly more trustworthy than user profiles with negative textual information.

H2b. Contact request receivers evaluate user profiles with (i) positive textual information and (ii) negative textual information significantly more trustworthy than user profiles without textual information.

The trust-building brain processes during the initial connecting behavior of users are still unexplored. However, research on the neural correlates of trust has revealed major brain regions that play an important role in trust situations. Recently, Riedl and Javor (2012) reviewed the corresponding literature and concluded that "trust behavior is associated with [...] specific brain structures, which are located in the basal ganglia, limbic system, and the frontal cortex" (p. 63). Moreover, this review indicates that activity in these three structures is related to different phenomena that are important in trust situations: (i) activity in the basal ganglia (e.g., caudate nucleus) mainly reflects reward processing and learning of the trustworthiness of an interaction partner, (ii) activity in the limbic system (e.g., amygdala, insula) reflects negative emotions, particularly distrust perceptions, and (iii) activity in the frontal cortex (e.g., paracingulate cortex) reflects thought processes on an interaction partner's intentions and feelings, referred to as mentalizing.

These findings are important, because specific brain areas are more related to affective processes (e.g., limbic system), while other areas are more related to cognitive processes (e.g., prefrontal structures). Because perception of a human face is often automatic and affective (e.g., Winston et al. 2002), while perception of textual information is typically more controlled and cognitive (e.g., Riedl et al. 2010), we derive the following hypotheses:

H3a. In contrast to trustworthiness judgments about user profiles without pictures, trustworthiness judgments about user profiles with human pictures activate brain regions associated with affective trust.

H3b. Trustworthiness judgments about user profiles with textual information trigger activity in brain regions associated with cognitive trust.

Research Methodology

For the preparation of the stimulus material of our main experimental fMRI study and in order to finally test our hypotheses, we conducted one pretest and one behavioral experiment. The goals of the pretest and the behavioral experiment were (i) to evaluate and optimize our stimulus material and (ii) to compare the behavioral data of a typical online experiment with the behavioral and neural data of the fMRI experiment.

Pretest – Profile Picture Selection

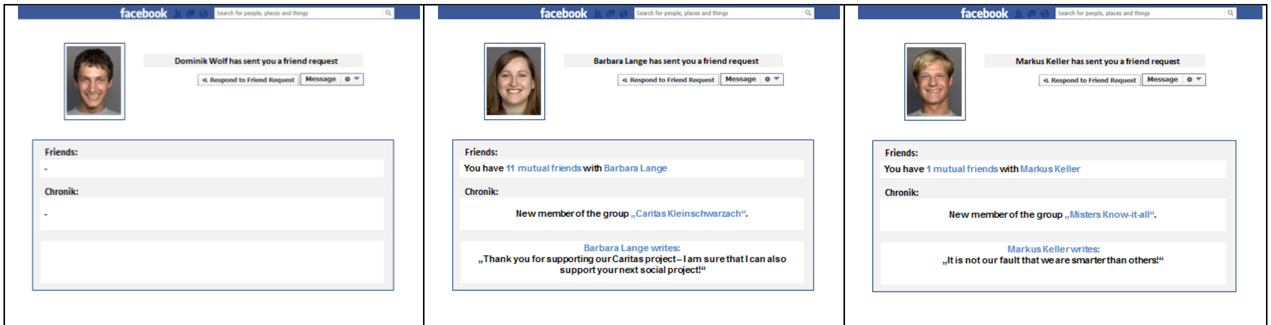
In our first pretest, which was conducted with a paper-based questionnaire, we requested 26 participants (N_{female} = 8; N_{male} = 18) with M_{age}= 22.12 years (*SD*= 3.71) to evaluate 48 pictures (22 female pictures; 26 male pictures). We used faces of younger women and men (age ranged from 20 to 35) from the scientific "FACES" database of the Max-Planck Institute (http://faces.mpdl.mpg.de). "FACES" is a set of photographs of naturalistic faces of women and men displaying different facial expressions (e.g., sadness, happiness, or no emotion). For the first pretest, we selected 48 friendly-looking faces with an inconspicuous smiling. The participants rated the trustworthiness on a 5-point Likert scale (1="very trustworthy"; 5= "not trustworthy at all"). In essence, the pictures were evaluated as being medium-trustworthy (*M*=3.00, *SD*=0.45). To further optimize our stimulus material for the behavioral and fMRI experiments, we excluded 4 pictures with extreme deviations concerning the mean value and the standard deviation. For the remaining 44 pictures, female (*M*= 2.96, *SD*= 0.48) and male (*M*= 3.08, *SD*= 0.49) user profile pictures did not significantly differ concerning their trustworthiness ($t(25)= 1.88$; $p>0.05$). Furthermore, there was no significant gender difference for the rating of male participants regarding male (*M*= 3.03, *SD*= 0.43) and female (*M*= 3.21, *SD*= 0.66) user profile pictures ($t(23)= 0.77$; $p>0.05$) and for the rating of female participants regarding male (*M*= 2.95, *SD*= 0.34) and female (*M*= 3.01, *SD*= 0.79) user profile pictures ($t(23)= .23$, $p>0.05$). The pretested 44 profile pictures were used for building up the different fictitious user profiles.

Behavioral Experiment – Stimulus Development and Evaluation

In our behavioral experiment (within-subject design), which was implemented with the online platform Unipark, 31 participants (N_{female} = 14; N_{male} = 17) – all Facebook users, M_{age}= 22.12 years (*SD*= 3.71) – were firstly instructed to imagine that they are currently online at Facebook and are receiving a contact request from a so far unknown person. After the general instructions, the participants had to evaluate the trustworthiness of 90 randomly presented fictitious user profiles with a contact request on a 5-point Likert scale (1= "very trustworthy"; 5= "not trustworthy at all").

In our experiment, we manipulated the different levels of textual information (positive textual information, negative textual information, no textual information) in user profiles by using the well-established model of argumentation by Toulmin (1958), which has been applied to build trustworthy relations through structured communication in various disciplines such as management science (e.g., Locks 1985), as well as marketing, consumer, and IS research (e.g., Gregor and Benbasat 1999; Kim and Benbasat 2006; Ye and Johnson 1995). We used Toulmin's (1958) three most important text modules, called DATA (number of mutual friends of the contact receiver and the contact requester), CLAIM (name of a group the contact requester is participating) and WARRANT (personal statement that gives deeper knowledge about the group participation) (see, for example, Riedl et al. 2010 for a more detailed description of Toulmin's model).

The 90 fictitious user profiles were manipulated with respect to the textual information into three overall conditions: (i) thirty user profiles with positive textual information, (ii) thirty user profiles with negative textual information, and (iii) thirty user profiles without textual information. Within these three conditions (see Figure 1) user profiles displayed real female and male user pictures, as well as female and male icons to additionally control for differences between user profiles with and without real pictures and between gender.



Example User Profile without Textual Information	Example User Profile with Positive Information	Example User Profile with Negative Information

Figure 1. Stimulus Examples for User Profiles
Note: Stimulus material was translated into English for illustrative purposes. The actual material was presented in German.

Main Experiment – fMRI Study

Based on Friston (2012) and previous studies, we included 20 participants (N_{female} = 9; N_{male} = 11) with M_{age}= 25.6 years (*SD*= 3.24) in the main fMRI experiment (within-subject design). In the MRI scanner, the task for the participants was to press one of five corresponding buttons on a magnetic resonance compatible response box (1= “very trustworthy”; 5= “not trustworthy at all”) to indicate the trustworthiness of user profiles with contact requests.

Specifically, each trial started with a 7 seconds lasting fixation cross. Next, a user profile with a contact request was presented for max. 15 seconds. During this presentation phase participants could read the user profile (see Figure 1) and evaluate its trustworthiness. Once the participants pressed one of the five buttons to state their choice, the 5-point Likert scale was displayed for 2 seconds with the selection highlighted. This experimental procedure was repeated for all 90 stimuli. The order of the stimuli was randomized.

Regarding data generation and analyses, standard fMRI exclusion criteria were performed (Savoy 2005). We used a 3T MRI scanner (Magnetom Trio, SIEMENS) with a BOLD-sensitive (blood oxygenation level-dependent) imaging sequence for estimating the neural activity that corresponds with an experimental task. Imaging parameters were: repetition time 1750 ms, echo time 30ms, parallel imaging (GRAPPA) with a factor of 2, flip angle 90°, 32 consecutive slices with 3.5mm thickness, a gap of 20%, a field of view of 224mm, and a matrix of 64x64, yielding isometric voxels of $(3.5mm)^3$. For data analysis, we used FEAT ([FMRI Expert Analysis Tool] Version 5.98, part of FSL [FMRIB's Software Library, www.fmrib.ox.ac.uk/fsl]). The first-level analysis included motion and slice timing correction, high pass filtering (cutoff 100s) and spatial smoothing (FWHM 5mm). Higher-level analysis was done with fixed effects analysis.

Results

Behavioral Experiment

Our results show that participants’ “general trust level” was relatively similar across all subjects; we used Rotter’s (1967) 25-item scale with minimum 25 points and maximum 125 points to measure this variable (see also Riedl et al. 2010; Kenning 2008). Specifically, the scores ranged from 71 to 99 points with *M*= 80.86 points (*SD*= 7.73).We integrated this variable as a general control for the trust level.

Results of a repeated-measures ANOVA showed that the three conditions based on Toulmin’s model (1958) significantly differ concerning their trustworthiness, $F(1.45; 43.53)= 118.41$, $p<0.001$, partial $\eta^2=0.798$). The specific results are as follows: positive textual information: *M*= 2.35, *SD*=0.71; negative textual information: *M*=4.10, *SD*=0.56; no text: *M*=4.34, *SD*=0.55.

Furthermore paired t-tests within the three conditions showed that user profiles with human pictures were evaluated as being significantly more trustworthy than user profiles without pictures: (i) condition with positive textual information (with picture: *M*=2.15, *SD*=0.84; no picture: *M*= 2.53, *SD*= 0.68; t(30)=-4.30, p<0.001), (ii) condition with negative textual information (with picture: *M*=3.99, *SD*=0.64; no picture: *M*=4.21, *SD*=0.54; t(30)=-3.76, p=0.001) and (iii) condition with no text (*M*=4.14, *SD*=0.63; *M*=4.58, *SD*=0.58; t(30)=-.27, p<0.001).

These behavioral findings, based on the online task (without any brain activity measurement), support H1, H2a, and H2b.

Main Experiment – fMRI Study

Similar to the results from the behavioral experiment, the findings on the "general trust level" show no significant differences across the fMRI study participants. Specifically, we found that *M*= 81.55 points (*SD*= 6.44) with a minimum of 69 points and a maximum 96 points. Furthermore, all participants were active members of the social network "Facebook" and highly familiar (5-point Likert scale, 1="totally not familiar", 5="extremely familiar") with the Internet (*M*=4.05, *SD*=0.76) and SNSs (*M*=3.60, *SD*=0.82). Additionally, the frequency of Internet and social network usage (5-point Likert scale, 1="use very seldom"; 5="use very often") was high for all participants (Internet usage: *M*=4.60, *SD*=0.60; social network usage: *M*=3.70, *SD*=0.92).

As mentioned in the method section, participants performed the task in the fMRI-scanner and pressed one of five buttons to state their trustworthiness regarding the 90 presented contact requests. These *behavioral results* replicate the results from the behavioral experiment: Firstly, *H1* could be confirmed, because within all three conditions (with positive and negative textual information; without text) there is a significant difference concerning the participants' trustworthiness evaluations between user profiles with and without pictures. For user profiles with positive textual information: with picture (M=2.07, SD=0.86) vs. without picture (M=2.54, SD=0.55), t(19)=-3.23, p<0.01); for user profiles with negative textual information: with picture (M=3.96, SD=0.59) vs. without picture (M=4.17, SD=0.60), t(19)=-2.58, p<0.01); for user profiles without text: with picture (M=4.25, SD=0.54) vs. without picture (M=4.65, SD=0.52), t(19)=-3.85, p<0.001).

Furthermore, the participants' trustworthiness judgments significantly differ for user profiles with positive and negative textual information as well as without text, *F*(2; 38)= 85.17, p<0.001, partial η^2=0.82): positive textual information: *M*= 2.31, *SD*=0.64; negative textual information: *M*=4.06, *SD*=0.57; no text: *M*=4.46, *SD*=0.48. Thus, *H2a* and *H2b* are also supported by the behavioral data collected in the brain imaging study (i.e., in the fMRI scanner).

To test H3a and H3b, *fMRI data* was preprocessed (e.g. motion correction) and further analyzed: Firstly, contrast analyses were performed for the two conditions *"user profiles with pictures"* and "*user profiles without pictures"* with a General Linear Model (GLM) [FWE corrected].

The contrast maps show the averaged contrasts of the hemodynamic response functions (hrf) of all events regarding the two conditions. For the contrast analysis *"user profiles with pictures*" [1] > "*user profiles without pictures"* [-1] there is a significantly stronger activation for the fusiform area (temporal occipital fusiform cortex) (see Figure 2). Moreover, for the condition *"user profile with picture"* there is a stronger brain activation in the (i) frontal pole (BA 10), which is known to play a crucial role in complex cognitive processing, (ii) the precuneus and the cingulate gyrus (BA 31), which both represent the transition between the rather affective- and rather cognitive processing areas, as well as (iii) the lateral occipital cortex (BA 19), which is the main area for processing visual stimuli. Furthermore, we observed stronger activation in the amygdala, which is a part of the limbic system and mainly responsible for the neural implementation of emotions, including trust decisions (e.g., Baumgartner et al. 2008). For the condition *"user profile without picture"* there was only stronger activation for the intracalcarine cortex (BA 18), a region which is mainly known for visual processing. Based on these contrasts, *H3a* can be confirmed.

In a second step, contrast analyses were performed for the two conditions *"user profile with positive textual information"* and "*user profiles with negative textual information"* (see Figure 3, Table 1). In general, this GLM analysis shows that in both conditions brain areas are active, which are related to cognitive processing and/or mentalizing (see Table 1 remarked with*). Therefore, our data provide support for *H3b*. Interestingly; the *"user profiles with positive textual information"* are mainly processed by right-lateral brain structures, whereas the *"user profiles with negative textual information*" are mainly processed by left-lateral brain structures. Additionally, different areas for processing of visual stimuli are activated by profiles with and without textual information. These explorative findings, however, requires further exploration to provide a theoretical explanation.

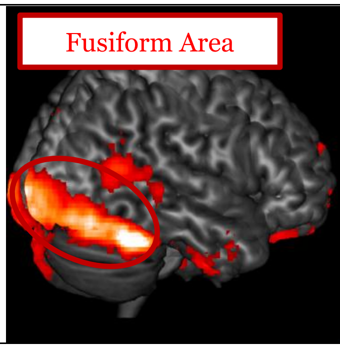


Figure 2. Lateral View of the Brain
Activated Fusiform Area for Contrast "With Picture">"Without Picture"

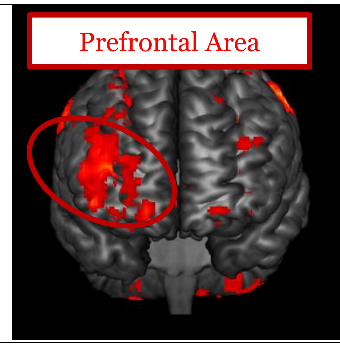


Figure 3. Frontal View of the Brain
Activated Prefrontal Areas for Contrast "Positive Textual Information">"Negative Textual Information"

Brain Areas	**Cluster Size** (Voxels)	**Broad-man Areas** (BA)	**Laterality** (R=Right, L= Left)	**MNI-Coordinates** (x,y,z)			**P**
Positive Text Information > Negative Text Information							
Superior Parietal Lobule (Cortical Structure); Right Cerebral Cortex (Subcortical Structure) *	6861	40	R	44	-42	58	1.44e-18
Frontal Pole (Cortical Structure); Right Cerebral Cortex (Subcortical Structure) *	4841	10	R	40	48	10	1.87e-14
Occipital Pole (Cortical Structure)	3259	18	R	4	-100	4	8.22e-11
Postcentral Gyrus (Cortical Structures); Left Cerebral Cortex (Subcortical Structure) *(a)*	2128	2	L	-54	-20	48	5.96e-08
Cingulate Gyrus (Cortical Structures); Left Cerebral Cortex (Subcortical Structure)	1008	31	L	0	-36	26	0.000292
Left Cerebellum	753	-	L	-	-	-	0.00276
Negative Text Information > Positive Text Information							
Inferior Frontal Gyrus (Cortical Structures); Left Cerebral Cortex (Subcortical Structures *	2205	45	L	-52	22	4	5.96e-08
Superior Frontal Gyrus (Cortical Structures); Left Cerebral Cortex (Subcortical Structures) *(a)*	942	9	L	-4	52	26	0.000512
Middle Temporal Gyrus (Cortical Structures); Left Cerebral Cortex (Subcortical Structures) *	818	21	L	-54	-24	-10	0.00152
Right Cerebellum	713	-	R	26	-74	-42	0.004

Notes: (a) = could be possible artefacts (e.g., superior frontal gyrus because of hand movements)
* = regions could be involved in cognitive or mental processing

Table 1. User Profiles: Positive Textual Information vs. Negative Textual Information

Discussion and Limitations

In our experiments, we explored the judgments on trustworthiness in SNSs to better understand how pictures and textual information influence users' connecting behavior. Altogether, our behavioral results in our first study as well as in the fMRI study showed that both pictures and textual information can significantly enhance the contact receivers' trustworthiness judgments. Interestingly, negative textual information in user profiles leads to significantly higher ratings of trustworthiness than user profiles without any textual information. Based on our results, therefore, it can be suggested that mere availability of information about the contact requester (e.g., Borgatti and Cross 2003) – even if the information is negative – diminishes the contact request receivers' uncertainty more than no information. The general desire for information and its effect on decision-making is already discussed in organizational social network studies (e.g. Borgatti and Cross 2003; Driscoll 1978). Furthermore, it can be argued that the contact requester's openness and honesty regarding his or her limitations (that presumably constitutes negative textual information) could also lead to higher trustworthiness than hiding of private information, which has been shown to increase uncertainty in decision-making contexts (see, for example, Riedl et al. 2010 for the context of eBay websites).

However, based on behavioral results alone, it is difficult to explain *why* the pictures and the textual information have led to higher trustworthiness. Therefore, in the present study we also investigated the contact receivers' brain activations to get a deeper insight into the underlying processes of connecting behavior. We found that the different trustworthiness judgments regarding user profiles with and without pictures are based on significantly different brain activations. First, user profiles with pictures activate the fusiform area significantly more than user profiles without pictures. This finding is consistent with prior studies on the emotional processing of faces (Kanwisher et al. 1997). Furthermore, in contrast to user profiles without pictures, the amygdala is significantly more activated for user profiles with pictures. Because the amygdala is responsible for affective processing, it can be assumed that the affective processing of trust is stronger for user profiles with pictures. Further analyses showed that perception of user profiles with textual information mainly activated brain regions responsible for cognitive processing, reading, and mentalizing (e.g., superior parietal lobule, frontal pole, frontal gyrus). These brain activations are consistent with prior studies about the processing of textual information (Gazzaniga 2000).

Nevertheless, this preliminary study has also limitations. First, a general constraint of fMRI studies is the relatively small sample size. While generalization of the results seems to be limited, the statistically significant effects must be of great size (Friston 2012). Lieberman et al.'s (2009) recent review article which analyzed fMRI studies in highly recognized journals such as *Nature* and *Science* has shown that the average sample size of those studies is N=18. This sample size goes in line with the size of other NeuroIS studies (N=6, Dimoka and Davis 2007; N=18, Riedl et al. 2011; N= 20, Riedl et al. 2010). Second, despite the fact that we pretested our stimulus material in an online study, it should be taken into account that our results are based on a controlled laboratory experiment, in which participants made decisions in an artificial environment with simulated friend requests from fictitious social network users. Third, during the experiment participants were required to lie supine and not to move. This artificial setting, which decreases external validity, is considered as a major weakness of fMRI and similar tools (e.g., Dimoka et al. 2012). Therefore, we also conducted our study in a traditional behavioral computer setting. Because the behavioral data of the fMRI experiment and the behavioral data of the computer experiment are similar, we have reason to assume that potential confounders such as movement restrictions or scanner noise have had no significant influence on our results. Additionally, we conducted our study in a recently established fMRI laboratory with comfortable natural light and a new and hence less noisy fMRI scanner. Third, the present study investigated one particular group of users only (young, healthy, and right-handed persons) in one specific SNS frame (Facebook). The use of a different sample (e.g., older users) and context (e.g., other networks) might trigger different brain activations, thereby resulting in different findings.

Despite these limitations, however, we think that our study helps to better understand the trust building processes underlying users' initial connecting behavior in social networks.

Conclusion, Practical Implications and Further Research

Overall, the present study provides new insight into the trust building processes underlying users' initial connecting behavior in social networks. The behavioral and neural results of the fMRI study show that both cognitive- and affective-based trust are important for the users' initial connecting behavior in SNSs. The presented results not only contribute to prior studies about online trust (e.g., Gefen 2003; Dimoka 2010; Brock et al. 2011; Hubert et al. 2012; Riedl et al. 2010; Riedl et al. 2012), but also give new impetus for optimizing the structure of a lively, long-lasting, and successful SNS by building up functionalities for boosting users' connecting behavior. Our findings revealed that the affective and cognitive effects of pictures and textual information on online trust are important antecedents of connecting behavior in SNS. Future research could investigate the interacting effects of pictures and textual information by means of eye-tracking technology (which can also be used in combination with fMRI). Such a study could provide insight on the conditions under which pictures or textual information is firstly fixated by the contact receiver. Such insights could have important practical implications for SNSs, particularly with respect to user interface design, e.g. for the optimal position of user pictures and the ideal number of pictures on user or company SNS. Additionally, further research is needed that compares the connecting behavior of the initial phase, with the networking behavior in the ongoing connecting phase (Lee and Choi 2011) to analyze the behavioral and neural differences between these two phases regarding the users' cognitive and affective processing. Moreover, based on prior studies regarding gender differences concerning risk perception (e.g., Garbarino and Strahilevitz 2004) and trustworthiness judgments in online contexts (e.g., Riedl et al. 2010), future research could analyze gender differences regarding the trustworthiness evaluations of user profiles and the corresponding neural correlates. Finally, age-related studies could be fruitful for further research on trustworthiness judgments in online contexts.

Our research has also some important practical implications. In today's digital world companies use the advantage of the popular and highly frequented social networks to get in touch and interact with their consumers. To present and distribute company news and product information, companies often use "fanpages," which consumers can share with each other and on which users can provide comments. Based on this practical relevance of SNS ("fanpages"), it is important to get deeper insight into SNS users' connecting behavior and underlying neurophysiological processes. These novel insights can give new impetus for companies how to spread their news and product information and how to increase connecting behavior of their customers. Furthermore, for SNS providers (e.g., Facebook) it is essential to foster connectivity and keep the communication and interaction lively. For instance, due to the ever increasing amount of online connection possibilities (e.g., Twitter, Linkedin, Facebook, and many others, today's users seem to be increasingly stressed. This phenomenon is referred to as *technostress*, a topic which has gained considerable momentum is the IS literature (e.g., Brod 1984; Riedl 2013, Riedl et al. 2012, Tarafdar et al. 2012). This accelerating technostress can increase the risk of decreased user activity. With trust-building strategies, such as optimization of user profile designs, SNS providers could diminish this risk by coping with complexity.

In IS research, there is still a lack of studies about the interplay and the impact of pictures and textual information on the underlying cognitive and affective processes in the different trust building phases of SNS use. Therefore, we believe that our research-in-progress study is a first step towards a larger research agenda in the area of NeuroIS on the behavioral and neural effects of pictures and textual information in user social networks.

References

Bakshy, E., Rosenn, I.; Marlow, C.; Adamic, L. 2012. "The Role of Social Networks in Information Diffusion," in *Proceedings of the 21st International Conference on World Wide Web*, Lyon, France, pp. 16-20.

Baumgartner, T., Heinrichs, M., Vonlanthen, A., Fischbacher, U. and Fehr, E. 2008, „Oxytocin Shapes the Neural Circuitry of Trust and Trust Adaption in Humans," *Neuron* (58:4), pp. 639-650.

Bechara, A., and Damasio, A. R. 2005. "The Somatic Marker Hypothesis: A Neural Theory of Economic Decision," *Games and Economic Behavior* (52:2), pp. 336-372.

Benevenuto, F.; Rodrigues, T.; Cha, M.; Almeida, V. 2012. "Characterizing User Navigation and Interactions in Online Social Networks," *Information Sciences* (195:7), pp. 1-24.

Borgatti, S. and Cross, R. 2003."A Relational View of Information Seeking and Learning in Social Networks," *Management Science (*49:4), pp. 432-445.

Boyd, D.M., and Ellison, N.B. 2007. "Social Network Sites: Definition, History and Scholarship," *Journal of Computer Mediated Communication* (13:1), pp. 210-230.

Boyd, D.M. 2007. "None of This is Real: Identity and Participation in Friendster," in *Structures of Participation in Digital Culture*, Karaganis, J. (ed.), New York, Social Science Research Council, pp. 132-157.

Brock, C., Blut, M., Linzmajer, M., and Zimmer, B. 2011. „F-Commerce and the Crucial Role of Trust," in *Proceedings of the International Conference on Information Systems (ICIS)*, Shanghai, China, December 4-7, pp. 1-11.

Brod, C. 1984. "*Technostress: The Human Cost of the Computer Revolution*," MA, Addison Wesley.

Child, J.T., and Petronio, S. 2011. "Unpacking the Paradoxes of Privacy in CMC Relationships: The Challenges of Blogging and Relational Communication on the Internet," in *Computer Mediated Communication in Personal Relationships*, Wright, K. B. and Webb, L. M. (eds), Cresskill, NJ: Hampton Press, pp. 21-40.

Dimoka, A. 2010."What Does The Brain Tell us about Trust and Distrust? Evidence from Functional Neuroimaging Study," *Management Information Systems Quarterly* (34:2), pp. 1-24.

Dimoka, A. and Davis, F. D. 2007. "Where does TAM Reside in the Brain? The Neural Mechanisms Underlying Technology Adoption," in *Proceedings of the 29th International Conference on Information Systems (ICIS),* Paris, France, December 14-17, pp. 1-18.

Dimoka, A., Banker, R. D., Benbasat, I., Davis, F. D., Dennis, A. R., Gefen, D., Gupta, A., Ischebeck, A., Kenning, P., Pavlou, P. A., Müller-Putz, G., Riedl, R., Vom Brocke, J., and Weber, B. 2012. "On the Use of Neurophysiological Tools in Information Systems Research: Developing a Research Agenda for NeuroIS," *Management Information Systems Quarterly* (61:3), pp. 679-702.

Driscoll, J. 1978. "Trust and Participation in Organizational Decision Making as Predictors of Satisfaction," *Academy of Management* (21:1), pp. 44-56.

Efimova, L. 2004. "Discovering the Iceberg of Knowledge Work: A Weblog Case", in *Proceedings of the Fith European Conference of Organizational Knowledge, Learning and Capabilities*, Innsbruck, Austria.

Ehrlichmann, H. 1987. "Hemispheric Asymmetry and Positive-Negative Affect. Duality and Unity of the Brain," *Wenner-Gren Center International Symposium Series* (47), pp. 194-206.

Ellison, N. B., Steinfield, C., and Lampe, C. 2007, "The Benefits of Facebook 'Friends:' Social Capital and College Students' Use of Online Social Network Sites," *Journal of Computer-Mediated Communication* (*12*:4), pp. 1143-1168.

Friston, K. 2012, "Ten Ironic Rules for Non-Statistical Reviewers," *Neuroimage* (61:4), pp. 1300-1310.

Gazzaniga, M. S. 2000, *New Cognitive Neurosciences (2nd ed).* Cambridge, MA: MIT Press.

Gefen, David, Benbasat, Izak and Pavlou, P.A. 2008. "A Research Agenda for Trust in Online Environments" *Journal of Management Information Systems* (24:4), pp. 275-286.

Garbarino, E., and Strahilevitz, M. 2004. "Gender Differences in the Perveived Risk of Buying Online and the Effects of Receiving a Site Recommendation," *Journal of Business Research* (57:7), pp. 768-775.

Gregor, S., and Benbasat, I. 1999. "Explanations from Knowledge-Based Systems: A Review of Theoretical Foundations and Empirical Work," *Management Information Systems Quarterly* (23:4), pp. 497-530.

Haselmann, T., Winkelmann, A., and Vossen, G. 2010. "Towards a Conceptual Model for Trustworthy Skills Profiles in Online Social Networks," in *Proceedings of the 19th International Conference on*

Information Systems Development (ISD),Prague, Czech Republic
Haugdvedt, C. E., Petty, R. E. and Cacioppo, J. T. 1992. "Need for Cognition and Advertising. Understanding the Role of Personality Variables in Consumer Behavior," *Journal of Consumer Psychology* (1:3), pp. 239-260.
Hubert, M., Linzmajer, M., Riedl, R., Kenning, P., and Hubert, M. 2012, "Introducing Connectivity Analysis to NeuroIS Research," in *Proceedings of the 33rd International Conference on Information Systems (ICIS),* Orlando, USA, Paper 15, pp. 1-21.
Johnson, H., Lavesson, N. Zhao, H., and Wu, S. 2011. "On the Concept of Trust in Online Social Networks." in *Trustworthy Internet,* Salgarelli, L., Bianchi, G. and Blefari-Melazzi, N. (eds.), Milano: Springer Verlag, pp. 143-157.
Kanai, R.; Bahrami, B.; Roylance, R., and Rees, G. (2012). "Online Social Network Size is Reflected in Human Brain Structure," in *Proceedings of The Royal Society* (279), pp. 1327-1334.
Kelleher, T. and Miller, B. M. 2006. "Organizational Blogs and the Human Voice: Relational Strategies and Relational Outcomes," *Journal of Computer-Mediated Communication* (11:2), pp. 395-414.
Kenning, P. 2008, "The Influence of General Trust and Specific Trust on Buying Behavior," *International Journal of Retail and Distribution Management* (36:6), pp. 461-476.
Kim, D., and Benbasat, I. 2006. "The Effects of Trust-Assuring Arguments on Consumer Trust in Internet Stores: Application of Toulmin's Model of Argumentation," *Information Systems Research* (17:3), pp. 286-300.
Koroleva, K., Brecht, F., Goebel, L., and Malinova, M. 2011 "'Generation Facebook' – A Cognitive Calculus Model of Teenage User Behavior on Social Network Sites," in *AMCIS 2011 Proceedings,* Detroit, USA, Paper 392.
Krackhardt, D. 1992. "The Strength of Strong Ties: The Importance of Philos in Organizations," pp. 216-239," in *Networks and Organizations*, Nohira, N. and Eccles, R. G. (eds.). Boston, USA: Harvard Business School Press.
Krasnova, H., Koroleva, K. and Veltri, N. F. 2010. "Investigation of the Network Construction Behavior on Social Networking Sites," in *Proceedings of the 31st International Conference on Information Systems (ICIS),* Saint Louis, USA, December 12-15.
Lee, Jae-Nam and Choi, Byounggu 2011. "Effects of Initial and Ongoing Trust in IT Outsourcing: A Bilateral Perspective," *Information and Management* (48:2), pp. 109-114.
Lieberman, M.D., Beckman, E.T., and Wagner, T. D. 2009. "Correlations in Social Neuroscience aren't Voodoo," *Perspectives on Psychological Science* (4:3), pp. 299-307.
Lipshitz, R. and Stauss, O. (1997), "Coping with Uncertainty: A Naturalistic Decision-Making Analysis," Organizational Behavior and Human Decision Processes (69:2), pp. 149-163.
Locks, M. O. 1985. "The Logic of Policy as Argument," *Management Science* (31:1), pp. 109-114.
Riedl, R. 2013. "On the Biology of Technostress: Literature Review and Research Agenda," *DATA BASE for Advances in Information Systems* (44:1), pp. 18-55.
Riedl, R., Hubert, M. and Kenning, P. 2010. "Are There Neural Gender Differences in Online Trust? An fMRI Study on the Perceived Trustworthiness of eBay Offers," *Management Information Systems Quarterly* (34:2), pp. 397-428.
Riedl, R. Kindermann, H., Auinger, A. and Javor, A. 2012. "*Technostress From a Neurobiological Perspective: System Breakdown Increases the Stress Hormone Cortisol in Computer Users," Business and Information Systems Engineering* (4:2), pp. 61-69.
Riedl, R. and Javor, A. 2012. "The Biology of Trust: Integrating Evidence from Genetics, Endocrinology and Functional Brain Imaging," *Journal of Neuroscience, Psychology, and Economics* (5:2), pp. 63-91.
Riedl, R.; Mohr, P.; Kenning, P.; Davis, F. D.; and Heekeren, H. 2011. "Trusting Humans and Avatars: Behavioral and Neural Evidence," in *Proceedings of the 32nd International Conference on Information Systems (ICIS)*, Shanghai, China, December 4-7.
Savoy, R.L. 2005. "Experimental Design in Brain Activation MRI: Cautionary Tales," *Brain Research Bulletin* (67:5), pp. 361-365.
Tarafdar, M., Tu, Q. and Ragu-Nathan, T.S. 2010. "Impact of Technostress on End-User Satisfaction and Performance," *Journal of Management Information Systems* (27:3), pp. 303-334.
Toulmin, S. 1958. "The Uses of Argument (1st ed.)," Cambridge, UK: Cambridge University Press.
Willis, J., and Todorov, A. 2006. "First Impressions: Making Up your Mind After a 100-ms Exposure to a Face," *Psychological Science* (17:7), pp. 592-598.

Winkelmann, A., and Bertling, J. 2011. "Exploring the Business Value of Soft Skills in Social Networks – A Conceptual Approach Based on Consensus Scoring," in *Proceedings of the European Conference on Information Systems (ECIS)*. Helsinki, Finland, Paper 250.

Winston, J.S., Strange, B.A., O'Doherty, J. and Dolan, R. J. 2002. "Automatic and Intentional Brain Responses During Evaluation of Trustworthiness of Faces," *Nature Neuroscience* (5:3), pp. 277-283.

Ye, R. L., and Johnson, P. E. 1995. "The Impact of Explanation Facilities on User Acceptance of Expert Systems Advice," *Management Information Systems Quarterly* (19:2), pp. 157-172.