Gaze Behaviour, Motivational Factors, and Knowledge Sharing

Completed Research Paper

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Abstract

Despite the development and implementation of knowledge management systems, the translation from individual knowledge to organisational knowledge is not an easy or automatic process. Co-worker knowledge sharing is an important step in such a translation. This paper examines co-worker knowledge-sharing via an experiment. Specifically, the relationships between gaze behaviour and knowledge sharing, as well as the mediating factors convincingness, power, and attractiveness, are investigated. Behaviour of the sender and receiver of a knowledge sharing request is examined using eye tracking technology and subjective responses. The results of the study indicate that direct eye contact from the sender of a request increases the willingness to adhere to the request, but we do not find evidence that the gaze behaviour of the receiver influences knowledge sharing behaviour. Perceived convincingness and attractiveness were identified as partial mediators, while no mediating relationship was found for power.

Keywords: knowledge sharing, gaze behaviour, eye contact, motivational factors, eye tracking
Introduction

The human eye is a fascinating object. Without the eye, and the vision it bestows upon us, significant limitations are placed on our ability to experience and interact with the world around us. However, in addition to the wealth of visual input directed through our eyes, the eyes can also serve a wider range of communicative purposes. Long described as the “windows to the soul”, our eyes can be used to convey a range of emotions such as pain and anger. Eye gaze, and eye contact are ubiquitous features of social interaction, with eye gaze indicative of attention and playing an important role in conversational turn-taking (Kleinke 1986), and information from the eyes signalling complex mental states (Baron-Cohen et al. 2001). Within professional and personal relationships a common type of social interaction is asking another individual for help or assistance. Think about a time at work where someone has asked you for help. Where were they looking while they asked you? Did they meet your gaze directly? Or were they looking away?

We study the influence of different gaze directions of an individual seeking assistance in the form of knowledge sharing. We define knowledge sharing as a form of cooperation among employees thereby exchanging information. As many aspects of human life are influenced by the way in which we interact with one another, understanding the role of eye contact and motivational factors in various tasks is critical, and can therefore contribute to the creation of appropriate management controls in organisations. Our first research question asks whether the direction of eye gaze in a photograph of an individual accompanying a written knowledge sharing request (e.g., sending an email, or posting on an online noticeboard of a blog or an intranet) influences the knowledge sharing behaviour of the receiver. However, the absence or presence of eye contact during a knowledge sharing request is not the only factor that influences knowledge sharing behaviour.

Attempting to understand the mechanisms behind knowledge sharing is necessary, as achieving and maintaining an elevated level of knowledge sharing between employees ensures the competitive advantage of an organisation through pervasive organisational learning (Argote and Ingram 2000). Although modern technology has greatly increased the ease of knowledge sharing through the development of electronic knowledge management systems and software designed to target organisational knowledge creation, there are still many barriers to truly effective and efficient knowledge sharing. Examples of such barriers to knowledge sharing include social relationships, perceived unfairness, or individual proprietorship perspectives (Bock et al. 2005, Constant et al. 1994, Wolfe and Loraas 2008). Prior research has identified many personal motivational factors that promote or prevent knowledge sharing behaviours (Chang and Chuang 2011, Kankanhalli et al. 2005). For many years it has been known that motivational factors such as power and attractiveness exert a noticeable effect within social (and professional) relationships (Riecken 1960). This leads us to our second research question. We ask how the perception of convincingness, attractiveness, and power influences adherence to written knowledge sharing requests. Do these factors make receivers of knowledge sharing requests more motivated to adhere to the requests? In other words, do these factors mediate the association between eye gaze and knowledge sharing behaviour studied in the first research question?

Further, it may not only be the requestor’s eye gaze, but also the receiver’s eye gaze that is associated with knowledge sharing behaviour. At any particular moment, the gaze of humans is normally focused on the most important aspect of our surrounding environment (Driver et al. 1999). When we observe another individual looking in a particular direction, our attention is then drawn to match theirs (i.e., we look in the same direction or at the same object; Friesen and Kingstone 1998, Hietanen 1999, Langton and Bruce 1999). In fact, prior research has shown that we spend more time looking, and thinking, about objects when we observe other people looking at them (Droulers and Adil 2015, Hutton and Nolte 2011). Does this mean that an individual’s willingness to share knowledge increases with the amount of time spent looking at the individual making the knowledge sharing request? Our third research question therefore explores how compliance to knowledge sharing requests varies with the gaze behaviour and eye movements of the person receiving a written knowledge sharing request.

This study contributes to a better understanding of motivational factors for knowledge sharing. Given the reported difficulties of intra-organisational knowledge sharing, managers need to be well aware of factors
influencing knowledge sharing, in order to develop training programs for their subordinates at an interpersonal or information-system level that effectively improve knowledge sharing behaviour. It may be possible that simple behavioural changes (e.g., meeting their gaze directly) when seeking assistance from a colleague may promote knowledge sharing, therefore increasing the competitive advantage of an organisation. Thus, the results of the study may have important implications for designers of knowledge management systems and managers of employees who seek to maintain a competitive business advantage through the sharing of knowledge amongst their employees.

**Literature Review and Hypothesis Development**

**Knowledge Sharing**

Knowledge sharing refers to a specific form of cooperation among employees where knowledge is exchanged between parties. The action of knowledge sharing depends on the willingness of individuals to share knowledge that is acquired or created. For individual knowledge to lead to organisational innovations, this knowledge must be shared among individuals of a company or firm. Consequently, researchers are interested in how knowledge is shared within employees of an organisation, and how knowledge sharing among employees can be improved (Argote and Ingram 2000).

The creation and implementation of organisational knowledge repositories (e.g., knowledge management systems, expert systems etc.) provides one avenue by which knowledge sharing can be formalised. Such technologies are designed to expand the creation and sharing of knowledge across different levels within organisations. Despite the development and implementation of such systems, the translation from individual knowledge to organisational knowledge is not an easy or automatic process (Bock et al. 2005). Kankanhalli et al. (2005) undertook a detailed investigation into the costs (and benefits) for employees to use a formal knowledge management system (e.g., cost of time and effort). In addition, knowledge sharing frequently occurs through informal interactions and discussions of employees. Although neither formal nor informal knowledge sharing can be accurately quantified, knowledge sharing that occurs through informal avenues is significantly more difficult to manage. Motivational factors are known to be a critical influence on informal knowledge sharing, although the exact influence is not fully known (Kalling and Styhre 2003).

There is a personal cost which accompanies knowledge sharing. If an individual believes that the expected personal cost of sharing knowledge is less than the anticipated benefits of sharing the knowledge, then this will have a negative effect on knowledge sharing behaviour. Knowledge sharing can be promoted by supplying employee rewards for situations where appropriate knowledge sharing occurs (Taylor 2006). However, as knowledge sharing contains many strategic considerations, it is far more complex than a simple cost-benefit analysis would lead us to believe. Knowledge sharing within an organisation is similar to the public goods dilemma (Cabrera and Cabrera 2002, Coleman 2000, Wasko and Faraj 2000). As such, defecting, i.e., not contributing to a public good (e.g., knowledge) is viewed as a dominant strategy, from the perspective of maximising economic utility (Dawes 1980).

Therefore it is a vital responsibility of organisations to play an active role in the management of knowledge, as well as promoting knowledge sharing. There are many potential strategies to diffuse situations of non-cooperation, may these arise (for a detailed review of such strategies see Cabrera and Cabrera 2002). Unfortunately, these strategies often do not have the desired positive effect on knowledge sharing (Bock et al. 2005). Although incentives for a group of individuals may have positive effects, specific individual extrinsic rewards can exert a negative effect on knowledge sharing (Taylor 2006). Efficacy refers to the extent that individuals believe that their contributions are of value to others. Those individuals with higher levels of self-efficacy are more likely to cooperate within a group situation (Kerr 1992). As larger group sizes decrease the ability of an individual to perceive efficacy, cooperation within larger groups tends to decrease (Cabrera and Cabrera 2002, Messick and Brewer 1983). Additionally, the willingness to share knowledge with other members of a group increases with the extent that an individual relates to a group (Bonacich and Schneider 1992). Therefore knowledge sharing can be fostered by promoting common values or a subjective norm between individuals within a particular group (Kankanhalli et al. 2005).
However, there has been little research investigating the gaze behaviour of both parties during a knowledge sharing request. We study key factors of knowledge sharing and seek to add to the collective understanding of their potential to increase knowledge sharing: eye gaze, and motivational influences. Investigating the relationship between these factors would enrich the understanding of knowledge sharing behaviour by highlighting the importance and influence of eye contact (an ever-present social behaviour) and common motivational factors during social interaction (i.e., attractiveness, power, and competence) during knowledge sharing. Identifying ways these factors alter knowledge sharing behaviour would have substantial flow on effects for organisations across the world who rely on knowledge sharing between employees to maintain their competitive advantage. Importantly, with the increasing sophistication of neuro-measurement and eye tracking tools (Riedl et al. 2010, Riedl et al. 2014, Djamasbi 2014), systems that record gaze behaviour can be increasingly employed by organisations and be potentially used to inform and improve knowledge sharing behaviour. Both eye gaze and motivational influences are discussed independently, before being related back to knowledge sharing.

**Eye Gaze and Behaviour**

Eye contact is a ubiquitous social behaviour, and consequently can lead to a variety of different outcomes based on the surrounding social context. Prior research has displayed that direct gaze (i.e., direct eye contact) is frequently associated with attention, attraction, reward, and openness to approach in social settings (Chen et al. 2013). Newborn human infants return gaze directed towards them (Farroni et al. 2002). Intranasal administration of the neuropeptide oxytocin (Gimpl and Farenholz 2001), known to play a role in social interactions and bonding (e.g., Insel and Young 2001, Meyer-Lindenberg et al. 2011), has been shown to increase gazing at others’ eyes (Gamer et al. 2010, Guastella et al. 2008). Such links between eye gaze and attention and openness to social interactions may explain the popular conceptions associating eye contact with open-mindedness. However, such theories do not consider the involvement of disagreement or conflict in persuasion (Chen et al. 2013).

Within the animal kingdom, direct eye gaze is commonly utilised as a means of asserting dominance during competitive situations (e.g., determining the alpha male of a pack). Dogs, for example, assert dominance by staring into the eyes of their challenger (Bradshaw and Nott 1995, Fox 1971). Gaze aversion is observed in many human societies to signal deference toward a higher status individual (Argyle and Cook 1976, Foster 1992). Early research into eye gaze and persuasion in humans found that speakers who gaze more into the eyes of listeners are perceived as more persuasive, likeable, and competent (Kleinke 1986, Segrin 1993). In contrast, a more recent study by Chen et al. (2013) demonstrated that there is a decrease in the success of potential persuasion attempts when the listener maintains eye contact with the speaker. Importantly, they show this during communication of a counter-attitudinal message. It appears that the relationship between eye contact and persuasion is driven by other psychosocial factors, such as if the listener agrees with the speaker or not. If a listener agrees with (or is receptive to) the message of the speaker then they will meet the gaze of the speaker, whereas a listener who disagrees (or is not receptive to) the message of the speaker there is a tendency to avoid eye contact, presumably to avoid a potentially aversive experience (Chen et al. 2013). Therefore, if an individual is not receptive to a knowledge sharing request from a colleague, whatever the reason (e.g., the colleague had previously refused to assist the individual in question), the individual may avoid eye contact with the colleague making the request and instead prioritise their mental resources to avoiding a conflict in the workplace.

However, there are also many positive effects of eye gaze during interaction. Eye gaze can be used as a nonverbal cue to initiate and regulate conversation (Argyle 1988, Kendon 1977), with the direction and duration of eye contact providing guidance in relation to turn taking, intention to speak, and speech encoding. Additionally, gaze has been shown to function on an emotional level, resulting in arousal and perceptions of immediacy (Andersen et al. 1998, Mehrabian 1967) for those who gaze is directed at. Consequently, there is solid evidence displaying that individuals can gain social influence by maintaining direct eye gaze (Segrin 1993). The effects of direct gaze are widespread, with directing gaze at others (as opposed to looking away from others) leads to more persuasive presenters (Burgoon et al. 2002, Morton 1980), better sales people (Bull and Gibson-Robinson 1981), and more effective teachers (Fry and Smith 1975, Otteson and Otteson 1979, Sherwood 1987). There are many theories which seek to explain the persuasive effect of direct gaze, including theories of gaze and conversational regulation (Kendon 1979), immediacy and arousal (Patterson 1976), and expectancy violation (Burgoon 1983). Hence, it is therefore suitable to consider a knowledge sharing request as a persuasive message, and that direct eye gaze may
influence the willingness of an individual to agree with the persuasive message and adhere to the knowledge sharing request, compared to when there is no direct eye gaze.

**H1A:** A front-on gaze (as opposed to a sideways gaze) attached to a knowledge sharing request results in increased willingness to share knowledge with a co-worker.

**H1B:** A front-on gaze (as opposed to an averted gaze) attached to a knowledge sharing request results in increased willingness to share knowledge with a co-worker.

### Motivational Factors Influencing Behaviour of Request Receivers

The self-determination theory (SDT) is a recognised, well-established theory of motivation that has been widely utilised to investigate how and why humans act the way they do (Deci et al. 1999, Deci and Ryan 1985). At the core of SDT lies the notion that individuals may be motivated to perform particular behaviours (e.g., knowledge sharing) in response to both external (i.e., controlled) and internal (i.e., autonomous) sources of motivation (Cameron Cockrell and Stone 2010). **Autonomous** motivation refers to the incentives available to individuals when they perform actions that do not directly contribute to their core —self needs and benefits (i.e., when individuals contribute to the overall greater good). Factors that contribute to autonomous motivation include enjoyment and care for other parties (Wang and Hou 2015). Alternatively, **controlled** motivation refers to the incentives based on which individuals perform certain behaviours that explicitly contribute to their core-self needs and benefits. Such motivations are influenced by reward systems, evaluations from others (either formal or informal), and status within significant social or professional groups (Wang and Hou 2015). Our study investigates three motivational factors (convincingness, power, and attractiveness), and their potential influence on adherence to knowledge sharing requests between employees within an organisation. These three factors are investigated in the current study as these are motivational factors that can influence behaviour in line with the SDT. Convincingness and power can both be seen as controlled (i.e., external) motivations, whereas attractiveness is more of an autonomous (i.e., internal) source of motivation. However, all three motivators are closely related, and may interact extensively with one another. Without imposing hierarchical relationships or potential consequences of not showing collegiality, we test whether power, convincingness, and attractiveness can be inferred by gaze behaviour, and whether these perceptions can mediate the relationship between gaze behaviour and knowledge sharing.

The perceived **powerfulness** of an individual or object has been suggested to influence interpersonal relationships and communication. Russel (1938) stated that “the fundamental concept in social science is power; in the same way that energy is the fundamental concept in physics” (p.10). However, the importance of this variable was not immediately manifested within the practice of social psychology (Cartwright 1959). Many theorists believe that power can be divided into separate components. For example, one researcher cites that power is “the ability to make things happen or to bring about desired outcomes” (Coleman 2000, p.121), before distinguishing and defining the many facets of the ‘variable’ that is power. Reference power is deeply connected with the organisations and groups we belong to. By affiliating with a group (e.g., a company), we align our individual beliefs with that of the group, to a certain extent. Referent power emphasises similarity, and positive referent power uses shared beliefs as an agent of influence (Raven 1992). Consequently, the more powerful an individual is perceived to be, the more likely others will share their beliefs (e.g., that sharing knowledge can assist others to overcome challenges or difficulties).

**Convincingness** refers to the extent that an action or a statement causes someone to believe in the truth of the action/statement, where persuasiveness refers to the extent that an action or statement causes someone to do something through reasoning or argument. Prior research from Mann et al. (2013) revealed that people deliberately increase eye contact with individuals they are trying to convince of something. Therefore, we investigate whether convincingness associated with a knowledge sharing request is influenced by a requestor’s gaze behaviour (i.e., a front-on gaze opposed to a sideways or averted gaze) and whether a resulting belief in the convincingness translates into sharing of knowledge by the receiver of a knowledge sharing request.

**Physical attractiveness** (i.e., how physically attractive we perceive another individual to be) is primarily influenced by the facial attractiveness of the individual. The determination of attractiveness of an individual is an **automatic** process, and can be evaluated following a rapid glance (Olson and Marshuetz...
Neuroscientific research has demonstrated that avoiding eye contact decreases the perceived attractiveness of an individual (Kleinke et al. 1975), and that attractive faces with a direct gaze are more rewarding than observing attractive faces with an averted gaze (Kampe et al. 2001). The physical attractiveness of an individual can determine the ability of that particular individual to influence the decisions of others, even when someone is not deliberately trying to persuade. Subsequently, students who are more physically (i.e., facially) attractive are higher academic achievers at school, and are more likely to be employed as a result of a job interview compared to their less attractive peers (e.g., Cialdini 2009, Hamermesh and Biddle 1994). Furthermore, individuals who are perceived as being more physically attractive possess a persuasive advantage in advertising – especially in relation to endorsing beauty-enhancement products (e.g., Ohanian 1991, Praxmarer 2006). This logic can therefore be applied to the notion of knowledge sharing, and that a more physically attractive employee can increase the willingness of co-workers to share their knowledge. Physical attractiveness can also be construed as a controlled motivator within the SDT, wherein employees believe that adhering to a knowledge sharing request from an attractive co-worker thereby improves their personal relationship with the attractive co-worker, and being viewed as a more attractive sexual partner.

**H2:** A front-on gaze attached to a knowledge sharing request results in increased willingness to share knowledge with a co-worker (as opposed to a sideways and an averted gaze) through one or more of the following mediating factors:

(a) **Convincingness,**

(b) **Power,** and

(c) **Attractiveness**

**Receiver’s Gaze as a Predictor of Knowledge Sharing Behaviour**

Eye tracking measures gaze behaviour during the execution of tasks, allowing researchers to gather data about where an individual is looking. Utilising camera technology to track movements of the eyes is a well-established concept, which was first used to study the gaze behaviour of pilots in the 1950’s (Fitts et al. 1950). Since this initial study, new techniques and technologies have been developed, and modern eye tracking devices record the corneal reflection of infrared lighting to track the position of the pupil, mapping the attention of the subject on still and moving images presented within the field of view of the subject (i.e., gaze; Duchowski 2007). In addition to gaze tracking, such technologies now allow for the measurement of various eye metrics including fixation frequency, and the duration spent observing particular regions of interest (utilised as a surrogate measure of perceived stimulus importance; Fitts et al. 1950, Koh et al. 2011). The eyes represent critical focal points in communication, and are the primary source for detecting interpersonal interest and threat (Haxby et al. 2002, Klin et al. 2003). Research has shown that the amount of eye gaze has been found to be predictive of an individual’s ability to interpret the intention of others and the meaning of social situations (Garrett et al. 2004, Klin et al. 2003, Klin et al. 2002, Spezio et al. 2007). Therefore, we suggest that an increase in eye contact with the person making the knowledge sharing request leads to an increase in adherence to the request.

**H3A:** Increased time spent looking at the face of a co-worker making a knowledge sharing request increases willingness to share knowledge with that particular co-worker.

Both humans and animals gaze towards regions of their environment that are currently of particular interest to them, in order to observe these regions with their most sensitive visual receptors (Driver et al. 1999). The direction of gaze carries information about the focus of the user’s attention (Just and Carpenter 1976), and can therefore convey considerable amounts of information to an observer. There are many potential attractors that can lead to the focusing of attention on a particular area of the surrounding environment. For example, food, possible danger, or an attractive conspecific can all attract attention and lead to gaze in a particular direction (Byrne and Whiten 1991, Menzel and Halperin 1975). When we observe someone looking in a particular direction, our attention is shifted to the same location in space (Driver et al. 1999, Friesen and Kingstone 1998, Hietanen 1999, Langton and Bruce 1999), a reaction we are capable of at just four months of age (Corkum and Moore 1995, Hood et al. 1998).

The perceived gaze direction of an individual is a critical, influential cue in the process of attention orienting (Bayliss et al. 2011). By orienting attention in a particular direction, or towards a specific object,
the processing of objects (e.g., text, images, etc.) can be facilitated (Reid et al. 2004). Marketing studies have found that the gaze direction of models in print advertisements can quickly catch and influence the attention of the viewer (Droulers and Adil 2015). Therefore it is not unrealistic to suggest that a similar effect of gaze cues can occur in relation to knowledge sharing requests, and that we will observe a similar pattern of gaze behaviour from our participants when a picture of a model (i.e., a co-worker) accompanies a knowledge sharing request. Hutton and Nolte (2011) identified that when the gaze of the model was directed toward the product in the advertisement, people observing the advertisement spend an increased amount of time looking at the object. Extending on this finding, Droulers and Adil (2015) show that in addition to drawing attention to the cued area, such gaze cues in advertisements also influence the processing of the content of the ad, and modulate product and brand memorisation. In doing so, the end result is an increased likelihood of purchasing the advertised object. It may be possible that if a knowledge sharing request is accompanied by a photo in which the gaze of the requester is directed toward the knowledge sharing request, that the gaze cue may influence the way in which the individual processes and considers the request, resulting in increased adherence to the request to share coded knowledge. Thus, particularly when the gaze of the recipient is directed towards a knowledge sharing request we may expect that:

H3B: Increased time spent looking at the knowledge sharing request increases willingness to adhere to the knowledge sharing request.

Although H3A and H3B initially appear to be contradictory, it is critical to note that these hypotheses are the result of vastly different theoretical backgrounds. The effect of eye gaze and direction on knowledge sharing is largely unexplored, and these hypotheses provide initial insight into this area of research.

Methods

Design

A computerized experiment was conducted in the behavioural laboratory of a large university. Participants were seated in front of Tobii TX300 eye trackers. The study is designed as a between subjects experiment, involving three manipulations of the gaze behaviour of a co-worker requesting knowledge: sideways gaze, front-on gaze, or averted gaze.

Procedures and Task

Participants were presented with a case in which they were asked to rate how likely they were to share coded knowledge in the form of a computer program. The case is adapted from Constant et al. (1994). The case asks participants to assume the role of a junior level computer programmer in an IT company. The case was utilised as it generates a sense of potential conflict, thus making the case more appropriate for a laboratory experiment, in addition to being more realistic. A situation is described in which Jamie, a colleague who is also a junior-level computer programmer, previously refused to help to fix a software bug. Subsequently, the participants are presented with a picture of Jamie, accompanied by the question “I have encountered some challenges in another project. Could you help me to meet, solve, and overcome these challenges by sending me this program?” (Fig. 1). The participants are required to decide whether to share the self-developed computer program with Jamie. The picture of Jamie contains the eye contact manipulation based on her gaze behaviour. In the picture presented with the knowledge sharing request, Jamie exhibits one of three potential behaviours: (a) sideways gaze, with her head turned away from the participant; (b) front-on gaze, where she faces the participant; or (c) an averted gaze, where she is facing the participant, but her eyes are directed elsewhere.
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<table>
<thead>
<tr>
<th>Sideways Gaze</th>
<th>Front-on Gaze</th>
<th>Averted gaze</th>
<th>Knowledge Sharing Request</th>
</tr>
</thead>
<tbody>
<tr>
<td>![Sideways Gaze]</td>
<td>![Front-on Gaze]</td>
<td>![Averted gaze]</td>
<td>I have encountered some challenges in another project. Could you help me to meet, solve and overcome these challenges by sending me this program?</td>
</tr>
</tbody>
</table>

![Figure 1. Gaze behaviours accompanying the knowledge sharing request](image)

The pictures were selected from the Radboud Faces Database, which contains pictures of people making facial expressions with different gaze direction, taken from a series of different angles. The pictures selected for the current study are all categorized as being ‘happy’, thus the emotional state Jamie is held constant throughout. High recognition of the intended facial expressions shows the validity of the pictures used (Langner et al. 2010).

**Measurements**

**Independent Variable (IV)**

The picture of Jamie contained the gaze manipulation (Figure 1): (a) sideways gaze, with her head turned away from the participant; (b) front-on gaze, where she faces the participant; or (c) an averted gaze, where she is facing the participant, but her eyes are directed elsewhere. This variable is called Gaze Behaviour.

**Dependent Variable (DV)**

The DV was the willingness of the participant to adhere to Jamie's knowledge sharing request. Participants were prompted to answer the question “What is the likelihood that you would give a copy of the computer program to Jamie?” on a seven point computerised Likert scale with anchors of 1 (not at all likely) and 7 (very likely). This question is adopted from Constant et al. (1994) and was presented directly after Jamie's request.

**Mediating Factors**

The current study investigated the effects of three mediating factors postulated to influence the willingness to adhere to a knowledge sharing request: convincingness, power, and attractiveness. Following the presentation of the knowledge sharing request, and the question relating to the willingness to adhere to the knowledge sharing request, participants were also asked the following questions: (i) “How convincing did you find the way Jamie looked at you?”; (ii) “How convincing did you find Jamie’s facial expression?”; (iii) “How convincing did you find Jamie’s question?”; (iv) “How powerful did you find Jamie’s question?”; (v) “How abstract did you find Jamie’s question?”; (vi) “How powerful did you find Jamie’s facial expression?”; and (vii) “How attractive do you think Jamie is?”. Participants were asked to rate their perceptions of Jamie and the knowledge sharing request using a computerised seven point Likert scale with anchors of 1 (not at all convincing/powerful/abstract/attractive) and 7 (very convincing/powerful/abstract/attractive). Convincingness was interpreted as the average of three ratings.
Two of these ratings were provided in response to questions directly relating to Jamie’s gaze and facial behaviour (questions i and ii), while the third question related to the knowledge sharing request (question iii) *Power* was interpreted as the average of three ratings. Two questions related to the knowledge sharing request (questions iv and v). Question v was included as a potential mediating factor as abstract language is perceived as powerful (Waksłak et al. 2014). The final question related to the perception of Jamie herself – question vi. *Attractiveness* was interpreted as the average rating in response to question vii.

**Eye Tracking Data**

Tobii TX300 eye trackers were used to capture the movements of the participant’s eyes while observing the knowledge sharing request and the accompanying photo. The eye tracking technology was used to record the duration that participants spent looking at both the knowledge sharing request (defined as a rectangular area of interest of 275 x 150 pixels in size; Fig. 2), and Jamie’s face (defined as a rectangular areas of interest 300 x 350 pixels in size). From this data, the relative duration of time spent between the two areas of interest was calculated (i.e., the relative duration of time spent looking at the knowledge sharing request compared to the time spent looking at the face of the requestor) and used in the statistical analyses. The relative (rather than absolute) gaze duration on the knowledge sharing request and Jamie’s face was selected for analysis as this limits the influence of potential confounding factors (e.g., how long the participant takes to complete the task).

![Figure 2. Areas of interest employed to calculate relative duration of participant gaze on Jamie’s face and the knowledge sharing request](image)

**Participants and Sample Description**

96 students enrolled in an information systems class as part of a Master’s degree participated in the experiment. Two participants were excluded due to eye tracking calibration failure, while a further three participants were excluded due to incomplete answer sets. Therefore the final analyses are based on a sample size of 91. There were 30 participants in the Sideways Gaze condition, 29 participants in the Front-on Gaze condition, and 32 participants in the Averted Gaze condition.
Results

Manipulation Check

As a manipulation check, participants were prompted to answer the question “To what extent did Jamie look at you directly?” on a seven point computerised Likert scale ranging from 1 (low extent) to 7 (high extent). This check served to ensure participants could differentiate between the different gaze behaviours that accompanied the knowledge sharing request. The subjective ratings displayed that the three gaze behaviours (i.e., sideways gaze, front-on gaze, and averted gaze) were perceived to significantly differ in the extent that Jamie looked directly at the participants ($F = 4.111, p < .05$). The front-on gaze image ($M = 4.45$) was perceived as being more directed towards the participant than averted gaze condition ($M = 3.38$, planned contrast $t = 2.83, p = .006$). While higher, the front-on gaze condition did not differ significantly from the sideways gaze condition ($M = 3.73$, $t = 1.86, p = .067$, two-tailed). As expected, the smallest mean difference was observed between the averted and sideways gaze conditions. This difference was not statistically significant ($p = .343$).

Gaze Behaviour of Requestor

Overall, a one way analysis of variance (ANOVA) confirmed a significant influence of gaze behaviour across the three conditions on knowledge sharing willingness ($F = 5.97, p = .009$). $H_{1A}$ and $H_{1B}$ were tested using independent samples t-tests, with the self-reported willingness to share knowledge as the DV. $H_{1A}$ was found to be statistically significant, with participants indicating that they were significantly more willing to share knowledge in response to the front-on gaze condition ($M = 4.03$) compared to the sideways gaze condition ($M = 3.13; df = 57$, $t = 2.44, p = .009$, one-tailed). $H_{1B}$ was statistically significant at the level of 0.1, with participants indicating that they were more willing to share knowledge in response to the front-on gaze condition compared to the averted gaze condition ($M = 3.59; df = 59$, $t = 1.44, p = .079$, one-tailed).
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<table>
<thead>
<tr>
<th>Gaze Behaviour</th>
<th>Knowledge Sharing Willingness</th>
<th>Perceived Convincingness</th>
<th>Perceived Power</th>
<th>Perceived Attractiveness</th>
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<td></td>
<td>Std. Deviation</td>
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<td></td>
<td>Std. Deviation</td>
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<td>Std. Deviation</td>
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<td>1.21</td>
<td>.92</td>
</tr>
<tr>
<td>Total</td>
<td>Mean</td>
<td>3.58</td>
<td>3.71</td>
<td>3.77</td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>91</td>
<td>91</td>
<td>91</td>
</tr>
<tr>
<td></td>
<td>Std. Deviation</td>
<td>1.34</td>
<td>1.23</td>
<td>1.17</td>
</tr>
</tbody>
</table>

Table 1. Knowledge sharing, gaze behaviour, and mediating factors – descriptive statistics

Note: There were 30 participants in the Sideways Gaze condition, 29 participants in the Front-on Gaze condition, and 32 participants in the Averted Gaze condition.

Mediating Effects of Power, Convincingness, and Attractiveness

Since we have established that eye contact significantly influences knowledge sharing willingness (i.e., in the subset of front-on gaze contact versus sideways gaze), the potential mediating effects of power, convincingness and attractiveness will be examined in this subset of the collected data (N = 59). H2A-C were tested using Holmbeck’s (1997) four criteria for mediating relationships. The tests of the four necessary and sufficient criteria are reflected by the paths a, b, c, and d (Figure 3). A decrease in the F-value from (a) to (d) in Figure 3 constitutes evidence for a partial mediation. This is the case for perceived convincingness and perceived attractiveness. Perceived power was identified to be positively associated with knowledge sharing, but there is no indication of mediation.
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Figure 3. Indirect effect of gaze behaviour on knowledge sharing willingness through mediating factors

Note: Mediating factors – perceived power, convincingness, and attractiveness. The mediation is formally tested using Holmbeck’s (1997) necessary and sufficient four criteria to established mediating relationship (See also Baron and Kenny (1986), and an application in Rowe (2004)). Specifically, the F-statistic and one-tailed p-value associated with path (a) is the ANOVA with Knowledge Sharing Willingness as the dependent variable and Gaze Behaviour as the IV. The F-statistic and one-tailed p-value associated with path (b) is the ANOVA with the respective mediator as the DV and Gaze Behaviour as the IV. The F-statistic and one-tailed p-value associated with path (c) is from a linear regression with Knowledge Sharing Willingness as the DV and the respective mediator as the IV. The F-statistic and one-tailed p-value associated with path (d) is the significance of path (a) after entering the respective mediator as a covariate in the ANOVA with Knowledge Sharing Willingness as the dependent variable and Gaze Behaviour as the IV. Specifically, in this test the IV should be less highly associated with the DV than in (a). Thus, the F value should be lower here than in (a) to satisfy this condition for a mediation. N = 59 (i.e., the subset of front-on gaze versus sideways gaze conditions). ** p < 0.05, * p < .1
Gaze Behaviour of Participants

H3A and H3B were tested via linear regression models for each gaze manipulation state using the relative duration of time spent looking at the knowledge sharing request (text) compared to the time spent looking at the face of the requestor (face) as the IV, and knowledge sharing willingness as the DV. For the sideways gaze ($\beta = -0.98$) and averted gaze ($\beta = -0.214$) manipulations the regression showed negative relationships between the IV and DV, whereas for the front-on gaze condition, the regression showed a positive relationship ($\beta = 0.213$). While the different directions indicate that gaze behaviour of the receiver and its effects on knowledge sharing is highly context specific, neither of the coefficients were significant, and therefore we do not find evidence for either of the hypotheses.

<table>
<thead>
<tr>
<th>Gaze Behaviour</th>
<th>Total Fixation Duration Face</th>
<th>Total Fixation Duration Request</th>
<th>Relation: Request / Face</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sideways Gaze</td>
<td>Mean</td>
<td>2.04</td>
<td>3.53</td>
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<tr>
<td>Gaze</td>
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<td>30</td>
<td>30</td>
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<tr>
<td></td>
<td>Std. Deviation</td>
<td>4.25</td>
<td>3.220</td>
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<tr>
<td>Front-on Gaze</td>
<td>Mean</td>
<td>1.87</td>
<td>5.88</td>
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<tr>
<td>Gaze</td>
<td>N</td>
<td>29</td>
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<tr>
<td></td>
<td>Std. Deviation</td>
<td>1.11</td>
<td>2.250</td>
</tr>
<tr>
<td>Averted Gaze</td>
<td>Mean</td>
<td>2.41</td>
<td>7.99</td>
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<td>Gaze</td>
<td>N</td>
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<td>32</td>
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<tr>
<td></td>
<td>Std. Deviation</td>
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<td>5.787</td>
</tr>
<tr>
<td>Total Gaze</td>
<td>Mean</td>
<td>2.12</td>
<td>5.85</td>
</tr>
<tr>
<td></td>
<td>N</td>
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<td>91</td>
</tr>
<tr>
<td></td>
<td>Std. Deviation</td>
<td>2.73</td>
<td>4.457</td>
</tr>
</tbody>
</table>

Table 2. Eye tracking fixation data for gaze behaviour manipulations

Discussion

The process of knowledge sharing amongst employees is vital to the success of organisations. However, there are many technological and personal barriers within organisations that prevent effective knowledge sharing (Bock et al. 2005, Kankanhalli et al. 2005). Thus, identifying techniques and behaviours that lead to increases in willingness to share knowledge between employees (and therefore productivity) are thus of great value to many organisations and information systems designers. This paper addressed the influence of gaze behaviours and motivational factors on knowledge sharing in an organisational setting.

Several studies have investigated how gaze influences behaviour. Many of these works were conducted from a persuasion perspective, exploring the relationship between gaze behaviour and persuasion. In this study, we propose that the gaze behaviour of an individual making a knowledge sharing request determines the willingness of an individual to adhere to the request, and that this relationship is mediated by the factors of perceived convincingsness, power, and attractiveness. We also propose that the gaze behaviour of the individual who the knowledge sharing request has been submitted to influences the willingness to adhere to the request.

The findings support the positive effects of gaze behaviour during social interactions, with direct eye contact leading to increased willingness to share knowledge. Maintaining direct gaze (eye contact) while making a knowledge sharing request was found to increase knowledge sharing behaviour, in line with previous evidence relating to the persuasiveness of presenters (Burgoon et al. 2002, Morton 1980). More specifically, this study shows that the sender of a knowledge sharing request facing and directing their
gaze toward the recipient has a positive effect on the willingness to share knowledge in the form of a coded computer program, while aversive gaze behaviours (e.g., a lack of eye contact, facing away from the recipient) are less likely to result in adherence to a knowledge sharing request.

Furthermore, this paper provides evidence for the effect of motivational factors on knowledge sharing willingness, consistent with that of other studies (Cialdini 2009, Grolnick and Ryan 1987, Mitchell et al. 2012, Ohanian 1991). The perceived convincingness, attractiveness, and powerfulness of the requestor of the knowledge sharing request were all found to be associated with knowledge sharing willingness. However, partial mediations of the relationship between the gaze behaviour of the requestor and the willingness of the recipient to adhere to the knowledge sharing request could only be established for perceived convincingness and attractiveness.

Finally, the relative duration of time the recipient spent observing the face of the requestor, and the knowledge sharing request itself were not found to influence their willingness to adhere to the request. Gaze behaviour of the recipient of a knowledge sharing request in relation to willingness to share knowledge appears to be very context specific. There was a positive (non-significant) relationship between the gaze behaviour of the recipient and the willingness to share knowledge in the front-on gaze condition. This indicates that the more the recipient focuses on the request, rather than the face of the requestor, the more willing they are to adhere to the knowledge sharing request. Such behaviour is indicative of the persuasive effect identified by Chen et al. (2013), where maintaining eye contact with the deliverer of a persuasive speech proved to be an inhibitor of persuasion. However, there was a negative (non-significant) relationship observed in the other gaze conditions. As such, more research is required to uncover potential context specific effects.

Limitations

As with any study, there are limitations that must be addressed. First, this study utilised three different gaze behaviours of the co-worker making the knowledge sharing request: a front-on gaze, a sideways gaze, and an averted gaze. To fully explore all possible relationships between eye contact, gaze direction, and knowledge sharing, the current study could have included additional gaze behaviours – such as one in which the requestor was not facing the participant directly, but making direct eye contact, or in which the requestor was facing the opposite direction to the text of the request. Second, the results of the current study rely on the relative comparisons between conditions. Although we hypothesise that these relative differences can be generated to other samples in similar settings (Friedman and Sunder 1994), it is critical to note that the participants in the current study were university students, and that the results obtained here may differ from other demographic groups in “real world” settings. Third, the knowledge sharing requests made in the current study were made in a static setting and environment. Despite the fact that many knowledge sharing requests are made electronically (e.g., via email), the static knowledge sharing request may be viewed more as an interaction with a knowledge management system that contains pictures. Fourth, this study did not consider the effect of gender within its design. The current research study utilised only a female hypothetical co-worker. As there are known effects of the gender of the requestor (or poser) on conscious and automatic behavioural tendencies (Scharlemann et al. 2010, Seidel et al. 2010), it may be possible that the results of the current study were affected as a consequence of not employing both a male and female “Jamie”. Additionally, as the same model (i.e., Jamie) was used in each condition, this may have limited the subjective ratings of attractiveness more than if different models of varying attractiveness had been included in the design of the study. Finally, the ethnicity of the hypothetical co-worker “Jamie” and the participant was not taken into account. Social neuroscience research has identified that racial group membership modulates empathic neural responses (Xu et al. 2009), and that in-group bias for reward allocation exists when punishing or rewarding others (Molenberghs et al. 2014). Consequently, the willingness of the participant to share knowledge may have been influenced by potential (mis)matches in the ethnicity between the participant and “Jamie”.

Implications

This study contributes to the literature on motivational factors for knowledge sharing (Chang and Chuang 2011, Huang et al. 2013, Bock et al. 2005, Kankanhalli et al. 2005). For reported difficulties of intra-organisational knowledge sharing managers need to be well aware of factors influencing such sharing behaviour. Specifically, we inform researchers and practitioners about the importance of gaze behaviour.
This knowledge can assist managers in developing training programs for staff or in designing control systems to improve sharing behaviours. From a theoretical perspective it contributes to the controversial debate on eye contact and persuasiveness and shows its potential importance for knowledge sharing behaviours (Chen et al. 2013). Furthermore, this research may inform developers of knowledge management systems about the effects of placing different pictures along with system functionalities. While knowledge management systems often are a formalized form of managing knowledge, personalizing knowledge management systems appropriately and using effects of gazes in pictures may enhance knowledge sharing within such systems. Thus, our findings may prove helpful towards improving the effectiveness of knowledge sharing systems.

**Directions for Future Research**

Future research can explore various ways to extend the current study. First, repeating the current experiment using a different participant demographic (i.e., employees in a professional organisation, rather than university students) is warranted to determine the repeatability and consistency of the results of the current study. Second, expanding the number of gaze behaviour conditions would allow for a more detailed understanding of the relationship between gaze direction and knowledge sharing behaviour. Third, future studies could incorporate dynamic knowledge sharing requests (e.g., short film clips) into their methodology to explore for potential differences in willingness to share knowledge compared to static knowledge sharing requests. Forth, the current study examined the influence of perceived convinciness on knowledge sharing. Concepts such as convinciness or persuasion are processes aimed at changing the attitude or behaviour of an individual toward an event, idea, object, or another individual through the use of written or spoken words to convey information or reasoning. The current study did not employ a kind of attempted convinciness or persuasion that included direct benefits if participants complied with the knowledge sharing request, or involved negative consequences or punishments if they did not. Fifth, there are other variables that could be taken into consideration in future research, such as the perception of sincerity.

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References


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