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# An empirical investigation into the influence of predictable and timely communication on cognition-based trust

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## ABSTRACT

The objective of this study, conducted at a large financial services organisation in Australia, was to examine the effect of peer timeliness and peer communication predictability on cognition-based trust in virtual workers. The results indicated that neither timeliness nor predictability explained a notable amount of variance in the level of cognition-based trust in virtual workers. Peer timeliness explained only a small amount of the variance in the level cognition-based trust in virtual workers and peer communication predictability explained even less. The results did suggest however, that peer communication predictability was a greater predictor of cognition-based trust in virtual teams when the respondent displays a high level of communication predictability. Peer communication predictability has less influence on the level of cognition-based trust when the respondent displays low communication predictability. The findings also implied that cognition-based trust may have a different set of antecedents depending on characteristics of the trustor (such as gender).

## Keywords

Trust, virtual teams, predictable communication, timely communication

## INTRODUCTION

The combination of advances in communication technology and corporate restructuring has drastically changed the shape of the modern organisation. A trend towards the virtualisation of the workplace has emerged from the increasing need for flexible organisational structures and the increasing ability of technology to facilitate communication and coordination across space and time.

Existing literature has sought to understand factors instrumental to the success and failure of virtual teams and the role played by communication. It has been found that whilst communication lies at the core of virtual team functioning and cohesion, it is inherently more difficult in the virtual environment. The dispersion of people across space and time renders the communication process more complex and creates problems in relation to communication and team building.

Two of the major challenges facing virtual teams requiring further investigation are the development of effective communication processes (Watson-Manheim and Belanger, 2002; DeSanctis and Monge, 1999) and maintaining a solid team culture (Belanger, Watson-Manheim and Jordan, 2002). According to Belanger et al., (2002), practitioners are interested in “*how communication within virtual work can be better used for... relationship development*” and require more “*precise answers about time sensitiveness to the distributed team work performed*”

The study reported here examines a fundamental factor in strong teams’ cultures and how communication among virtual team mates can engender or reduce its prevalence in a competitive business environment: trust. The primary objectives of this study were to understand how trust in virtual workers is affected by (1) communication timeliness, and (2) peer communication predictability. The secondary objective of the study was to discover what assumptions were made by virtual workers when their team mates did not communicate with them in a timely or predictable manner.

## BACKGROUND

Communication is fundamental in organisations to accomplish tasks, manage interpersonal identities and roles (Walther, 1995). Communication is particularly important in virtual organisations and forms the backbone of information exchange

(Watson-Manheim and Belanger, 2002). It makes it possible for physically and temporally disperse team members to exchange information with another (Sarbaugh-Thompson and Feldman, 1999) and build trust within the team. The authors also suggest that gender may affect such relationships and it might be expected that the effect would be minimised in the virtual workplace. Not only does communication allow groups to create shared meaning (Wiesenfeld, Raghuram and Garud, 1999) and coordinate tasks, reliable and effective communication processes allow organisations to bridge time, space and cultural differences (DeSanctis and Monge, 1999). Virtual teams rely on computer-mediated communication to coordinate tasks, share information and build trust. A heavy reliance on e-mail is a reality and necessity in many organisations (Lurey and Raisinghani, 2001; Wisenfeld et al., 1999), allowing groups to coordinate their tasks, share information and sustain their identification as a group without physical proximity (Ahuja and Carley, 1999). Lurey and Raisinghani, (2001) found that e-mail is the most frequently used tool in virtual teams when compared other technologies such as the telephone and video conferences, with 80% of team members communicating via e-mail daily.

Existing bodies of research conflict regarding the effectiveness of computer-mediated media in communicating social cues, replacing face-to-face communication and fostering trust. Whilst theories such as Media Richness (Daft, Lengel and Trevino, 1987) and Social Presence (Short, Williams and Christie, 1976) argue that computer-mediated communication media are ineffective in transmitting rich interpersonal cues and relational information, other research has shown that relational information such as enthusiasm can be communicated via electronic communication (Jarvenpaa and Leidner, 1999). Relational information refers to messages used by people to “*define or redefine relationships*” and “*how they regard their relationships, ... themselves and their partners within relationships*” (Walther, 1995) and may include expressions of warmth, concern or acceptance. Media Richness and Social Presence theories suggest that computer mediated communication has an inherent inability to convey such information due to the lack of visual and auditory cues such as facial expressions and posture (Chidambaram 1996, Walther, 1995).

The nature of team work is such that team members must interact cooperatively in order to accomplish their shared objectives (Kanawattanachai and Yoo, 2002). It is an interdependent undertaking by a group of people to accomplish personal and organisational goals (Mayer, Davis and Schoorman, 1995). As such, trust is instrumental in allowing team members to work together effectively. It is widely agreed that trust is pivotal in virtual teams. Whilst trust is considered to be important in all working relationships (Mayer et al., 1995), trust is particularly critical in virtual teams where shared communication systems are relied upon to accomplish coordination rather than social controls (Jarvenpaa and Leidner, 1999; Jarvenpaa, Knoll and Leidner, 1998), traditional controls and hierarchies (Kasper-Fuehrer and Ashkanasy, 2001). Virtual workers can no longer exercise control over their team mates through physical presence (Handy, 1995). Trust functions “*like the glue that holds and links virtual teams together*” (Kanawattanachai and Yoo, 2002, p. 188) and “*the success and performance of virtual teams is contingent on their ability to trust*” (Lipanck and Stamps, 1997). Staples and Ratnasingham, (1998) suggest that “*trust is the defining feature of a virtual enterprise and all types of management in the era of virtual enterprises must be built on trust*”.

Trust facilitates cooperation, better decision making, open, substantive and influential information exchanges (Kanawattanachai and Yoo, 2002; Lurey and Raisinghani, 2001; Jarvenpaa et al., 1998). Trust also promotes risk taking behaviour (Kanawattanachai and Yoo, 2002; Jarvenpaa and Leidner, 1999; Mayer et al., 1995). Trust can have a significant effect on group cohesion, overall group performance and effectiveness (Sarker et al., 2000). Lind (1999) argues that mutual trust must exist in a group before the group can be cohesive. The higher the level of trust, the higher the level of cohesion and social integration will be. Moreover, Jarvenpaa et al., (1998) argue that increased trust encourages individuals to engage in less self-protective actions. Quality communication is essential for trust to be built and maintained in virtual teams (Balthazard, Potter and Warren, 2002). Communication can strengthen a person’s identification with their team or organisation, create a sense of shared meaning (Wiesenfeld et al., 1999) and increase team performance. Certain communication behaviours have been found to influence levels of trust at different points in a group’s life. Jarvenpaa and Leidner (1999) found that social communication and communication of enthusiasm facilitated trust early in a group’s life while communication behaviours such as predictable communication, substantial and timely responses helped maintain trust later in a group’s experience.

Existing research has shown that trust is not a monolithic construct. Treatment of trust as a one-dimensional concept is problematic as each form of trust has its own set of antecedents and outcomes (Mayer et al., 1995; McAllister, 1995). Mayer et al., (1995) purported that interpersonal trust must be considered from two different angles - characteristics of the trustor and characteristics of the trustee – to prevent distortion of the trust relationship. The most influential characteristic of the trustor is propensity to trust whilst characteristics of the trustee may be further broken down in: ability, benevolence and integrity. According to Sarker et al., (2000), institutional forms of trust “*believe in the existence of norms and rules that guide human behaviour*” (p. 596). Integrity refers to the extent to which an individual or group adheres to these norms and rules to make them dependable and reliable in the trustor’s view (Jarvenpaa et al., 1998). Principles on which individuals may be judged upon include their sense of justice and credibility of their communications (Mayer et al., 1995).

McAllister (1995) found strong empirical support for the distinction between sociological and rational foundations of trust. He argued that there are two discrete forms of trust: affect-based trust (based on interaction frequency and peer affiliative behaviour) and cognition-based trust (rational and action based, cognition-based trust is concerned with the processes surrounding the use of communication media). It was found that interaction frequency and peer affiliative behaviour were significant predictors of affect-based trust whilst the constructs peer reliable role performance, cultural-ethnic similarity and professional credentials were found to have an insignificant effect on cognition-based trust. Following his study, McAllister called for further research into the factors influencing cognition-based trust.

Jarvenpaa and Leidner (1999) conducted a qualitative investigation into levels of swift trust in temporary virtual teams over a four week period and found that trust is highly fragile and dependent on member actions. Teams starting with low levels of trust can develop high levels of trust if team members engage in trust facilitating behaviours and teams can lose high levels of trust if team members do not engage in regular, predictable and timely communication. Jarvenpaa and Leider (1999) suggest that swift trust, a form of cognition-based trust can only be maintained in virtual team if team members continue to engage in trust building behaviours such as predictable communication, substantial and timely responses. In their study, one third of teams that started with high levels of trust ended up with low levels of trust. Predictable communication implies regular communication that may or may not be frequent. Timely communication refers to “explicit and prompt responses” indicating that a team member’s messages and contributions have been read and thoroughly evaluated (Jarvenpaa and Leidner, 1999).

There is a greater need for predictable and timely communication in virtual teams to counteract uncertainty (Hawisher and Moran, 1993) and a person’s actions will lead others to trust them more or less (Mayer et al., 1995). Jarvenpaa and Leidner (1999) found that predictable and timely communication was critical to the development of task focused trust and effective team functioning. In accordance with this, Kanawattanachai & Yoo, (2002, p. 190) state that “*trust is strengthened when trustees do what they promise to do in a timely fashion*”. Team members are more confident about the commitment of others to the task if there is a regular pattern of communication and forewarning for communication absences (Jarvenpaa and Leidner, 1999). In addition, thorough responses rather than responses indicating only a cursory perusal of messages and contributions to tasks are necessary (Jarvenpaa and Leidner, 1999).

This study extended McAllister’s model of trust by applying Jarvenpaa and Leidner’s findings on the importance of timely and predictable communication to swift trust in temporary virtual teams to cognition-based trust in non-temporary virtual teams. Specifically, this research sought to analyse the influence of timely peer communication and peer communication predictability on cognition-based trust. It was anticipated that the outcomes of this research will contribute to Belanger et al.’s call for factors critical for building a solid team culture and effective communications processes in the distributed environment, and time sensitiveness to the distributed team work performed.

The above gives rise to the following research questions and associated hypotheses:

<i>Research Question</i>	<i>Hypothesis</i>
1. What is the influence of peer timeliness on cognition-based trust?	In virtual participants, timely communication has a positive influence on cognition-based trust.
2. What is the influence of predictability on cognition-based trust?	In virtual respondents, predictable communication has a positive influence on cognition-based trust.
3. Does the respondent’s behaviour in relation to communication timeliness affect the strength of ‘timely communication’ as a predictor of cognition-based trust?	Timely communication will have a greater influence on cognition-based trust in virtual respondents who exhibit more timely behaviour than those who exhibit less timely behaviour.
4. Does the respondent’s behaviour in relation to communication predictability affect the strength of ‘predictable communication’ as a predictor of cognition-based trust?	Predictable communication will have a greater influence on cognition-based trust in virtual respondents who exhibit high communication predictability than those who exhibit low communication predictability.

The research model used in this study is presented in Figure 1.

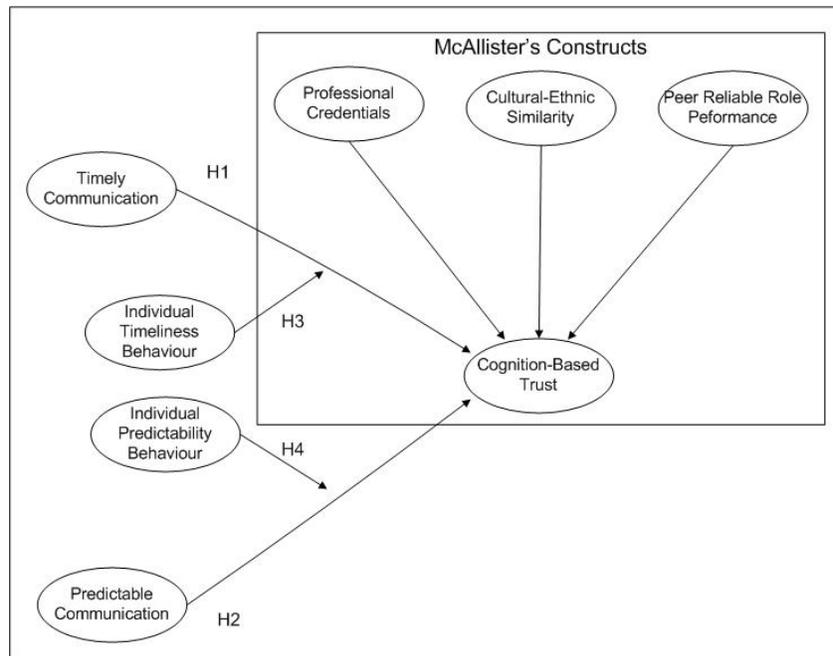


Figure 1 – The Research Model

## RESEARCH METHODOLOGY

A survey instrument was developed from the literature above and piloted on a group of undergraduate students and refined. The instrument was then piloted and re-tested in a large organisation. The reliability and validity of the instrument (based on the previously established Kanawattanachai and You (2002) construct measures) was found to be acceptable (test-retest scores were all highly correlated and significant, the Cronbach alpha scores were all acceptable (DeVillis, 1991)), internal validity was supported by development of the instrument from existing research, and face validity by subjecting the instrument to expert review. Thus no changes were necessary and the same instrument was then applied to a larger sample in the same organisation. Cognition based trust was calculated by measuring perceptions of dedication, competence, support and reliability.

All staff in the IT department of a large Australian financial services organisation were invited to participate in the survey-based study. A total of 76 useable responses were received, a response rate of around 30%. Of these, 43 were considered virtual workers and 33 non-virtual. Descriptive statistics, correlations, non-parametric t-tests and multiple regression were conducted to examine the relationship between cognition-based trust and its potential predictors: timeliness and predictability, as suggested by the literature (outlined above) relating this trust back to doing what is promised on time and following a pattern.

## RESULTS

### Timeliness

An analysis of the data using regression indicated that the communication timeliness of team mates had only a small influence on cognition based trust in virtual respondents. As shown in Table 5-1, only 4% of the variance in cognition based trust in virtual workers was explained by timeliness ( $p = 0.438$ ). The Beta coefficients showed that the variable 'respondent's expectations in comparison with team mates' timeliness' only had a partial regression correlation of 0.093 whilst the variable 'respondent's timeliness in comparison with team mates' timeliness' achieved a marginally better correlation of 0.137. Neither figure was significant with both p values being over 0.450.

Group	N	R <sup>2</sup>	p value
Virtual	43	0.040	0.438
Non-Virtual	33	0.221	0.024

**Table 1 Timeliness - Virtual Vs Non Virtual Participants**

Accordingly hypothesis 1 is rejected.

Interestingly, timely communication explained a significant amount of variance in cognition-based trust in face-to-face workers, with over 22% of the variance explained and p value significant at the 0.05 level. The Beta value revealed that the variable '*respondent's expectations in comparison with team mates' timeliness*' had a partial regression coefficient of 0.443 whilst the variable '*respondent's timeliness in comparison with team mates' timeliness*' achieved smaller value of 0.119. Analysis via Stepwise regression showed the variable '*respondent's expectations versus team mates' timeliness*' (i.e. the extent to which the respondent's timeliness expectations were met ) alone explained over 20% of the variance in cognition-based trust. This suggested that not only did timely communication explain 22% of the variance in cognition-based trust, but also that this variance was largely influenced by the extent to which the respondent's expectations of his/her team mates was met.

Importantly, the results for the non-virtual workers add support to the constructs and the research model.

During the analysis of the data timeliness was found to have a greater influence on cognition based trust in virtual males than face-to-face males. As shown in table 5-2, almost 23% of the variance in cognition-based trust was explained in virtual males. This variance was trending towards significance with  $p = 0.065$ . This near significance value may be explained by the small sample size of 24. Stepwise regression demonstrated that the variable '*respondent's timeliness in comparison with team mates' timeliness*' alone explained 18% of the variance in cognition-based trust in virtual males. Despite the small sample size, this variance was significant with at the 0.05 level ( $p = 0.039$ ). On the other hand, less than 16% of the variance in cognition-based trust in face-to-face male workers as explained by the timeliness measures and the R<sup>2</sup> value ( $p = 0.235$ ).

Mann-Whitney tests provided further support for the statement that the timeliness of peers has a positive influence on cognition-based trust. It was noted that the average level of timeliness in virtual males was higher in virtual males than the average level of timeliness in face-to-face males, as was the average level cognition-based trust. The timeliness expectations of virtual male workers are much likelier to be met than the timeliness expectations of face-to-face male workers ( $p=0.019$ ). Cognition-based trust is also significantly higher in virtual male workers than face-to-face male workers, with  $p = 0.37$ . Face to face male workers are slightly more likely to have team mates who reply in the same (or shorter) timeframe from them, however, this difference in means was negligible ( $p = 0.956$ ). In sum, the expected relationships between the average level of timeliness and average level of cognition-based trust was observed.

Thus, it can be concluded that whilst timeliness does not have a positive influence on cognition-based trust in virtual workers as a homogenous group, it does have an positive influence on one group of virtual workers: males. A potential limitation of this may be the small sample sizes involved (24 virtual male workers, 20 face-to-face male workers). However, the results of regression analysis and Mann-Whitney tests do suggest that a further exploration of the influence of cognition-based trust in different groups is necessary.

Limitations in data collection (see "Limitations" below) meant that analysis could not be conducted using participants who typically responded to work-related emails in a longer timeframe than their team mates. Only a very small number indicated that this was the case and as a result, Hypothesis 3 could not be tested.

### **Predictability**

As shown in Table 2, multiple regression revealed only very weak supported for Hypothesis 2. Less than 2% of the variance in cognition-based trust in virtual workers was explained by the predictability of communication from peers. The Beta coefficients showed that the variable '*my team mates initiate regular communication*' only had a partial regression correlation of 0.013 whilst the variable '*my team mates advise me of times when they will be unavailable*' achieved a marginally better correlation of 0.042. The variable '*I know roughly when my team mates will communicate with me*' attained a partial correlation coefficient of 0.1.

Group	N	R <sup>2</sup>	p Value
Virtual	43	0.016	0.891
Non-Virtual	33	0.250	0.037

**Table 2 Predictability - Virtual Vs Non-Virtual Participants**

Accordingly hypothesis 2 is rejected.

In contrast with timely communication, predictable communication measures explained a significant variance in face-to-face workers, providing support to the model. A significant R<sup>2</sup> value of 0.250 was achieved with a significance level under 0.05. The Beta values revealed that all three variables: ‘my team mates initiate regular communication’, ‘I know roughly when my team mates will communicate with me’ and ‘my team mates advise me of times when they will be unavailable’ achieved partial regression coefficients of 0.219, 0.275 and 0.212 respectively. Stepwise regression revealed that the variable ‘I know roughly when my team mates will communicate with me’ was the largest contributor the model and explained almost 15% (R<sup>2</sup> = 14.8, p = 0.027) of the variance in cognition-based trust. Thus, the level of cognition-based trust in face-to-face workers is largely influenced by the extent to which the respondent knows when his/her peers will contact them.

Peer communication predictability explained a larger variance in cognition-based trust in females than males for both virtual and face-to-face workers, however, the statistical significance of the model was weak in all four cases.

22% of the variance in female virtual workers was explained by cognition-based trust, somewhat more than the variance explained in virtual males workers and moderately high p values were obtained for both regressions. What is encouraging is that despite the smaller sample size of female virtual workers (N = 19) compared to male virtual workers (N = 24), a higher level of significance was achieved for female workers in conjunction with a higher R<sup>2</sup> value. These findings imply that the model is a better predictor of cognition-based trust in virtual female workers than virtual male workers. Obviously, further research is need here.

Gender	Group	N	R <sup>2</sup>	p Value
Female	Virtual	19	0.220	0.279
	Non-Virtual	13	0.369	0.274
Male	Virtual	24	0.134	0.398
	Non-Virtual	20	0.224	0.243

**Table 3 Influence of Gender on Predictability Measures**

Respondents who advise their team mates of times when they will be unavailable were defined as having “high communication predictability”. Respondents who do not inform their team mates of times when they will be available were classified as having “low communication predictability”. Almost 28% of the variance in cognition-based trust was explained in virtual respondents who indicated high communication predictability. This contribution of predictable communication to the model was significant at the 0.05 level. Stepwise regression revealed that the variable ‘my team mates advise me of times when they will be unavailable’ was the greatest contributor to the model, explaining 27.2% of its variance (p = 0.003). In contrast, only 1.4% of the variance in virtual workers who indicated low communication predictability was explained. Whilst the sample size is small (N = 9), the R<sup>2</sup> and high p value suggests some support for hypothesis 4. In addition, the variance explained for this subset of virtual workers who indicate high communication predictability contrasts with the 1.6% of variance explained when treating all virtual workers as a homogenous group.

There is sufficient support in the data then for hypothesis 4 to be conditionally accepted.

## DISCUSSION

The results reported above are surprising. It seems that cognition-based trust is not influenced very much by communication timeliness or predictability. The generally poor fit of the model in explaining cognition-based trust in relation to virtual workers came as a surprise and contrary to what existing literature prompted the researchers to expect. Although small

sample sizes and sample demographics may be potential reasons for the model's poor fit in virtual workers, it is quite possible that peer timeliness and peer communication predictability is only important to cognition-based trust in temporary teams i.e. swift trust. That is, whilst timely and predictable communication was found to have a strong influence on the level of swift trust in temporary virtual teams (Jarvenpaa and Leidner, 1999), they are not antecedents of trust in permanent virtual teams. Whereas workers in temporary teams typically do not have history of working together or an expectation of working together again as a group, workers in permanent teams naturally expect a continuing working relationship. This expectation of a continuing working relationship and the absence of a finite team lifespan may have decreased the importance of timely and predictable communication.

However, the findings on cognition-based trust in virtual workers do suggest that peer timeliness and peer communication predictability may have varying degrees of influence on the level of cognition-based trust depending on the subset of virtual workers being considered. The findings imply that cognition-based trust may have a different set of antecedents depending on characteristics of the trustor (such as gender); the results did indicate that for one particular demographic group (virtual males) peer timeliness may be a significant predictor of cognition-based trust – further work is required here.

### LIMITATIONS AND FURTHER RESEARCH

There are several limitations to this study and it is important that the implications of these be understood and taken into account in any conclusions drawn. These are:

- *Sample size* – a major limitation in relation to data collection was the number of responses collected. Whilst the overall sample size of 77 was sufficient to compare the influence of the predictors between virtual and non-workers, it was unsuitable for any further analysis. A larger sample size would have reduced the ambiguity surrounding the results. In some situations, it was unclear if the model was weak due to failings in the model or the sample size involved.
- *Single site* – a further limitation regarding data collection was the utilisation of participants from one department of a single research site. All participants were members of the internal Information Technology department in a large financial institution, thus greatly limiting the generalisability of the results. There is a possibility that the profession of the respondents influenced their responses to the survey.
- *Demographics* – another data collection limitation associated with the demographic make up of the sample related to the length of time respondents had been a member of their team and an employee of the research site at the time of measurement. Three problems were encountered as a result of demographics. First, the length of time respondents had been members of their teams and the organisation was not normally distributed. This inhibited a meaningful analysis of the impact of time on the predictors and potentially skewed the results. If in fact the length of time a respondent has been a member of their team or the organisation does affect the strength of the model, the non-normal distribution of would have created a bias in the analysis. Secondly, although the length of time the respondent had been a member of their team was known, the researchers were not able to determine the conditions under which they joined the team. It was not known if the respondent joined their team at the time of team's inception or sometime afterwards. It is almost certain that different respondents joined their teams at different stages in their teams' life. And lastly, the generally substantial length of time that respondents had been employed at the organisation may lend itself to situation where respondents had worked with the team mates in previous teams.

On the other hand it is worthy of note that the survey validation tests produced satisfactory results and that the model seems to have the expected results for the non-virtual teams – both of these suggest that some confidence can be placed in the findings.

The above suggests that the study needs replication – preferably in studies covering wider categories of staff, in more than one organisation and in larger numbers. Future research should also examine the differences in the influence of peer timeliness and peer communication predictability in relationships between managers and staff. For example, do employees tend to trust their managers regardless of whether they have communication timelines and predictability? Do they allow the same concessions for their team mates?

A further extension of this research for future work may be the investigation of peer timeliness and peer communication predictability from a more qualitative point of view. For example, future work may consider conducting a content analysis to provide a richer picture of the results presented in this study. For instance, communication between team members could be examined to determine what constitutes as a substantial response or the quality of the communication, be it of a predictable or unpredictable nature.

## CONCLUSION

Despite not producing conclusive findings, this study makes a number of contributions to the existing body of knowledge on trust in virtual work environments. In contrast to many prominent studies of trust in virtual teams (Iacono and Weisband; Kanawattanachai and Yoo, 2002; Jarvenpaa, Knoll and Leidner, 1998; Jarvenpaa and Leidner, 1999) this study was conducted in an organisational context. This study also contributes to the empirical search of the predictors of cognition-based trust. As well as supporting further research into peer timeliness and peer communication predictability as antecedents of cognition-based trust, the findings in this study may suggest that cognition-based trust has different antecedents under different circumstances.

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