Fostering trust in virtual project teams

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Fostering trust in virtual teams: towards a design framework

Ellen Rusman [1]
Educational Technology Expertise Centre
Open University of the Netherlands
Valkenburgerweg 167, 6401 DL, Heerlen
Ellen.rusman@ou.nl
Tel.: 0031 (0)45 5762381
Fax: 0031 (0)45 5762800

Jan van Bruggen
Educational Technology Expertise Centre
Open University of the Netherlands
Valkenburgerweg 167, 6401 DL, Heerlen
Jan.vanbruggen@ou.nl
Tel.: 0031 (0)45 5762754
Fax: 0031 (0)45 5762800

Peter Sloep
Educational Technology Expertise Centre
Open University of the Netherlands
Valkenburgerweg 167, 6401 DL, Heerlen
Peter.sloep@ou.nl
Tel.: 0031 (0)45 5762696
Fax: 0031 (0)45 5762800

Rob Koper
Educational Technology Expertise Centre
Open University of the Netherlands
Valkenburgerweg 167, 6401 DL, Heerlen
Rob.koper@ou.nl
Tel.: 0031 (0)45 5762657
Fax: 0031 (0)45 5762800

[1] Corresponding author

ABSTRACT

Several collaboration problems in virtual project teams can be attributed to a hindered process of interpersonal trust formation. In order to design solutions to solve these trust formation problems, it is important to understand how interpersonal trust is formed in face-to-face project teams and how this differs in a virtual setting. Synthesising literature from various disciplines, we propose a cognitive-(factor) and process-oriented model for the formation of interpersonal trust between face-to-face project team members. Taking this kernel theory as a starting point, we analyse how virtual settings alter or even obstruct the process of trust formation. We propose that one method to improve the formation of interpersonal trust is to facilitate virtual project team members with the estimation of each others trustworthiness. This can be done by making information available about individual team members that is based on the antecedents of trustworthiness. We extent current research by taking a designer's perspective to the proposed cognitive schema of trustworthiness and apply it for the design of artefacts, such as personal identity profiles to support estimation of trustworthiness in virtual project teams.

KEYWORDS
Trust; Trustworthiness; Artefact design; Virtual Team; Collaboration; Impression formation

Fostering trust in virtual teams: towards a design framework

Introduction

Project teams are increasingly functioning in distributed and mediated settings, where communication is facilitated by ICT and limited to asynchronous text exchanges (Powell, 2004). These 'virtual project teams' are assembled on an as needed basis for the duration of a project and staffed by two or more members across spatial, temporal, cultural and/or organizational boundaries (Hung, 2004; Powell, 2004). Team members rarely meet in person; they may not have a prior history of working together (Jarvenpaa & Leidner, 1998) and they probably will not meet in the future (Hung, 2004). These virtual project teams tend to experience various problems in collaboration, such as poor decision-making, hampered information exchange, an increased risk of misunderstandings and amounting personal conflicts (Häkkinen, 2004). Several authors (Beer, 2003; Brown, 1999; Corbitt, 2004; Dignum, 2005; Furumo, 2006; Gambetta, 1988; Jarvenpaa & Leidner, 1998; Raes, 2006; Walther, 2005) suggest that these problems can be traced back to an impeded process of creating interpersonal trust. In comparison to face-to-face project teams interpersonal trust in virtual teams develops slowly (Jarvenpaa & Leidner, 1998; Wilson, Straus, & McEvily, 2006) and is often fragile and easily damaged (Bos, Olson, Gergle, Olson, & Wright, 2002; Hung, 2004; Wilson et al., 2006; Zolin, Fruchter, & Hinds, 2003).

In this article we present a kernel theory of interpersonal trust formation in virtual teams that may help to explain the encountered problems. The formulation of this kernel theory is the first step in the development of a design theory for fostering interpersonal trust in virtual teams (Markus, Majchrzak, & Gasser, 2002). We first explore the nature of interpersonal trust; How interpersonal trust is formed in face-to-face project work settings and how this process may become problematic and hampered in virtual project teams. We then propose a strategy to prevent these problems. We identify the factors that accelerate the formation of trust and that lead to more solid forms of trust (Hung, 2004). Perceived trustworthiness is such a factor and we argue that members in virtual

teams often lack the **information required to form a cognitive model of each other's trustworthiness**. Creating interpersonal trust in virtual project teams can be fostered by making specific personal information available, that is grounded in a schema of trustworthiness in project work settings. We then present a design framework that system designers may use to select the personal information that will be made available to facilitate estimation of trustworthiness among the members of a virtual team. We end with a discussion of possible ways to validate this design framework and by presenting an overview of future research activities.

A kernel theory on trust

Trust: understanding the concept

Trust is a multidimensional and complex construct that is studied in different disciplines, such as psychology, sociology, economics, philosophy and, more recently, computer science. These disciplines developed their definitions and understanding of the concept in parallel. In recent work, however, multi-disciplinary conceptualizations of trust emerge (Chopra & Wallace, 2002; Hung, 2004; Kanawattanachai & Yoo, 2005; Rousseau, Sitkin, Burt & Camerer, 1998; Staab, 2004; Tschannen-Moran & Hoy, 2000; Ulivieri, 2005; Wang & Emurian, 2003). These conceptualizations converge toward an **interpersonal** connotation of the concept: trust as 'a social tie from one actor to another'(Chopra & Wallace, 2002; Wang & Emurian, 2003).

Starting from this perspective and definitions previously proposed (Castelfranchi & Falcone, 1999; Chopra & Wallace, 2002; Hung, 2004; Mayer, Davis, & Schoorman, 1995; Riegelsberger, 2005; Rousseau et al., 1998; Ulivieri, 2005) we define interpersonal trust as:

- A positive **psychological state** of a **trustor** (person who can trust/distrust) towards a **trustee** (person who can be trusted/distrusted)
- comprising of **positive expectations** of the intentions and behaviour of the trustee
- while trying to accomplish a **goal/outcome**
- where the **trustor is dependent** on the trustee

- and is willing to **accept vulnerability**
- by **relying on the trustee**
- through **a willingness to act and display trusting behaviour**
- in a specific **context**

Trust has both cognitive (e.g. competence, reliability, professionalism) and affective dimensions (e.g. caring, emotional connection to each other) (Kanawattanachai & Yoo, 2005; Meyerson, Weick, & Kramer, 1996). Hung (2004, p.2) states that "*cognition-based trust results from deliberate assessment of each other's characteristics and the process of weighting benefits of trusting over risks, whereas affect-based trust involves one's emotional bonds and sincere concern for the well-being of the others*"

We only need to build interpersonal trust if something is at stake and the outcome is uncertain (Riegelsberger, Sasse, & McCarthy, 2004). Interpersonal trust is an important risk-and uncertainty-reducing mechanism: the higher the risk, the higher the level of trust needed to display trusting behaviour (Hartman, 1999; Mayer, Davis, & Schoorman, 1995; Rousseau, Sitkin, Burt & Camerer, 1998).

We now turn to the process in which trust is formed and compare this process in the setting of a face-to-face project team to that of a virtual team, in order to identify problematic differences. We focus on the cognitive dimensions of trust, because we assume that in situations where persons do not know each other well, as is the case in virtual teams (Chopra & Wallace, 2002; Gabarro, 1978), cognition is the precursor of affective trust.

The process of interpersonal trust formation

Figure 1 represents our process model for the formation of interpersonal trust in face-to-face project teams. Like Zolin, Hinds, Fruchter & Levitt (2002) we make a distinction between the concepts of trust and trustworthiness in our model. Interpersonal trust comprises the perceived trustworthiness of a trustee, but is in addition influenced by more and different factors. Trustworthiness is the main factor influencing interpersonal trust and high correlations between the two concepts are reported (Tanis & Postmes, 2005; Zolin, Hinds, Fruchter, & Levitt, 2002), but there is no '1-to-1' relation. (Hardin, 2002) defines perceived trustworthiness as the individual's assessment of how much and for what type of performance a trustee can be trusted.

The process model for the formation of cognitive-based trust is divided in three parts: **input**, which is observable; a cognitive **process**, which cannot be observed directly and **output**, the observable outcomes of the cognitive process. The cognitive process and the outcomes are influenced by characteristics of the context as well as by the trust predisposition and the mood of a trustor. The cognitive process consists of information collection, assessment of trustworthiness, the assessment of the overall situation in which trust is required (influenced by mood and trust predisposition and by taking trustworthiness and context into account), leading to the trust state and the trust decision.

INSERT FIGURE 1 HERE

We will use this model to first describe the trust formation process in general and then focus on the differences between face-to-face and virtual teams and the implications they have on the trust formation process . First of all we may assume important communalities. Members of virtual teams do, like face-to-face teams, form, monitor and assess a cognitive model of a trust-requiring situation. The antecedents of interpersonal trust are similar in virtual and face-to-face teams (Henttonen & Blomqvist, 2005; Lewicki, Bunker, & Rubin, 1995). Thus, we may assume that the

process of trust formation in virtual teams will evolve similar to that in face-to-face teams and therefore the model can be used as an anchor for comparison.

However, there are some differences as well. It generally takes virtual team members longer to develop cognitive models of the trust requiring situation; They generally develop less 'thick'(stable through time) and more 'fragile' (instable) cognitive-based trust and often do not have the chance to develop habitual trust, which is more emotional and mostly based on an extensive shared history and personal bonding (Hung, 2004).

Moreover, virtual team members tend to 'stick' more to their initial perceptions of trustworthiness compared to face-to-face teams, whether they are based on stereotypes or on initial interactions. This will colour their perception and assessment of the interaction and the performance of the trustee during the project (Zolin et al., 2002, 2003).

We now describe each of the elements of the trust formation model and explain problems that virtual project teams are likely to encounter when they try to form interpersonal trust.

Input

Signs and signals

In face-to-face encounters people form an impression of others that is based on *signs* (perceived properties of objects or events) and *signals* (perceived properties of objects or events with an intended communicative function) (Bacharach & Gambetta, 1997; Donath, 2006). Signs and signals can have different modalities that are related to our senses, such as sound, visual, kinaesthetic, smell and touch (Kandola, 2006; Riegelsberger, 2005). We receive signs and signals through different routes, which can be either direct or indirect (Hung, 2004). A direct route means that input about a person is acquired through firsthand experience, in encountering and interacting with this person; An indirect route means that we receive the input from a third party who had experience with the person involved.

In computer mediated situations the type and amount of signs and signals that can be used to form an impression are limited, while information transfer routes are hampered and not all information, available in face-to-face settings can be mediated. Riegelsberger (2005) collected examples of visual and auditory cues which we use for the construction of a cognitive model of trustworthiness and which are not necessarily available in mediated settings. He mentions physiognomy, gestures, body movements, posture and para-verbal cues (e.g. intonation, pitch, modulation, speed, regional accents). Due to these restrictions on available types of signs and signals, virtual team members are likely to encounter problems with interpersonal trust formation in general and the assessment of trustworthiness in specific.

Cognitive process

Information collection and selection

People actively select and interpret signs and signals that will help them to assess a situation. They assign different weights to collected information, taking into account the 'input'-route. Signs and signals acquired through direct encounter with another person will be valued more than those acquired through "word of mouth'.

Hung (2004) applies the Elaboration Likelihood Model of Petty & Cacioppo to the phenomenon of trust. In this model two main cognitive processes for trust formation are distinguished: a deliberate, conscious and **active** consideration of available information and a less cognitively aggravating, **more automatic, routine and emotional-grounded assessment**. The second 'assessment' is based mostly on an extensive shared history and personal bonding with another person. According to Hung (2004) trust based on this reinforced, habitual route is relatively resilient, durable and not easily disrupted, thus "thick". But, on the other hand, when it is shattered it is not easily restored. We assume that the second process is less likely to occur in virtual teams, because it is not likely that they share an extensive history and thus had the chance to develop strong personal bonds.

Within the deliberate, active process of establishing cognitive trust again two subroutes are distinguished: the peripheral route and a central route of cognitive processing. Within the peripheral route, trust is based on information processing that is category-, schema- and heuristic-driven. Hung (2004) typifies trust that is based on cognitive models constructed via the peripheral route as "fragile or thin" and states that it is easily withdrawn, because it lacks personal knowledge of the trustee to base expectations on. In these cases, even minor violations of a trustee could lead to distrust. On the opposite, it is also easily repaired once misinterpretations or errors in inferences are clarified and meaning is renegotiated (e.g. due to different cognitive schema of what is considered as "appropriate behaviour " used in different cultures). The central route of information processing involves the deliberate consideration of relevant information and evaluating its merits in a specific situation. This route requires more cognitive effort, but information that is processed in this way tend to be more enduring and stable.

There are several reasons why in virtual teams trustworthiness is generally created along a peripheral route. First of all, the entry conditions are such that members have no shared working experience or previous cognitive models of each other's trustworthiness (Jarvenpaa & Leidner, 1998). Given the cross-disciplinary and inter-organizational nature of the virtual team they do not have the chance to receive third-party information on the reputation of a co-worker prior to collaboration. They also have less overall time to collect information about their co-workers and the whole trust requiring situation (Kanwattanachi & Yoo, 2005). Instead of elaborate gathering and processing of information on team members, the virtual team is dependent on first impressions – and their shallow processing - and on information subsequently gathered during collaboration with fellow team members. Zolin et al. (2002) found that team members who were geographically distributed had less personal communication and that this was associated with lower perceived trustworthiness and lower trust.

Finally, the limited communication means of virtual teams, in terms of pace, frequency and richness of messages, may impede appropriate and timely assessment of the behaviour of other members which has a direct effect on group performance – by increasing the occurrence of misunderstandings (Cramton, 1997) and delays in responses in asynchronous communication media (Hung, 2004, Giddens (1990) in Riegelsberger, 2005) – and on trust formation, which is now based on more shallow or stereotyped reasoning.

Assessment of trustworthiness of trustee

People start to build a model of perceived trustworthiness based on the traits of a trustee that are perceived as evidence for their trustworthiness (Goffman, 1959; Macrae, 2001). Examples of such traits are the trustees' supposed honesty, ability and openness. The cognitive schema comprises several traits which are in general considered as characteristics of a trustworthy person, called the **antecedents** of trustworthiness (Jarvenpaa, Knoll, & Leidner, 1998; Mayer, Davis, & Schoorman, 1995).

The trust warranting properties of a specific trustee are derived from the receiver's interpretation of the signs and signals, such as the countenance, average response time on messages and quality of performance. Thus, cognitively processed signs and signals become cues ('proof') for certain trust warranting properties that are incorporated in the model of the trustworthiness of a specific trustee (Castelfranchi & Falcone, 1999; Gambetta, 1988; Kramer, 1999; Mayer et al., 1995; Riegelsberger, Sasse, & McCarthy, 2004; Rousseau et al., 1988; Wang & Emurian, 2003). In a model of trustworthiness of a trustee traces of prior encounters are maintained and new information is used to update the model. When assigned properties of the trustor in the cognitive model of perceived trustworthiness match the requirements of the situation, one may expect that the trust formation process is accelerated and the trustor reaches a trust decision sooner (Castelfranchi, 2006). For example, people are not likely to trust a car mechanic to do their finances, but might ask him to help them with their plumbing.

When people do not receive signs and signals that match the cognitive schema of trustworthiness, they will compensate for this lack of information by constructing a cognitive model of trustworthiness of a trustee on the basis of available cognitive schema and scripts. They then follow the peripheral route of cognitive processing (Hung, 2004). Examples are inferences made on the basis of stereotypes, roles, rules and tasks, organisations, culture and (social)groups (Hung, 2004). In all these cases people assign properties to an instance of a certain class or category of broader concepts. E.g. 'Alan is an expert and expert's can be trusted within their domain'. They will use these clustered previous positive or negative experiences to extrapolate through time and make predictions about the future (situations and behaviours).

Members of virtual teams often have different work-, discipline- and cultural-related cognitive schemata and expectancies of each other's behaviour. These existing schemata are the 'filters' people use when they are operating in a context, trying to achieve a result and perceiving each other's behaviour. These differences in perception, due to different backgrounds, can, if they go unnoticed, become a source of misunderstanding and conflict in a virtual team. They may also reduce the feeling of familiarity or the sense of belonging to the same group or (social) category, which is one of the factors that contribute to perceived trustworthiness and thus to interpersonal trust (Feng, Lazar, & Preece, 2004; Kramer, Brewer, & Hanna, 1996).

Assessment of the trust requiring situation

People form interpersonal trust based on a model of the trust requiring situation. Existing research (Arnold, Cooper, & Robertson, 1998; Castelfranchi, 1999; Gambetta, 1988; Riegelsberger et al., 2004) suggests that this cognitive model at least comprises two components:

- the perceived trustworthiness of the trustee (e.g. based on perceived ability and motivation of trustee, as discussed in the previous paragraph)
- the characteristics of the context (e.g. amount of risk, locus of control and external factors which can influence the behaviour of the trustee)

The constructed cognitive model is influenced by the overall trust predisposition and mood of a trustor. Trust predisposition (Rotter, 1967) is an attitude, a stable positive, neutral or negative tendency to evaluate trust related information that is independent of the situation or characteristics of the trustee. The trust predisposition of a trustor will influence the trust formation process even before information about others becomes available (Mayer et al., 1995). The processes leading to a model of the trust-requiring situation are also influenced by the emotional state, the mood, of the trustor at the moment of assessment, but only influence the attributions of properties in the model (Arnold et al., 1998; Williams, 2004). A trustor will evaluate information on the components and weight the importance of this information in order to form a cognitive model of a specific trust-requiring situation. The trustor answers the question: what type of behaviour is the trustee likely to display in this context while we are trying jointly to achieve this result? Thus a certain expectation of the behaviour of the trustee is formed (Castelfranchi & Falcone, 1999).

Trust state

The ‘trust state’ is the psychological state to which people normally refer to as ‘trust’ or ‘interpersonal trust’. The interpersonal trust state is gradual and dynamic, not stable (Rempel, Holmes, & Zanna, 1985), it fluctuates over time based on experiences of the trustor with the trustee. It may have negative values (distrust) (Jian, Bisantz, & Drury, 1997), based on a negative impression or experience with a trustor in a certain context. Others have argued that the concept of distrust requires a separate conceptual model (Lewicki, McAllister, Daniel, Bies, & Robert, 1998; McKnight, Kacmar, & Choudhury, 2004).

A positive trust state is still no guarantee for action, because a trust state can exist without the direct necessity to display trusting behaviour (Castelfranchi, 2006); Due to circumstances a trustor might not have had the chance to act trustful in a specific situation.

Trust decision

A decision to trust precedes and is a preparation for the display of trusting behavior. A trustor weights the possible risks and rewards (Castelfranchi, 2006; Zolin, 2002) against the trust state currently achieved. This trust state is influenced by the trust predisposition, the assessment of the context and the perceived trustworthiness of the trustee. A trustor decides if and how (s)he will act, partly based on a personal threshold of risk acceptance or avoidance and the corresponding level of trust (Castelfranchi, 2006).

In some circumstances the trust state and trust decision may be based primarily on **contextual control mechanisms**, e.g. supervision by a teacher. Here, clear expectations of the behaviour of a trustee exist. It can also be based primarily on the **perceived trust warranting properties** (Riegelsberger, 2005) and trustworthiness of the trustee. In both cases the cognitive model of the trust requiring situation will be different, the resulting trust state can be higher or lower and more prone to time and changes, but both can lead to a trust decision and trusting behaviour which will look quite the same from the outside. Only in the trustor's mind the behaviour is grounded in different considerations.

Importance of context

Certain characteristics of the context influence the cognitive processes as well as the output and behaviour of a trustor. One of the most important context factors is the **perceived risk**. Without a risk or a chance of a reward, it would not be necessary to establish interpersonal trust. Interpersonal trust is in its core an uncertainty and risk-reducing mechanism, aimed to increase the chances of 'survival' of the trustor (Deutsch, 1960; Luhmann, 2000; Riegelsberger, 2005). If people run a high risk, they will need higher and 'thicker' trust, unless extreme conditions apply (e.g. a life-threatening accident). In terms of risk run in a working context, Zolin, Hinds et al. (2002, p.12) state that "*the value at risk for the trustor equates to the value of what will be lost if the trusted person does not perform. Failure to perform by the trusted person may result in loss of overall project*

quality, time invested, or reputation if the failure interferes with the trustor's ability to meet obligations. Perceived risk may be mitigated by social controls such as binding contracts, procedural norms and so forth (Shapiro, 1987) or exacerbated by uncertainty and lack of information."

Compared to face-to-face settings computer-mediated settings increase the level of perceived risk. Reduced, different and delayed information availability can increase uncertainty (Giddens, 1990 in Riegelsberger 2005) among team members. Hung (2004) also mentions computer anxiety, unfamiliarity with mediated signs and signals and the availability of less social control mechanisms (e.g. direct supervision, geographical collocation, similar backgrounds and shared experiences) as factors which can contribute to risk perception, next to role overload, role ambiguity, absenteeism, and social loafing often observed in short-term computer mediated collaboration.

Also unfamiliarity with a specific person, the culture of the organization a person is affiliated with and general cultural norms can increase the sense of uncertainty of (virtual) project team members. When they perceive higher risk and uncertainty, people tend to compensate with trust. This could indicate that virtual team members need to establish a higher interpersonal trust state, before they decide to display trusting behaviour (Hartman, 1999). Without trust, team members are not apt to take risks for fear of not meeting expectations or even for losing their jobs (Kanawattanachi & Yoo, 2005).

An aspect of the context that is of particular interest to project teams, is the extent to which a trustor is **dependent** on the actions of the trustee. This correlates with perceived risk and vulnerability. If the risk is high and a trustor is highly dependent on the performance of a trustee, (s)he is also more vulnerable. In working contexts the degree of dependability is mainly dependent on the task structure (is it still open who will do what, or are roles clearly divided), task complexity and domain familiarity (do we have to build on each other's knowledge in order to be able to complete the task)

and time pressure within a project (are we dependable on each other as resources to complete a task in time) (Hung, 2004).

Next to organizational control mechanisms and monitoring possibilities, also the time needed on task and the overall project duration can influence perceived dependability and vulnerability. Also individual monitoring and control opportunities can help to reduce perceived risk. Hung (2004, p.8) states that "*for collaboration actions to be successful, one should either possess the ability to closely monitor or trust the involved parties. The ability to control the others is, thus, inextricably interlinked with perceived risk – the lower the perceived control, the greater the perceived risk.*". According to Castelfranchi (2006) individual control and trust are not mutual exclusive. This conflicts with studies where monitoring and controlling behaviour are used as indicators of lack of trust. Rather, a feedback and monitoring process can help mitigate risk and thus facilitate the formation of trust (Castelfranchi, 2006).

Riegelsberger et al. (2004) distinguish three contextual properties that can create additional incentives for a trustee to fulfil the expectations of a trustor: temporal, social and institutional embeddedness. Temporal embeddedness refers to the chances that the trustor and trustee will meet again in the future. If they have stable identities and would meet again, a trustee is now more keen to meet expectations, due to the chance of reciprocity (return of favour) in the future. Social embeddedness refers to the possibility that the trustor exchanges information about a trustee's performance among other trustors, thus contributing through an indirect route of information spreading to the reputation of a trustor. Trustees who know that trustors exchange information about their behaviour have an incentive to fulfil, even if they do not expect any future interaction with this trustor (Riegelsberger et al., 2005). When institutional embeddedness is applicable, both trustor and trustee know that defection of the trustee, who operates under institutional constraints, has serious

consequences for the trustee (e.g. the loss of a job). These contextual factors help the trustor to behave vulnerable, even if little is known about the intrinsic properties of the trustee.

Team members of a virtual team often work together only once in a project. Thus, they will not share a common future and thus do not have a lot of chance for reciprocity, which can influence their behaviour. Feng, Lazar & Preece (2004) also mention that users in online settings are more sensitive to mixed or contradictory messages in which empathic emotion and type of response do not match. They report an effect on trust, which in case of inconsistent messages becomes more fragile and is thus more easily damaged.

If we apply Riegelsberger et al. (2005) model of temporal, social and institutional embeddedness to the context of a temporary virtual project team, several factors of this model are more applicable than others. Most of the time there is little temporal and social embeddedness, because virtual teams are often operating inter-organisational, temporal, distributed and mediated and on an one-off encounter. Virtual team members usually do not know each other well in advance; do not have a prior history of working together; do not have the opportunity to meet face-to-face; are unlikely to work with each other again in the near future; and do not share an elaborate social network (so, they do not have a lot of "word of mouth" reputation information available).

Due to the computer-mediated nature of communication between virtual team members, there is less chance on 'chance encounters' than in co-located project teams. This implies that there is less opportunity for personal communication, which can strengthen the bond between people (Zolin, et al., 2003). Therefore, in these cases, only the institutional embedding will be a contextual incentive for fulfilment. Moreover, information may flow less easily between team members (Zolin, 2002), there is more delay between a trusting action and fulfilment thus increasing uncertainty (Riegelsberger, 2005), information can be misunderstood or not grounded equally among team

members and may negatively affect the perception virtual team members have from each other (Cramton & Webber, 2005).

Output

Trusting behaviour, interaction and evaluation

Once people have reached a trust decision, following upon a positive trust state, they accept any risk left and act according to their trust state (Castelfranchi & Falcone, 1999): They will share resources and collaborate with the trustee. Initially the trust state relied to some extent on signs and signals from first impressions and/or inference from a stereotype. Now, it can be updated using information gained from direct interactions with the trustee. The expectations of the trustee can be compared with the actual behaviour and interaction, and on the basis of this evaluation the trust state will be updated. It might develop from a 'thin' towards a 'thick' trust state, or to distrust. Trust can be destroyed by 'no action' as well as by one 'fault action' (Deutsch, 1960) or by unsolved misunderstandings (Walther, 2005).

The results of the evaluation process can be twofold: either the trustor assigns the behaviour to **internal causes** and accordingly increases or decreases the trust state, or the behaviour is assigned to **external unfavourable causes**. In the latter case the trustee is excused for not having met expectations, because the trustor attributes the behaviour to negative external circumstances beyond one's control (Castelfranchi & Falcone, 1999). In these cases, the trust state generally will stay stable until further interaction and internal outcome attribution becomes possible. On the other hand, external conditions can also be extremely favourable for a trustee.

Iacona and Weisband (1997) and Jarvenpaa & Leidner (1998) found that higher trust states were established and kept within (virtual) teams that were continuously and frequently interacting during the whole project. They explain this by the re-evaluating (enfeeble or reinforce) cognitive models based on experiences during interaction.

As stated before, in virtual project teams all kind of information may be less available and less visible (Cramton, 2002), not only initial information on the identity of virtual team members, but also information related to their performance. Zolin et al. (2002) found that the first impression and cognitive model of perceived trustworthiness seem to be a more lasting one in virtual teams than in face-to-face teams. They explain this stability of perceived trustworthiness, perceived performance and trust by the lack of information available in a computer-mediated setting and the tendency to avoid searching disconfirming information (based on Good, 2002) after an initial cognitive of trustworthiness is created. Also Jarvenpaa and Leider (1999) found that virtual teams that develop trust in the initial stages of the project team are more likely to sustain high levels of trust. All these findings stress the importance of establishing an **initial** model of perceived trustworthiness for the formation of interpersonal trust, because the initial 'bias' can influence the perception of actual performance. But how can we help virtual teams with the formation of an initial model of perceived trustworthiness?

How to support the formation of perceived trustworthiness to foster initial interpersonal trust in a virtual team?

One way to support virtual team members with the formation of trustworthiness is to provide opportunities for accumulating personal knowledge and task-relevant background information (Hung, 2004, Kanawattanachai & Yoo, 2005). Jarvenpaa and Leidner (1999) found that high-performing virtual teams exchanged **background and personal information** and were **socializing more** with other members at the very beginning of their project. Zolin et al.(2003) found a relation between more **personal oriented communication and perceived trustworthiness**. They argued that social interaction is important for perceived trustworthiness, but didn't provide further explanations for this statement. Feng, Lazar & Preece (2004) and Hung (2004) are more specific towards the methods which might be used to spread this information about trustees. They claim that "*developing artifacts to help people to identify others who are **similar to themselves or who have similar experiences** may be helpful for promoting empathic attitudes that build interpersonal trust*"(p.20). They mention **story-telling**, in a free form as well as guided by a more formal template, a **role-playing game, team-building exercises and the facilitation of specific types of searches** as approaches to meet the information need of trustors.

Although all this research shows that personal information is important to develop interpersonal trust within virtual teams, it remains unclear what information specifically can help to foster interpersonal trust. In order to fill this gap, we developed a kernel theory on which prescriptive rules for the selection of information available in trust fostering artefacts can be based. Central in this kernel theory is the concept of trustworthiness. Perceived trustworthiness correlates positively with the interpersonal trust state of the trustor (Zolin, et al., 2002 & 2003). Thus, one of the promising strategies to speed up a trust decision and grow 'thicker' and less fragile trust, is to speed up the *initial* formation of a model of trustworthiness by supplying a minimal effective set of information

on trust warranting properties. But how can we select this minimal effective set? One approach is to look at existing theory on trustworthiness antecedents. We have integrated behavioural science and design science paradigms (Hevner, March, & Park, 2004) by combining insights about human 'trust' behaviour with the knowledge of a specific problem domain, in this case the functioning of virtual project teams. In this paragraph we introduce a detailed model of the antecedents of trustworthiness, derived from theory, which can be used to ground design decisions for information availability on virtual team members in.

A model for the schema of trustworthiness

What exactly are the antecedents of trustworthiness, on which a cognitive model for perceived trustworthiness in a specific situation can be based? In order to answer this question empirical research is needed, but we first review the literature on the antecedents and signals of trustworthiness. Mayer et. al.(1995), Butler & Cantrell (1984) and Butler (1991) distinguished three types of antecedents of trustworthiness: benevolence, ability and integrity. In Mayer et. al. (1995) ability is defined as "… *that group of skills, competencies, and characteristics that enable a party to have influence within some specific domain*" (p.717), benevolence is defined as "*the perception of a positive orientation of the trustee towards the trustor*" (p.719) and integrity is defined as "*the trustor's perception that the trustee adheres to a set of principles that the trustor finds acceptable*"(p. 719)

Although this division helps to determine important factors for determining trustworthiness, it didn't include some antecedents which were mentioned earlier and more recently in literature. Examples of such factors are 'openness' (Mishra, 1996) and 'communality' (Berscheid & Walster, 1978). Mayer et.al. (1995) took some decisions in order to construct their model and reduce complexity. Their reasoning was based on analytic arguments, not on empirical research. They grouped factors, which might have been considered also as separate factors, under their three main

factors of ability, benevolence and integrity. McKnight et.al. (2002) also reviewed antecedents for trustworthiness and trust in e-commerce settings by counting the occurrences of antecedents in the reviewed articles. They concluded that ability, integrity and benevolence can be considered as the main antecedents (McKnight, Choudhury, & Kacmar, 2002). However, the frequencies of these antecedents could be the result of the number of citations of the Mayer et.al.(1995) article which may have excluded other antecedents of trustworthiness from consideration We argue that a more detailed model of the antecedents of trustworthiness is necessary if we want to ground decisions for information provision in it. In a recent article Schoorman, Mayer & Davis (2007) themselves also argue that an elaboration and reconsideration of the antecedents is needed. Castelfranchi & Falcone (2000) as well state that a more complex model for the estimation of trustworthiness and interpersonal trust is needed. What antecedents (and information providing evidence of these properties in a specific trustee) does a trustor consider while he/she forms a cognitive model of a trustee in a virtual team?

To identify antecedents we reviewed available empirical research on **measurement** of perceived trustworthiness. Researchers here define antecedents but, in most cases, also provide empirical evidence for their effects.

The results of the review are summarized in a schema of trustworthiness with five main categories and underlying antecedents (figure 2). The antecedents of trustworthiness are used in new trust requiring situations to elaborate on and form a cognitive model of trustworthiness of a person in this specific situation. Not all antecedents are equally important in all situations. Trust will often be based on an 'incomplete' cognitive model of perceived trustworthiness, depending on the other characteristics of the trust requiring situation (e.g. context, trust predisposition).

INSERT FIGURE 2 HERE

The five main categories and the underlying factors of the trustworthiness schema are:

communality		**Personal characteristics which the trustor has in common with the trustee (Abrams, 2003; Feng et al., 2004; Illes, 2006; Levin, Cross, Abrams, & Lesser, 2002). This can be any shared characteristic, like a similar goal they want to achieve, shared language use, common identity characteristics or shared values. Even trivial ones, like a shared hobby or the same type of pet they have, can contribute to this category.**
ability		**Capability of a trustee, determined by knowledge, skills and competences, which enables to perform tasks within some specific domain (Butler, 1991; Butler & Cantrell, 1984; Mayer et al.,1995). Includes the extent to which a person seems:**
	knowledge	to recall facts, concepts, principles and procedures within certain domains (Jarvenpaa et al., 1998; McKnight et al., 2002)
	competence	capable to act properly and with a good result while solving problems in a complex, real-life environment, using and integrating ones personal characteristics, knowledge and skills (Cook & Wall, 1980)
	skills	to have acquired a proficiency in the execution of operations to achieve a certain goal state (Butler, 1991; Cook & Wall, 1980)
benevolence		**The perceived level of courtesy and positive attitude a trustee displays towards the trustor (Mayer, et al., 1995). Includes the extent to which a person seems:**
	willingness to help	to give support in situations in which it is needed (Cook & Wall, 1980; Jeanquart-Barone, 1993; Rempel et al., 1985; Rozendaal, 1997; Zolin, 2002)
	availability	approachable and reachable for another person (Rozendaal, 1997)
	sharing	not to keeps (re) sources to him/herself and to give access to them to other

	people (Butler, 1991; Zolin, 2002; Rempel et al., 1985)
faith in intentions	to act in another person's interest and does not exploit this person when vulnerable (Rempel, et al. 1985; Johnson & Swap, 1982; Cummings & Bromiley, 1996; Rozendaal, 1997; Cook & Wall, 1980)
receptivity	interested in another person's ideas and feelings, listen to them and takes them into account while acting (Butler, 1991; Zolin, 2002; Johnson & Swap, 1982; Cook & Wall, 1980)
kindness	friendly and easy to get along with (Jeanquart-Barone, 1993; Johnson & Swap, 1982; Rozendaal, 1997)
openness	to reveal oneself, in terms of personality and thoughts, to another person (Butler, 1991)
caring	concern about other people interests (Sheppard & Sherman, 1998)
commitment	dedication and engagement towards something (Jarvenpaa et al., 1998; Kanawattanachai & Yoo, 2005; Zolin, Hinds, Fruchter, & Levitt, 2004)
internalized norms	**The intrinsic moral norms a trustee guards his actions with. These differ from benevolence in that they are directed towards others in general, rather than toward a specific trustor (Chopra, 2002). Includes the extent to which a person seems:**
integrity	sincere and cannot be corrupted (Johnson & Swap, 1982)
discretion	to keep sensitive information confidential (Butler, 1991)
honesty	not to mislead or lie to others (Cummings, Bromiley, Kramer, & Tyler, 1996)
fairness	to treat people equal (Butler, 1991; Johnson & Swap, 1982; Cummings & Bromiley, 1996)
loyalty	to respect a and to be true to another person (Butler, 1991; Johnson &

		Swap, 1982)
accountability		**The degree to which a person is liable and accountable for his/her acts and meets expectations of another person. Includes the extent to which a person seems:**
	reliability	to follow up on any appointments and commitments made and shows adequate judgment to act in encountered situations (Butler, 1991; Zolin, 2002; Rempel, et al., 1985; Johnson & Swap, 1982)
	consistency	to display consistent character traits and predictable behavior (Butler, 1991; Rempel, 1985)
	self-confidence	to belief (s)he is able to perform a task (Castelfranchi, 1991)
	persistence	stable in formed intentions to complete a task, independent of difficulties encountered (Castelfranchi & Falcone, 1999)
	responsibility	to accept part of the work load and uses his/her ability to accomplish a task (Zolin, 2002; Cummings & Bromiley, 1996; Cook & Wall, 1980)

The trustworthiness antecedents vary along a continuum and may be weighted differently during the trust formation process, dependent on the trust-requiring situation (Hung, 2004). In different trust-requiring circumstances, different antecedents of trustworthiness may be more important than others. For example, Butler & Cantrell (1984) report a result from Gabarro that for a superior the integrity, competence and consistency of a subordinate are the most important antecedents, whereas for a subordinate the integrity, loyalty (motives) and openness of the superior were most important (Butler & Cantrell, 1984).

Conclusion and further research

In this article we showed, based on an extensive interdisciplinary literature review, that problems in the formation of interpersonal trust in virtual project teams are partly due to problems with the formation of a cognitive model of trustworthiness. Virtual team members often have insufficient information on which they can base their assessment of trustworthiness. In the absence of signs and signals they fall back on inferred information (e.g. based on stereotypes or other categorical cognitive schemata), which may lead to erroneous and rather persistent judgments of trustworthiness and a more fragile form of interpersonal trust.

Previous research showed the role of signs and signals for the formation of a cognitive model of perceived trustworthiness in general (Bacharach & Gambetta, 1997; Donath, 2006; Riegelsberger, 2005), but did not look in more detail into the relation between the signals offered and the cognitive schema of trustworthiness in a working context. Most research aimed to measure the effect of the modality, not so much its significance, of signals on perceived trustworthiness and/or interpersonal trust. Although some media convey signals which are not available through other media, and thus the medium is indeed important, we propose to focus also on the content of the signals which are transferred through the medium. We expect that specific signals, which are grounded in the cognitive schema of trustworthiness and its antecedents, will accelerate the formation of a cognitive model of trustworthiness and thus also interpersonal trust in a specific trust requiring situation.

We proposed an updated model for the cognitive schema for trustworthiness. Project team members presumably use this schema as a reference model when assessing the trustworthiness of a particular trustee in a trust requiring situation. Based on this assessment they form a cognitive model of the trustworthiness of a trustee. This cognitive model is an elaboration, based on the cognitive schema for trustworthiness.

Elaborating on the idea of offering specific signals, related to the cognitive schema of trustworthiness, in the next phase of this research project we will use the model as a design framework. We will test what signals trustors mark as important when they perceive trustworthiness of trustees in different virtual project team settings and how these signals relate to the antecedents of trustworthiness. We will investigate which specific information (signals) about virtual project team members should be made available to facilitate the formation of a cognitive model of each others trustworthiness.

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Figure 1: the process of interpersonal trust formation

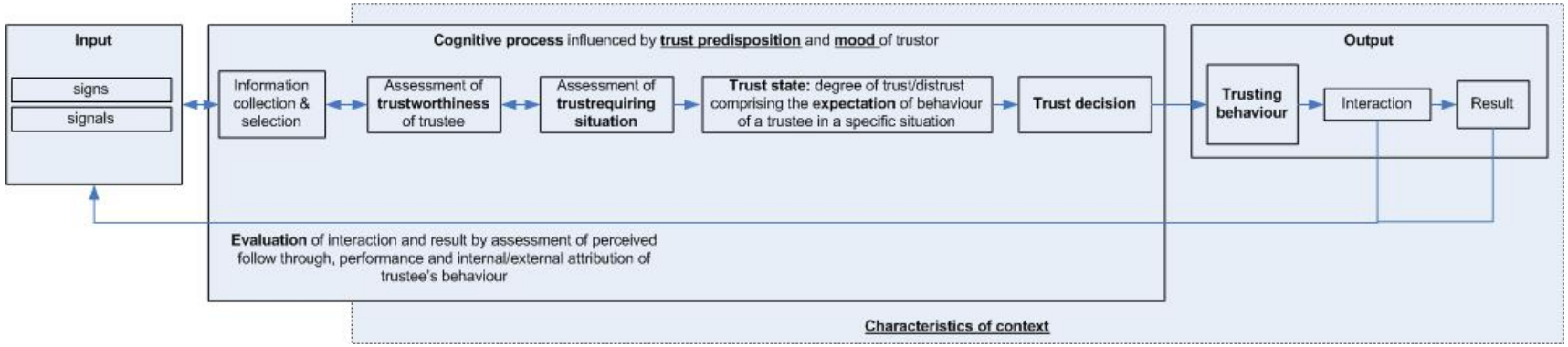

Figure 2: a model for the schema of trustworthiness