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## Trust and credibility in an online computer-supported collaborative learning (CSCL) task.

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**Abstract:** This study describes the development of credibility and trust among adult learners involved in an online computer-supported collaborative learning (CSCL) activity. Eleven groups of adult learners enrolled on a distance-learning MBA were observed for twenty weeks to better understand the relationship between credibility and trust, and the effects of various types of trust on groups' activities. The results a) indicate that credibility and competence trust are very close concepts, b) show that various types of trust operate during CSCL activity, and c) reveal that trust works on the composition, cohesion and production of collaborative groups. Implications for future research on trust and credibility in online computer-supported collaborative learning are discussed.

**Keywords:** Computer-supported collaborative learning, Transactive memory, Credibility, Trust.

### 1. Introduction

The aim of the present study is to analyze the relationship between one of the three dimensions of transactive memory system (*credibility*) and various types of trust (*system trust*, *competence trust*, *goodwill trust*, *characteristic-based trust*, *process-based trust*) during an online computer-supported collaborative learning (CSCL) task. The development of these various types of trust throughout this collaborative learning activity is also described, and its impact on group evolution and production is examined. Eleven groups of learners are observed (forty-five participants). Both qualitative and quantitative methods are used to capture the dynamics of the social interactions between group members.

### 1.1 *Transactive Memory Systems and Credibility*

Among the theoretical constructs that try to explain how groups or teams coordinate and use their knowledge or skills to solve complex problems, transactive memory theory is especially relevant. This notion was developed by Wegner (1986), to describe the ways in which dyads (such intimate couples) that are close to one another share knowledge or experiences, that allow them to anticipate, allocate and retrieve domain-specific knowledge in order to efficiently distribute information-processing responsibilities. Afterwards, the transactive memory framework has been extended to provide an explanation for the activities of larger work- or learning groups involved in a collaborative task, and particularly in online computer-supported collaborative tasks. According to transactive memory theory, group members divide the cognitive labor for their tasks, with members specializing in different areas, in such a way that collectively they possess all the information needed for their tasks. The distribution of group members' knowledge or memory is *transactive* in that members are able to retrieve the information stored in other group members' memories. This happens through communications (*transactions*) between the members (Lewis, 2003). By enabling the groups' members to efficiently identify and use relevant knowledge, the development of this collective metacognition allows individuals' cognitive limitations to be transcended, and transactive memory has been recognized as a strong determinant of performance in groups (Klimoski and Mohammed, 1994; Kozlowski and Ilgen, 2006; Mathieu, Goodwin, Heffner, Salas and Cannon-Bowers, 2000; Mohammed and Dumville, 2001; Peltokorpi, 2008).

Basically, the transactive memory theory relies on two assumptions. First, it maintains that the cognitive division of labor in groups has two components: a) an internal memory (what the groups' members know personally) and b) an external memory (what the individuals collectively know about the knowledge or skills of other members of their group). Therefore, every group's members have their own transactive memory, and as a function of their individual transactive memories, they build a collective transactive memory system (TMS). Secondly, the development of a TMS begins when members of a group learn something about the other group members' a) expertise (knowledge or competencies), b) abilities to efficiently work together on a task with greater collaboration and less misunderstanding, and about c) the degree to which group members trust each other's expertise on a given task. In fact, three manifestations of interpersonal awareness of others' knowledge are identified in a TMS: knowledge *specialization*, *coordination* of knowledge processing, and perceived *credibility* of member expertise (Moreland, 1999).

Moreover, compared to other theoretical constructs like shared mental models (Mathieu, Goodwin, Heffner, Salas and Cannon-Bowers, 2000), collective intelligence (Levy, 1994; 2006), or community of practice (Lave and Wenger, 1991; Wenger, 1998), transactive memory theory has the great advantage of having been confronted with empirical and systematic observations, especially

with groups of students who had previously worked with the same group members on a closely related task (Hollingshead, 2000, 2001; Mohammed and Dunville, 2001). These studies have widely established that a) TMS positively affects work- or learning collaborative group performance, and b) TMS is in turn affected by group activities. This positive feedback would allow TMS and group performance to develop jointly. Finally, almost all published transactive memory research has concurred that group member specialization is the most important dimension of TMS. Considered the true heart of this construct, specialization was more often the only component actually investigated. On the other hand, credibility component was less or not explored (Littlepage, Hollingshead, Dreak and Littlepage, 2008; Michinov and Michinov, 2006; Peltokorpi, 2008; Peltokorpi and Manka, 2008). Indeed, research on transactive memory has mainly focused on the socio-cognitive components of collaborative interactions (group knowledge stock, specialization of expertise, knowledge identification accuracy,...), neglecting the socio-emotional components potentially contained in these interactions.

This situation is more understandable when one considers many TMS studies a) have been conducted in laboratory settings, and b) have relied on either student samples or very small groups (dyads or triads), c) whose members are more often previously familiar. In addition, most of these studies have investigated the influence of TMS d) in a single task, e) taking place over a short time, f) relatively “inauthentic” (such as assembling electronic radio kits or memorizing verbal material), and g) without any real challenges for participants. In these conditions (groups and tasks characteristics), there was little chance that the credibility component of TMS had the opportunity to manifest itself, or even to grow. On the other hand, with bigger groups whose members are not intimate, involved in a series of online CSCL tasks with real consequences for participants, development and manifestations of the credibility component would be probably greater.

## ***1.2 Trust: types and production mechanisms***

In recent years, many studies have been conducted on the development and maintenance of trust in work or learning groups whose members are geographically distant and have to work together through Information and Communication Technology (ICT) systems (Wang and Emurian, 2005; Walther and Bunz, 2005; Young and Tseng, 2008). Trust is seen as a key factor of the performance of these groups (Kanawattanachai and Yoo, 2002; Panteli and Duncan, 2004). This concept, difficult to grasp, with a wide variety of semantics, could be consensually defined as "the expectation that an exchange partner will not engage in opportunistic behavior, even in the face of countervailing short-term incentives and uncertainty about long-term benefits" (Chiles and McMackin, 1996). It would probably be in situations of high interdependence and uncertainty as to the outcome of the task (characteristics almost inherent to work- or learning collaborative situations) that trust is most needed for the activity's achievement.

Several types of trust exist; the most common distinction is differentiating individual or interpersonal aspects of trust from organizational and institutional aspects. For example, in line with the work of Luhmann (1979), Giddens (1990), differentiates two type of trust: *trust system* (confidence on the system as a whole, transcending the personal experience or relationships between individuals) and *personal trust* (trust placed in individuals, to facilitate cooperation and better coordination of interactions). Sako (1991) refines this typology by distinguishing two types of personal trust: *competence trust* and *goodwill trust*. The first one is based on the belief that an individual has the required capacity (especially in terms of training or experience, which means in terms of knowledge and skills). The second is the belief that this individual will respect these commitments without any opportunism.

Table 1. Definitions of trust and its components from Giddens (1990) and Sako (1991).

Components	Basis	Indicators
System trust	Given to a system as a whole	Reputation of an institution, an organization, standards, benchmark,...
Personal trust	Given to a person	
Competence trust	Given to someone because of the belief in his knowledge or skills required for a task	Declared and actualized curriculum,...
Goodwill trust	Given to someone because of the belief that he will respect his commitments	Behaviors during interactions, respect of the commitments, reputation,...

Another typology has been proposed by Zucker (1986), and is based on different mechanisms for producing trust. Three forms of trust are distinguished: *characteristic-based trust*, *process-based trust* and *institutional-based trust*. The first one is related to personal characteristics of individuals, which are exogenous to the relationship of the actors. In contrast, the second one is linked with the relationship itself, and comes from the knowledge that group members develop on each other through repeated actions (past loyalty,...) or information coming from a third party about their reliability (reputation,...). These two forms of trust are primarily interpersonal. The institutional-based trust is a much more systemic, and can exist without previous interactions between individuals, and even without knowing each other. This kind of trust characterizes the trust that people place in formal or recognized institutions, such as legal or educational systems.

Table 2. Definitions of trust and its components from Zucker (1986).

Components	Basis	Indicators
Institutional-based trust	Given according to the characteristics of the social structure where the interactions take place.	Rules, code of ethics, professional standards,...
Personal trust	Given according to the personal characteristics	
Characteristic-based trust	Given according to the intrinsic characteristics of the person	Social, cultural, demographic characteristics,...
Process-based trust	Given according to the past or expected behavior, to the reputation,...	Knowledge or skills revealed in the task, respect of commitments,...

Taken together, studies on the TMS effects take little into account the impact of credibility component on the development and performance of online work- or learning collaborative groups. Moreover, if the proximity of the concepts of credibility and trust exists, the transactive memory theory seems to limit the definition of credibility to a very small part of trust: competence trust, which can be defined as a subjective assessment of the match between the knowledge and skills claimed by group's members and the perception of their actualization in the task. Finally, as emphasized Michinov and Michinov (2009), there are few studies about online computer-supported collaborative learning (CSCL) task, and the little existing research has been conducted in laboratory settings, over a short time and with very small groups, often composed of previously intimate dyads. However, we assume that in "authentic" collaborative learning task over a long period, with groups of more than three members not previously familiar, other aspects of trust could occur and influence the development and the production of the group. Therefore, the aim of this research is a) to identify the tracks of trust or credibility process in the course of CSCL activities, 2) to observe the time of occurrence of these traces, and 3) to observe their potential effects on the groups.

## 2. Method

### 2.1 Participants

The participants were fourth-year MBA students ( $M=41.08$  years,  $SD=8.20$ , range 24-58 years) enrolled on an online French University's "Educational Sciences" course. The sample consisted of forty-five participants (9 males; 36 females) that were geographically dispersed throughout several areas of France (and 2 overseas). All of them had a good previous experience of online learning practices, but it was their first experience of collaborative learning.

## ***2.2 Design of online activities and equipment***

The learning program of the MBA was designed for computer-supported online learning, with a majority of modules designed mainly for individual distance learning, with content developed with a predominantly transmissive pedagogical aim (for more information, see Godinet, 2003, 2005). However, some modules are designed to enable the implementation of an online collaborative learning activity. These include modules about quantitative and qualitative research methodologies. This type of teaching was possible and desirable because these materials allow students to face innovative problems, whose resolution necessarily requires various knowledge and skills. Students' participation in this "authentic" CSCL situation was part of their course, and was therefore a mandatory training. The work, timing, objectives guidelines, methods and criteria for the learning situation's assessment, tools (documentation, forum, email, chat) and actors (tutors of the activity) were presented to all participants three weeks before the beginning of the CSCL activity, in a face to face meeting, during the first week of the new university year. None of these elements were negotiable.

The forty-five students involved in this learning program were randomly divided into eleven groups, composed of four to five members. A tutor and a theme (eg, "The health representations of health educators" or "Informal learning in the workplace") were assigned to each learning group. The module was delivered over twenty weeks and sequentially subdivided into two periods: a) individual production and, b) collective production. During the *individual production* period (weeks 1 to 10), participants had 1) to read the course content and documents associated with the group's theme, 2) to find documentation on this theme, and 3) to write an individual paper which summarized the information found on the theme, propose a research question (and possibly hypotheses), and a research protocol. The members of each group were strongly encouraged to share their views, exchange documents, papers, or even points of view. For each group, two chats regulated by the group's tutor were organized during this individual period. During the collective period (weeks 11 to 20), participants had to collect and share all their individual productions to consensually develop a summary document. Two more chats regulated by the tutor were then organized. The evaluation of this module was done from the collective and individual productions of the students but also taking into account their level of participation. This evaluation was the only one scheduled for this module.

## ***2.3 Research design and data collection***

All the messages posted on the forum and all the conversations of the chats were saved and collected over the 20-week online CSCL activity period. Quantitative and qualitative analyses were applied to these data. The quantitative analysis consisted in examining the total number of messages posted in the forum, and the

number of messages posted by students. The qualitative analysis examined messages' content, and focused on the learners' references to credibility and trust (system trust, characteristic-based trust, process-based trust / competence trust, goodwill trust). Three different periods of the activity were especially distinguished: the beginning (weeks 1-2), the midpoint (weeks 10-11) and the end (weeks 19-20). These were supposed not to produce the same expressions of credibility and trust. Inter-judge agreement was required, and unclear contributions were unclassified.

### 3. Results

#### 3.1 Quantitative analysis

15.6% (n = 7) of students were not able to provide the work required for the individual production period. Accordingly, two CSCL groups were eliminated at the end of this first phase, and the membership or size of two other groups was modified. Of the remaining thirty-eight students, only one did not participate in the collective production period.

The results of the quantitative analysis reveal that learners posted 2683 messages in the forums, with a wide disparity between groups' contributions (M=272.6 messages per group, SD=130.6, range 119-480 messages). In the same way, the analysis of the number of messages for each participant shows significant differences between learners: one of them never actually participated in the activity and for the others a great variability also exists (M=59.6 messages per learner, SD=48.6, range 0-205). The statistical analyses (ANOVA) reveal no effect on sense of belonging or the work topic on the number of messages posted in the forums. Furthermore, learners contributed throughout the CSCL activities.

#### 3.2 Data illustration

We give below some illustrations representing each type of credibility or expression of trust, for each of the three observation periods. At the beginning of the CSCL activity (weeks 1-2), trust is primarily sought, either by providing personal or professional information (*characteristic-based trust*), or by expressing a pleasure to be here or by showing goodwill (*goodwill trust*):

Extract 1: F. (female), forum, week 1

"In the meantime, I'll introduce myself. I am a former nurse and I still work in a hospital".



Extract 2: M. (female), forum, week 1

"Well, I'm just getting to know the group and I'm happy with our work topic, I have no particular expertise, but I am ready for the adventure (...)"

Furthermore, in the first two weeks, a reminder of the rules and work guidelines is very often asked for by other group members or tutors (*system trust* or *institutional-based trust*).

Extract 3: Ni. (female), forum, week 1

"Hello everyone, I see I am in your group. Could anyone shed some light on instructions for me?"

In fact, before starting the activity, it seems necessary that an agreement with the behavior and production standards is explicitly expressed by the members, and implicitly endorsed by the tutors, witnesses of these interactions. At midpoint of the activity (weeks 10-11), solicitations of *institutional-based trust* are still present (demands about rules, evaluation criteria, deadlines, ..). However, these are manifestations of *credibility*, *competence trust* or *goodwill trust* (granted or removed) which are mostly observable.

Extract 4: A., C. (females), tutored chat, week 10

Tutor: "Everybody's here?"

C.: "Z. didn't work at all, and Ch. gave up."

A.: "The boys didn't do anything."

C.: "In my opinion, the boys will not succeed at all."

Finally, during the last two weeks (weeks 19-20), if reminders of the production requirements and reassurance as to the fairness of the evaluations are still required (*institutional-based trust*), it is primarily the balance of competences observed or commitments regarding outstanding activities that are expressed (*credibility*, *competence trust* or *goodwill trust*).

Extract 5: M-O. (female), forum, week 19

"The group was boosted by V. and P., two super-pros of methodology. They motivate, encourage and manage things; it's ideal ... a big thank you to them because I saw the best during this phase of work ..."

Thus, the observations indicate that if all the manifestations of credibility or trust are not focused on the task and do not appear to directly contribute to the growth of production quality, most of them seem to indirectly affect it by influencing the sense of belonging, group coordination and even its composition.

#### 4. Discussion

The main purpose of this study was to analyze the relationship between the credibility component of TMS and various types of trust during an online CSCL task. For that, the online interactions of eleven groups of adult learners (messages, forums, chats) were observed for twenty weeks. First, quantitative analysis confirmed the existence of a large disparity in collaborative practices and use of communication tools, both between groups and within groups. For all adult learners, online CSCL activity does not seem to be obvious. Secondly, as originally assumed, the results indicate that credibility and competence trust are very close concepts, hardly distinguishable in the content of interactions. Thirdly, the manifestations of trust or credibility operate throughout the online activity, even if the types of trust and their expressions (display, solicitation, observation, assessment) fluctuate depending on the activity periods. In addition, even if all of them are not directly linked to the task, they all contribute to the quality of the final result. Then, the restrictive definition of credibility proposed by the TMS framework does not seem to sufficiently take into account the great diversity of types and expressions of trust developed in an online CSCL activity. This conceptual restriction could explain the relatively limited importance given to this component in the description of TMS. It also could explain the lack of linear development of trust commonly observed in empirical studies. Indeed, the existence of various manifestations of trust should require the elaboration of research protocols that could be able to consider the multidimensional and nonlinear development of this phenomenon (in the diversity of types and modes of expression).

#### References

- Chiles, T.H. and McMackin, J.F.: Integrating variable risk preferences, trust, and transaction cost economics. *The Academy of Management Review*, 21(1), 73-99 (1996).
- Giddens, A.: *Consequences of modernity*, Polity Press, Cambridge (1990).
- Godinet, H.: Virtual and distant actors on a digital campus. *Proceedings of the 7<sup>th</sup> IFIP World Conference on Computer in Education "ICT and the teacher of the future"*, Kluwer, Boston, London (2003).
- Godinet, H.: Scenario for Collaborative Learning in a digital campus : what works ? *Proceedings of the 8<sup>th</sup> IFIP World Conference on Computer in Education "40 Years of Computers in Education: What Works?"*, Academic Publisher (2005).
- Hollingshead, A.B.: Perceptions of expertise and transactive memory in work relationships. *Group Processes and Intergroup Relations*, 3, 257-267 (2000).
- Hollingshead, A.B.: Cognitive interdependence and convergent expectations in transactive memory. *Journal of Personality and Social Psychology*, 81, 1080-1089 (2001).
- Kanawattanachai, P. and Yoo, Y.: Dynamic nature of trust in virtual teams. *Journal of Strategic Information Systems*, 11, 187-213 (2002).
- Klimoski, R. and Mohammed, S.: Team mental model: Construct or metaphor ? *Journal of Management*, 20, 403-437 (1994).

- Kozlowski, S.W.J. and Ilgen, D.R.: Enhancing the effectiveness of work groups and teams. *Psychological Science in the Public Interest*, 7, 77-124 (2006).
- Lave, J. and Wenger, E.: *Situated Learning: Legitimate Peripheral Participation*, Cambridge University Press, Cambridge (1991).
- Levy P.: *L'intelligence collective. Pour une anthropologie du cyberspace*, La Découverte, Paris (1994).
- Levy P.: La valeur ajoutée de l'intelligence collective. In Cycle de Conférences ENS Lyon. mai 2006. Site de référence <http://www.ieml.org/> . Accessed 13 Jan 2009.
- Lewis, K.: Measuring transactive memory systems in the field: Scale development and validation. *Journal of Applied Psychology*, 88(4), 587-604 (2003).
- Littlepage, G.E., Hollingshead, A.B, Dreak, L.R. and Littlepage, A.M.: Transactive memory and performance in work groups : Specificity, communication, ability differences, and work allocation. *Group Dynamics : Theory, Research, and Practice*, 12(3), 223-241 (2008).
- Luhmann, N.: *Trust and Power*, Wiley, Chichester (1979).
- Mathieu, J. Goodwin, G. Hefner, T. Salas, E., and Cannon-Bowers, J.: The influence of shared mental models on team process and performance. *Journal of Applied Psychology*, 85(2), 273-283 (2000).
- Michinov, N. and Michinov, E.: La mémoire transactive dans les groupes d'apprenants. Le rôle de la spécialisation sur l'amélioration des performances. Communication orale présentée au 6ème Congrès International de Psychologie Sociale en Langue Française – GRENOBLE, du 30 août au 2 septembre 2006.
- Michinov, N. and Michinov, E.: Investigating the relationship between transactive memory and performance in collaborative learning. *Learning and Instruction*, 19, 43-54 (2009).
- Mohammed, S. and Dumville, B.C.: Team mental models in a team knowledge framework: Expanding theory and measurement across disciplinary boundaries. *Journal of Organizational Behavior*, 22, 89-106 (2001).
- Moreland, R.L.: Transactive memory learning who knows what in work groups and organizations. In L. Thompson, D. Messick, and J. Levine (Eds.), *Sharing knowledge in organizations: The management of knowledge*, p. 3-31, Erlbaum, Hillsdale (NJ) (1999).
- Panteli, N. and Duncan, E.: Trust and temporary virtual teams: Alternative explanations and dramaturgical relationships. *Information Technology and People*, 17(4), 423-441 (2004).
- Peltokorpi, V.: Transactive Memory Systems. *Review of General Psychology*, 12(4), 378-394 (2008).
- Peltokorpi, V. and Manka, M.-L.: Antecedents and the performance outcome of transactive memory in daycare work groups. *European Psychologist*, 13(2), 103-113 (2008).
- Sako, M.: The role of trust in japanese buyer-supplier relationships, *Ricerche Economica*, 155(2-3), 375-399 (1991).
- Walther, J. B. and Bunz, U.: The rules in virtual groups: Trust, liking, and performance in computer-mediated communication. *Journal of Communication*, 55(4), 828-846 (2005).
- Wang, Y and Emurian, H.: An Overview of Online Trust. *Computers in Human Behavior*, 21(1), 105-125 (2005).
- Wegner, D.M.: Transactive memory: A contemporary analysis of the group mind. In B. Mullen and G.R. Goethals (Eds.), *Theories of group behavior*, p. 185-205, Springer-Verlag, New York (1986).
- Wenger, E.: *Communities of practice: learning, meaning and identity*, Cambridge University Press, New York (1998).
- Young, M.L. and Tseng, F.C.: Interplay between Physical and Virtual Settings for Online Interpersonal Trust Formation in Knowledge-Sharing Practice. *CyberPsychology and Behavior*, 11(1), 55-64 (2008).
- Zucker, L.: Production of trust : Institutional sources of economic structure : 1840-1920. In B. Staw and L. Cummings (Eds.) *Research in organizational behavior*, vol. 8, p. 53-111, JAI Press, Greenwich (CT) (1986).