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Trust in Electronic Commerce - a Language/Action Perspective

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Abstract

It is generally recognized that "trust" is an essential feature in business and even more critically so in electronic commerce. In this paper we first put "trust" (and related terms like deception and fraud) in context using a language/action perspective of (electronic) commerce. We use the theory of Habermas to distinguish between communicative action and strategic action. In the second part of the paper, we describe various ways in which fraud prevention and trust building can be implemented by means of a mediating and monitoring broker. The central claim of the paper is that security is not an add-on but part-and-parcel of "good" communication.

1 Introduction

From the start of the Internet, in the begin of the seventies, scientists have used this medium to sustain research communities. Only in recent years, since commercial clients have been allowed, this network, also called the Internet, has become available to the big public. Whereas in the beginning, the network was used by the research community (universities, institutions, etc.) that did mainly consist of a small group of people, these days the burgeois of Cyberspace reside anonymously in different (types of) communities at the same time (Spar and Bussgang, 1996). For instance a burgeois of Cyberspace can at one moment order something at an electronic bookstore, and thereafter get some information about ORB's at the OMG-website.

Trust plays an important role in everyday social interaction between subjects, and more particularly electronic commerce transactions. For instance, if a customer orders a book at a bookstore on the WWW, the supplier will, in case of any mistrust, hesitate whether he shall actually send the book to the customer. Conversely, the customer may be reluctant to send credit card information over the Internet. A situation may occur in which no commercial transactions get a chance. And even when transactions do get a chance, the transaction costs may rise because of the extra security measures that have to be taken (Williamson, 1985).

In this paper, we propose a broker architecture that enhances trustworthy transactions. We take the Language/Action perspective as our paradigm. The Language/Action-perspective focuses on the actions people perform while communicating. The foundation of this perspective is laid by Austin (Austin, 1962) and Searle (Searle, 1969), who claim that actions are performed on the basis of *speech acts*, e.g. language acts that form the most elementary unit of communication between subjects.

The remainder of this paper is organized as follows. In section 2 we present the basic concepts of communicative action in order to build up a conceptual framework in which "trust"

can be defined. Thereafter, we show the consequences of this framework for the security of electronic commerce communication. In section 4 we apply the conceptual framework by describing a broker architecture for trustworthy electronic commerce transactions and finish with a conclusion.

2 Putting trust in context

The concept of trust has been studied in a variety of situations and scientific disciplines. (Kini and Choobineh, 1998) provide a broad overview of the notion of "trust" in which they distinguish three perspectives: (1) the approach of Personality Theorists - that focuses on the tendency to trust of an individual, (2) the approach of sociologists - that focuses on societal trust, trust that people have in social institutions, and (3) the approach of social psychologists - that focuses on the role of trust in relationships. To these perspectives, we could add an economic approach that analyzes the dynamics of trust using game-theory (Nootboom, 1996) or transaction cost economics (Williamson, 1985). In this paper, we want to take a communicative, or Language/Action approach, since communicative acts, be it in the form of documents or EDI messages, or otherwise, are at the core of Electronic Commerce transactions.

Models that are based on the L/A-perspective focus on the communicational structure of a transaction, viewed as a communicative action. A communicative action can be defined as 'an interaction between subjects that engage in a social relationship' (Habermas, 1984). We will develop the perspective by further elaborating on some of the core concepts associated with communicative actions: sign, world, community.

2.1 Signs and deception

A communicative action is defined as an interaction between subjects, where this interaction is linguistic: people perform illocutionary acts, with a certain effect in the social world, by means of utterance acts, that is, using signs and combinations of signs. For example, by uttering the word "John" (utterance act) a Speaker can refer (illocutionary act) to a John. The relationship between the utterance act and illocutionary act is not a causal one but is based on social conventions. As such, it is always possible to misuse it: to shout "fox!" when there is no fox around. It is exactly by means of signs that subjects can deceive. Umberto Eco expresses the same in his slogan: "In principle, semiotics is the discipline studying whatever can be used for lying". Note, however, that the possibility to misuse the sign is parasitic on the normal use of the convention. As such, deception does not challenge the Gricean principles ("be relevant", "be cooperative", etc) but actually reinforces them. If subjects would not be cooperative most of the time, and use the sign according to the convention, the status of the convention would pass away and there would be no chance for deception either.

Some may question the close connection between signs and deception by arguing that one can also deceive another agent by just leaving the other in his ignorance or false beliefs. However, in general one would not speak about deception in such a case. For example, although I do not inform the people in China daily about my work progress, and hence leave them ignorant, it is hard to call this a case of deception. The issue here is one of relevance. When another agent yells in the dark: "Is anybody there?" and I keep silent, the silence is indeed a form of deception, because as a communicative agent, I am expected to make myself known, and I know the other party will interpret silence as a sign of no one being there. So although the meaning of signs should always be considered in context (see also below), we maintain that it is not possible to arrive at a meaningful notion of "deception" if it does not involve communicative action.

2.2 World

The L/A-perspective assumes that the actions that are performed by the subjects, take place in a world or context. This context is both presumed by the communicative actions and created by it.

In (Winograd and Flores, 1986), Winograd and Flores state that

‘[K]nowledge and understanding ... arise from the individual’s committed participation in mutually oriented patterns of behavior that are embedded in a socially shared background of concerns, actions, and beliefs. ... Through language ... we create and give meaning to the world we live in and share with others’.

In other words, Winograd and Flores claim that we ourselves build up the (conception of) world we live in by means of language.

Habermas introduces a more refined definition of a world; he states that through the ‘communicative practice, they (the subjects) assure themselves at the same time of their common life-relations, of an intersubjective shared lifeworld’.

As we have said above, the successful use of signs is dependent on the existence of social conventions. These conventions do not exist out there in an objective way: they must be supported by a community of subjects. However, these communication conventions are not the only part of the lifeworld; this world includes also the shared concepts, beliefs, norms etc that are needed for the right interpretation of the speech acts. It must be clear that communication cannot be understood solely by studying the signs/messages in isolation, but should always be considered in context. Linguists have expressed this by saying that a message is more a kind of Δ that should be combined with the shared context to derive the intended meaning (Clark, 1996)(Dik, 1989).

Thinking a bit further, it becomes clear that subjects do not live in one ‘world’, but in many worlds at the same time. We defined a world or domain as a ‘world that is made up by the language actions we perform and defines the scope of the commitments and the obligations that are made’ (van den Heuvel and Weigand, 1997). For example, norms differ from the organization I work in and the home I share with others; consequently, the speech acts that I perform only make sense within the boundaries of the particular domain, e.g. the organization. These world can be ‘natural’ worlds, like countries and families or ‘artificial worlds’, like the world that we create when playing a game, setting up an organization or making a transaction on the Internet.

According to Habermas (Habermas, 1984) rationalization (as a historical process) encompasses differentiation of the ”world” in three aspects: the subject world, the object world and the intersubject world. The subject world is the world of the beliefs, concerns and wishes of one individual subject. The intersubject or social world supports the interaction between multiple subjects and contains norms, obligations and social knowledge. The object world is the world of objects and cause-event relations. For one thing, this differentiation reminds us that communication should not be reduced to one single dimension: for example, a logical reduction to truth conditions, or a psychological reduction to ”intentions”.

2.3 Community

Communities are recognized as an important ingredient in developing lasting and fertile (electronic) commercial relationships. A community can be defined as (Webster Dictionary):

- people living in the same district, city, etc. under the same laws;
- the district, city etc. where they live;
- a group of people living together and having interests, work, in common: as a college community.
- society, public;

- ownership or participation in common;
- similarity; likeness: as, a community of spirit.

So, a community is characterized by a common background, or community of spirit, the same laws, interests and living areas. In L/A terms, it is identical to the subjects sharing a life-world. Because of the fact that the domains we are talking about in EC are artificial domains, we cannot identify physical borders of a community (or domain), like a country border. Sometimes other means can be taken to demarcate the community, such as a domain administrator (see section 3).

Besides physical communities, towards which the Webster Dictionary is oriented, we can discern artificial communities, for instance electronic communities in something that is called Cyberspace. In (Armstrong and Hagel, 1996), Armstrong and Hagel identify four kinds of electronic communities that meet consumer needs:

1. Communities of transaction
These communities support the actual negotiation between buyers and sellers, and offer related services like information about the product. An example of such a community is an electronic bookstore.
2. Communities of interest
These communities bring together subjects with the same interests. An example is the Object Management Group.
3. Communities of fantasy
An example of such an environment is the MUD-environment, where participants can pretend they are a certain hero, and build whole virtual, fantasy settings and story lines.
4. Communities of relationships
These communities contain people that not only have tight relationships with each other. Mostly, these relationships are based on a shared background, for instance the members all had the same disease. An example of such a site is the Anonymous Alcoholics Site.

Communities are developed and supported by communication, but this kind of communication is quite different from business transactions. The latter are by definition oriented at some action, the delivery of a product or a payment etc. Communication to support community building is not oriented at some particular action, but at sharing beliefs, values and norms. In this way, the stock of shared knowledge can grow and a basis is laid for communicative action as defined in the next subsection.

2.4 Communicative and Strategic Action

In this section, we investigate a taxonomy that has been developed by Habermas in his theory of communicative action (Habermas, 1984).

Communicative action is defined by Habermas as "action toward understanding (*Verständigung*) as a way of coordinating the actions of the participants". Coordination is achieved because the participants agree on certain beliefs and norms. Because of this agreement, a request for action (for example) is effective when it is validated by the shared knowledge. Or, to put it informally, the hearer accepts the request because he agrees with the speaker that this is the right thing to do.

The result of a communicative action is dependent on the acceptance or rejection of a validity claim. Habermas presents three different kinds of validity claims: truth, justice and sincerity. These claims refer to subsequently the objective, social and intersubjective world as we have seen these in section 2.2. The claim of truth refers to facts in the object world. The claim of justice regards the adequacy of interpersonal relations, and the claim of

sincerity entails the intentions of the speaker. These claims can be challenged; the agreement is the theoretical endpoint of the discussions that can arise when a party raises a claim.

Besides communicative action, Habermas distinguishes strategic action. Communicative action is oriented towards mutual agreement, whereas strategic action is aimed at attaining individual goals. When acting strategically, parties interact because they think this serves their own interests. So a hearer accepts a certain request because he thinks this will help him in achieving some goal of his own (this can be a selfish but also an altruistic goal). According to Habermas, communicative action and strategic action cannot be reduced to one another. Moreover, he claims that it is not strategic action but communicative action that achieves coordination in our lifeworld.

That opportunistic action, as presupposed in neoclassical economics, can lead to inefficient or even absurd results is nicely illustrated in a famous story told by the Nobel prize winner Amartya Sen. Two strangers meet. "Where is the railway station?" he asks me. "There", I say, pointing at the post office, "and would you please post this letter for me on the way?". "Yes", he says, determined to open the envelope and check whether it contains something valuable.

If we look deeper in the taxonomy (fig. 1), we see that Habermas makes a difference between two types of strategic actions: concealed strategic action and open strategic action. Habermas speaks of open strategic action whenever the strategic character of the interaction between the speaker and hearer is clear. In the case of concealed strategic action, the speaker makes the hearer believe that all the presumptions for communicative action are satisfied. If the speaker is deceiving himself, Habermas speaks of unconscious deception. Otherwise, the speaker is willingly oriented towards his own success, and tries to manipulate the hearer.

Instead of opposing strategic action and communicative action, we propose to view them as two different *levels* of social behaviour. Strategic action refers then to the economic level at which agents are viewed as individuals maximizing some utility function, or, put differently, as pursuing certain goals, selfish or not. They pursue these goals by finding subgoals and means that contribute to the satisfaction of the goals. In commerce, these goals are typically related to profits of the company. Communicative action resides at the social level at which subjects interact by means of language (section 2.1). In the same way as communicative (illocutionary) acts are performed by means of utterance acts (signs), strategic goals are pursued by means of communicative acts. Deception occurs when the strategic goal expressed is not the real one. Assuming that goals are part of the subject world of the communicative agent, deception is a case where the sincerity conditions are not met. On the other hand, open strategic action occurs when the strategic goal is explicit. In that case, there is no deception and no insincerity.

It may be objected that our proposal does not do justice to Habermas' extensive argument that coordination by means of strategic action is fundamentally different from coordination by means of communicative action. However, we still follow Habermas in the claim that communicative action cannot be reduced to strategic action and, more precisely, that the coordination is effectuated by *Verständigung* rather than by the two actors strategic behaviour. Although the *need* for coordination may arise from the individual goals (but not necessarily so), the coordination itself is achieved by communicative acts that have a different orientation.

Habermas also makes a theoretical argument that ontologically speaking, strategic action is grounded in communicative action. The thrust of his work is not that system worlds focused on strategic action (such as "the market") should be abolished, but that these system worlds should not colonize the lifeworlds. We interpret this in the present context that electronic commerce should not be approached from a strategic action point of view only, but its concrete applications should support ways of achieving mutual understanding (Weigand and Dignum, 1997). These channels may be used as back-up facility only when the system breaks down, but can also serve to support trust-building in the long run. An example is the possibility of discussing and agreeing on certain rules of conduct. We will

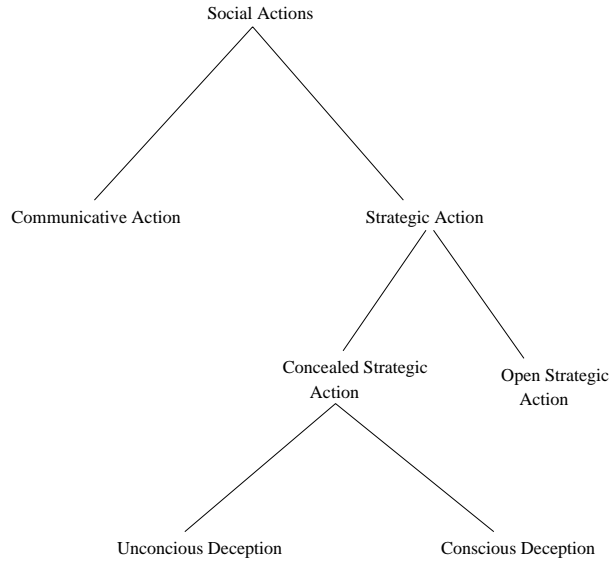


Figure 1: Taxonomy of Social Action

come back on some concrete examples in section 4.2. Interestingly, it seems to be the case in current (paper-based) international trade that most arrangements are made informally by telephone and fax, and the papers only follow afterwards. If this is true, we should be careful when replacing the paper-based procedure by electronic means not to ignore this informal part.

2.5 Trust, fraud and deception

In this subsection, we will take a closer look at the relation between trust, fraud and deception, in order to come to a language/action-based definition of trust.

We say that an action is fraudulent whenever a subject tries to deceive another (group of) subject(s) in order to gain an wrongful profit out of it, be witty at somebody else. Hence, the major element of fraud is deception. In practice, deception often occurs by manipulating documents in such a way that somebody believes (s)he has to do something (Bons, 1997).

Deception and fraud involve communication. Parties can cause various kinds of harm, but deception can only be achieved by means of signs. Hence prevention of deception and fraud is closely related with control measures at the level of communication

Trust has been defined as ‘a particular level of the subjective probability with which an agent assesses that another agent or group of agents will perform a particular action, both before he can monitor such action (independently of his capacity ever to be able to monitor it) and in a context in which it affects his own action” (Gambetta, 1985). Kini and Choobineh have defined the concept of trust in the context of Electronic Commerce systems as ‘an individual belief in the competence, dependability, and security of the system under conditions of risk’ (Kini and Choobineh, 1998). In terms of risk analysis, the *hazard* is the existence of mala fide parties, the *peril* is the occurrence of the deception and the *exposure* are the objects or funds being lost to such parties. All three components can be taken as a basis for prevention. The hazard can be reduced by dealing with trusted parties only (which of course prompts the question how trust can be enabled); the peril can be reduced by preventing deception (e.g. by using secure communication means), and the exposure can be reduced by e.g. insurances, outsourcing, but also by the back-up availability of legal court. This analysis also gives an indication of the relationship between trust and deception.

We have two additional remarks on the above definitions of trust. The first is that they describe trust as a cognitive disposition without taking into account where the trust

is built on. In the context of Electronic Commerce, the existence of trust or distrust is less interesting than the question how trust is enabled. This is what we would call the objective dimension of trust.

The second remark is that the definitions ignore the social dimension. Trust is *also* a relationship. People put trust in the other party, or in the agent that they hire, and in the case of nonconformance, the trust is violated, and the relationship is jeopardized. This is what we would call the social dimension of trust. An example in Electronic Commerce relating to this dimension of trust is the value of brand names, but also the whole issue of virtual organizations (see below).

We would like to summarize this discussion in a definition of trust from an L/A perspective. Let us first define a communicative agent as an agent *that takes responsibility for the communicative actions he is engaged in*. As a Speaker, he takes responsibility for what he says in terms of truth, sincerity and justice. This includes that he keeps up his promises. As an Addressee, he takes responsibility for what he hears. This includes confidentiality and an interpretation of the contents of the message in accordance with the shared beliefs and values. We can now define trust to be *(the level of) grounded expectation that the other agent is acting communicatively*. Note that this relationship may be symmetrical, but not necessarily so.

This definition recaptures several important elements from the definitions given above in an integrated form. For instance, it takes over the social dimension (because of its link to communicative actions between agents), the objective dimension (by the word "grounded") and the subjective dimension ("expectation"). In some sense, it is wider than the definition of Gambetta since it is not necessarily oriented towards the future, and in some sense it is more strict in that it does not apply in situations in which another agent may affect my behavior without there having been any communication between us.

To account for the (derivative) use of the word "trust" to inanimate objects, we can take over the definition of Kini and Choobineh. This notion of trust is supposedly metaphorically derived from the primary one, but they cannot be merged: objects are not communicative agents, nor can agents be reduced to objects. Note that in the context of Electronic Commerce, both notions of trust play a role and should be sharply distinguished: trust in the other party and trust in the system (the Internet, the firewall etc). For Electronic Commerce to be adopted, both forms of trust must be present.

3 Communication and Security

In the preceding sections, we have sketched a Language/Action based framework of communication. In this section, we show what this means for securing trustworthy electronic commerce.

In our framework, (electronic) commerce is doing business by means of speech acts. Security measures can and should therefore apply both to the means and the ends, that is, both the utterance acts (the physical level) and the illocutionary acts (the essential level). These two levels correspond with what Bons calls the communication level and the business level, respectively (Bons, 1997). These two levels of security are implementation-independent. The communication security draws on the lower level, the channel level. This level serves to secure the transport medium for the messages. The channel level is implementation-specific, and can be realized by firewalls and encryption techniques. We talk about levels rather than aspects because each level is enabling for the next-higher level.

Before going on to describe the possible measures at these levels, it is important to keep in mind what the purpose of these measures is. Parties want to execute communicative actions, that is, achieve effects in the social world(s), but they can only do that by making another act in which they *represent* the action. The utterance act makes use of a medium, either the medium of oral speech or the medium of paper-based text, or some digital medium. There will always be a medium, but the quality of different media can differ.

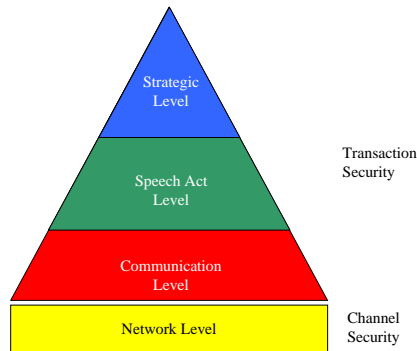


Figure 2: Levels of Security

In addition to the levels distinguished by Bons, we include one highest level, the strategic level, corresponding to the strategic goals that subjects achieve by communicative acts.

3.1 The channel level

The channel or network level is the most ‘primitive’ level of security, since it only looks at the transportation of messages as technical entities.

The channel security level services are hardware and/or software products that can be bought on the market (COST - Commercial Off The Shelf). They are enablers to trustworthy communication. At the moment, the channel level is rather well-served, but there is still a long way to go, especially with regards to the integration of different secure components, which may introduce new insecurities. We refer to the relevant literature for an in-depth discussion of these techniques.

3.2 The message level

We use the term “message level” as the equivalent of Bons’s communication level; in L/A terms, it is the level of the utterance acts, that is, the messages that are exchanged. Message level security is concerned with the documentary security of the messages. Traditional security requirements on the message as a means of achieving communicative action are:

1. Non-repudiation
2. Integrity
3. Authentication
4. Confidentiality

To these requirements that have been discussed already extensively in the security literature, we would like to add another group, namely, the level of context-independence. A message is typically a partial representation of a speech act, and hence requires additional context information for the interpretation. For example, it may be left implicit in a business transaction which national law does apply in the case of noncompliance. Even if it is unambiguous which law does apply in the context, the fact that it is not written down may become a cause of conflict and could be used by an opportunistic party to deceive the other (cf. 2.1).

Hence, the quality can be said to increase when the context is made more explicit. In written text, the context-independence is higher than in spoken dialogue. Writing is a

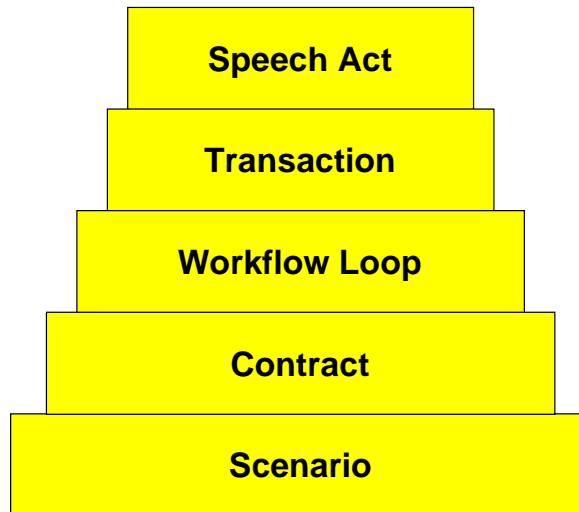


Figure 3: Patterns of EC communication

process of decontextualization, since written text is *designed* to be conserved and transferred to other contexts (in space or time).

Within the settings of Electronic Commerce, the context can be expressed at least in terms of the time and place of sending and the effect of certain speech acts (which hinges on the social world, the institutions and legal framework in which the transaction takes place).

In addition to these security requirements, other quality attributes can be defined as well, for example, efficiency and ease of processing. In practical situations, a trade-off has to be made between different sometimes conflicting requirements.

All the requirements stated so far pertain to the form of the message (the message level), and are not related to what is achieved by the messages, the business transactions. So, we still need a higher level of security, that looks at the what the business transactions *do*.

3.3 The speech act level

The speech act level of security is concerned with the type of information that has to be exchanged in order to perform a secure transaction (Bons, 1997). As we have argued in (Weigand and van den Heuvel, 1998), one can use patterns of speech acts to represent electronic commerce transactions (see fig. 3).

At the lowest level, we have defined individual speech acts represent one performative act, like a request or a promise. Speech acts usually only have a meaning when they come in pairs; for instance a request that is followed by a commit. We call these pairs of speech acts a transaction. A transaction can be defined more formally as the smallest sequence of speech acts that has an effect in the social world of the participants. These effects can be defined in terms of obligations, authorizations and accomplishments. At a higher level, we have defined a workflow loop that can be constituted of different transactions. For instance a typical workflow loop can be built up from an actagenic and factagenic transaction, or conversation. During the actagenic conversation an actor requests something from another actor, which he can reject or accept. This leads to a commitment or obligation to keep the promise. The factagenic conversation starts after the executor has performed the transaction, and (s)he has declared that (s)he has created the desired state-of-affairs. The factagenic conversation results in an obligation for the customer to accept the state-of-affairs, if it is conform the conditions of satisfaction. The ActionWorkflow-loop (Medina-Mora et al., 93) is an example of such a workflow loop (see fig. 4); a related approach is known as DEMO (Dietz, 1992).

The workflow loop gives a rather biased perspective of a transaction; either the analyst

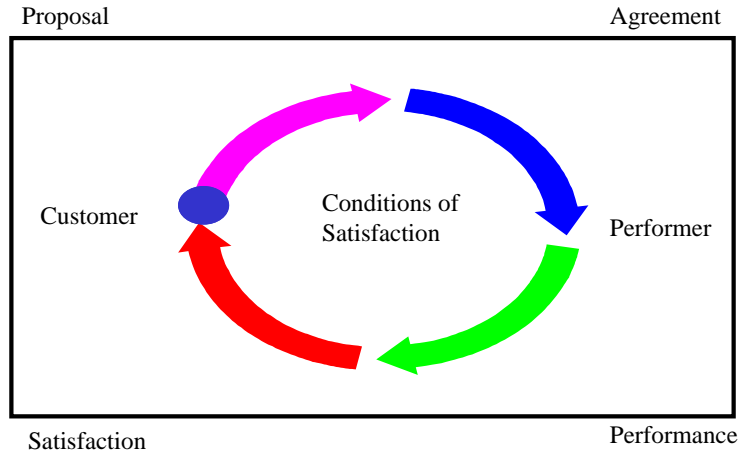


Figure 4: Workflow Loop

takes the viewpoint of the buyer or the seller. Since business transactions are in fact *exchange* processes, we have defined contracts to represent this reciprocity. The contracts can be represented as two interleaving workflow loops: e.g. a customer that requests a product, and a supplier that requests money for it in return. Typically, parties make use of various (implicit) contracts during a business transaction. The order of the contracts can be represented by means of scenarios. An example within the context of electronic commerce is an identification contract, followed by one or more transactional contracts and closed by the ending (writing out) of the relationship.

We want to emphasize that most of the general principles for inter-organizational controls (cf. (Bons, 1997), p.60-62) are automatically fulfilled when communication (at the speech act level) is set up properly. For example, when the Action-Workflow loop approach is followed, it is included that "if a primary activity is performed by Role1, Role 2 should testify the completion thereof" (principle 1), since this is what happens in the factagenic conversation. The fifth principle in (Bons, 1997) about outsourcing can also be interpreted as a specific application of the workflow principle that an activity requires commitment of the executor before he can and should do something. The other principles are summarized as: "before a role executes an activity for which some counteractivity has to be performed by another role, it should be certain about the performance of this counteractivity" (principle 2-4). These principles say two things: (a) that activities must be reported back to the initiator c.q. beneficiary, and (b) that in the case of mistrust, the agent should postpone his own action (the counteractivity) until he has received this report. The former follows in the L/A perspective from the use of workflow loops in which actagenic conversations must be followed up by factagenic conversations. This latter is a requirement that specifies something about when they must be made. This can be dealt with at the level of the contracts, where two workflows are synchronized. Secure contracts are contracts that guarantee the symmetry of the exchange. Interestingly, this latter constraint is not dealt with in Action Workflow or DEMO, probably because these methods assume that there is trust (which is a reasonable assumption within organizational settings, but not in the interorganizational context).

3.4 The strategic level

The previous levels have dealt with the prevention of deception: they specify *which* communicative acts should be made (speech act level) and *how* they must be made, i.e. the quality of the signs (message level). It should be stressed that these measures are only effective when there is a *community* in which the communication is embedded. This community can be formed by the umbrella of law (and a system of law enforcement), or by the umbrella of

a trusted third party or public institutions.

As explained in section 2.4, agents achieve strategic goals by means of communicative actions. However, whereas communicative acts are visible in the utterance acts, the strategic goals are set by each party itself, within his own domain.

In the agent architecture of (Verharen, 1997), the communication is specified in the form of transactions and contracts. These correspond to the communicative actions, over several layers, described above. In addition, each agent has a task structure which defines its goals. Whereas the communication is by necessity a shared responsibility of the two agents, the strategy is a private responsibility. The actions that are specified in the contracts, agreed upon by two or more agents, provide the means for the agent to execute its tasks. However, the contract also specifies the obligations that follow from a certain action. These obligations together with the tasks of the agent determine its agenda.

The strategic level itself falls outside the scope of the communicative perspective, but since it is enabled by communicative actions, communication is highly relevant also at this layer.

Risk prevention at the strategy level involves the alignment of the different strategies of the partners. The risk of opportunistic behaviour (the hazard) can be reduced by forming a strategic alliance or virtual organization. This can be done directly, in a bilateral agreement, or indirectly, by two or more bilateral agreements with a Trusted Third Party. Note that at this point, communication comes in again, but not communication in the form of business transactions, but communication about strategy alignment and community building.

4 The Trusted Broker

The main function of the trusted broker should be to facilitate the communication between parties that want to engage in an electronic commerce transaction. However, without trust between the parties the transaction costs can rise excessively.

This observation leads to the conclusion that the broker should be a trusted broker: e.g. a party that provides a community in which the parties can be sure (to a certain level of confidence) that the counterparty will not show opportunistic behaviour.

4.1 Security provided by the Trusted Broker

The trusted broker must provide three levels of security: channel level, message level and speech act level. As we have already indicated the channel level security solutions can be bought on the hardware and software market. The message and speech act level however, pose more problems. The security requirements, as defined in the above, can be fulfilled by a trusted third party, that is an independent party that is specialized in providing business confidence, through commercial and technical security features. Examples of such services are time-stamping, notary functions and the certification of digital signatures.

These *message security* issues are dealt with by the transaction, or accounting, module. This module should *monitor* and register all communication between the parties involved. The control information can be used to reduce the uncertainty about the performance of the transaction(s).

In case of any problems, the parties can get access to this repository. Moreover, this control module can check on the basis of the contract whether the transaction is acceptable.

The broker can deliver *speech act level security* through the provision of certified business patterns as discussed in 3.3.

The architecture of the broker has been denoted in figure 5. As can be seen in this picture, the broker needs a repository to store the identity of the subjects. The patterns can be stored and certified in the pattern repository. Transactions are monitored by the

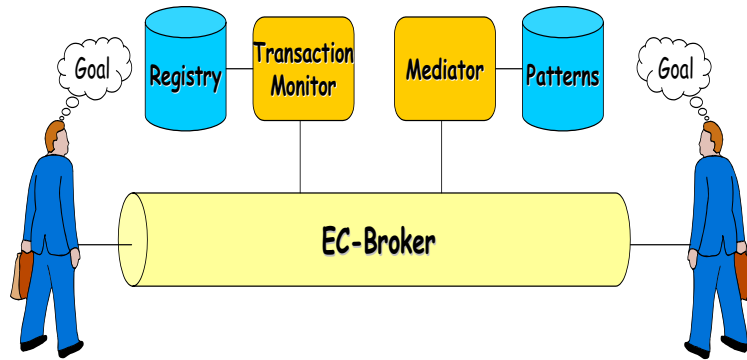


Figure 5: The Trusted Broker Architecture

‘transaction monitor’, or controller on the basis of the registry. The control information can be used to reduce the uncertainty about the performance of the transaction(s).

4.2 Communicative action supported by the Trusted Broker

The early work on electronic commerce attaches great importance and significance to transient relationships which support unique projects or in the context of electronic markets, rapid switching between economic partners. However, as (Holland and Lockett, 1998) and others argue, most virtual organizations (as they call all kinds of interorganizational relationships in general) do not follow this pattern but share instead more characteristics of relatively stable market networks. Holland and Lockett conclude that therefore trust will be more important than issues of security and formal guarantees, and that in international relationships, more emphasis will be placed on developing trust rather than security measures (Aulah et al., 1996).

From the Language/Action perspective we have described in section 2, this development certainly makes sense. Communication should always be viewed in the context of a lifeworld. However, developing trust should be supported somehow. (Holland and Lockett, 1998) hypothesize that shared information systems amongst economic partners will serve to speed up the trust/distrust development process. The “shared information system” may be the Trusted Broker as described in the previous section, but may also include the sharing of knowledge in the form of developing a common vocabulary or developing common contracts and scenarios (cf. section 4.3).

(Leiwo and Heikkuri, 1998) have discussed the use of ethics in open public communication networks. They propose an ethical “layer” that describes certain rules of conduct, but in contrast to other approaches, they argue that this ethical layer should be embedded in a “social contract” layer. In other words, first we must develop domains where subjects can be allowed or not. By becoming a member of the domain (“the club”), the subjects have to agree on some common ethical principles. Within a group, there must be room for further ethics negotiation. Although we do not follow (Leiwo and Heikkuri, 1998) in all details, we agree that *domains* must be supported (by the Trusted Broker), that subjects are allowed to domains by a Domain Administrator who *identifies* subjects (see also (van den Heuvel and Weigand, 1997)). And within the domain, subjects can negotiate more and more elaborated contracts and scenarios. Negotiation support can be an important added-value of the Trusted Broker.

4.3 The dynamics of trust

Usually, trust is dealt with in a static fashion, that is, trust exists or does not exist, or trust is enabled by certain measures or not. However, trust can evolve over time. For the

measures that we take, we should also consider the effect of these measures on the trust building process.

Let us start at the zero level in which there is no trust at all. In that case, business transactions can only be performed by direct exchange or by the involvement of a trusted third party. For international trade, direct exchange is not an option, unless we consider the installation of local branches as a means to support this. When there is a minimal level of trust, either by virtue of the trusted third party, or by the community environment, the level of trust can be raised by the use of trustworthy trade procedures. Crucial for the further development of trust is the experience acquired through repeated interaction.

To achieve a next higher level of trust, it is necessary to build up a common world, in terms of knowledge, norms and values. It should be remarked that this requires different types of communicative acts and probably much richer media (including non-verbal communication) to achieve this. At this point, trustworthy trade procedures, as they are used in the previous stage, may become a hindrance. A control message may increase the security, but at a meta-level (Bateson, 1972), it may be an expression of distrust ("I need this message because I do not trust you"). Therefore, the parties may decide to skip some control messages. However, it is also possible, and perhaps advisable, to keep the control messages and agree on the fact that it is not a matter of trust or distrust but a matter of transparency that just decreases the probability of errors and unintended misunderstanding. The value of transparency must be compared with the costs of the control messages, which may be very low in the case of automated processing.

5 Conclusion

In this paper, we have taken a Language/Action perspective on trust. The conceptual framework of L/A gives us the opportunity to put the notion of "trust" in a wider context. The central claim is that electronic commerce services, as any kind of information system, must be developed on the basis of "good" communication design. This includes, among others, that messages, or electronic documents, must not be studied in isolation, since they only make sense, or have meaning, in a world constituted by communicating subjects.

In the near future, we will start an industrial project in which a Trusted Broker will be developed. In this project, both the security measures as described in section 4.1 and the communicative actions described in section 4.2 will be worked out and implemented in the form of a prototype system.

Important open research questions concern the contents of the communication patterns. These questions relate to the present research on *institutions* (Picot et al, 1997). Institutions, whether in the form of a bilateral agreement or in the form of auctions or legal frameworks, are ways to stabilize market interactions. Institutions can and should be analyzed from an economic perspective - that is, how the goals of the partners are served, the efficiency of the process, the symmetry etc. - and from a communicative perspective, since communicative action is the enabler.

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