Chapter 15
Norms and Trust

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Abstract In this chapter, some different (and in part complementary) analyses and approaches to the study of the relationship between Norms and Trust are briefly introduced. First, how Trust and Norms can be considered the basis of each other is analyzed depending on the phenomenon considered. Second, starting from the fact that an agent's trustworthiness can be evaluated on its compliance with norms, the authors consider the different ways to comply with a norm and the relationships with this analysis and the trust models. In particular the feedback on the norm adaptation. Finally, an interesting analogy between Obligation, Role and Information Scenarios – with respect to the intimate connection between trust and rules – is presented. The need to consider the volitional component in the trust concept and the corresponding link between some types of emotions (regret, anxiety, hope) is also presented.

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15.1 Introduction

In this chapter we would like to show how interesting and not at all trivial and obvious are the relationships between Norms and Trust. In fact, the relationship between Trust and Social and Legal Norms is rather complicated (for an analysis see also Part VI in this book). This has been object of several misunderstandings and controversies in the literature, and never clearly systematized in its various, well characterized aspects, on the basis of a principled and precise model, able to explain, not just to describe, those relationships.

In this chapter we will briefly introduce some different (and in part complementary) analyses and approaches to the study of this relationship. In Falcone and Castelfranchi's contribution (see Section 15.2), how we can consider Trust as based on Norms (on the norm-based behavior of other agents) is analized, and, at the same time, how we can consider Norms as based on Trust, on the fact that without Trust, Norms are in practice ineffective and superfluous. In Cardoso and Oliveira's contribution (see Section 15.3), starting from the fact that an agent's trustworthiness can be evaluated on its compliance with norms, the authors consider the different ways to comply with a norm and the relationships with this analysis and the trust models. In particular the feedback on the norm adaptation. In Jones' contribution (see Section 15.4), there is an interesting analogy among Obligation, Role and Information Scenarios with respect to the "intimate connection" between trust and rules. Then the author evaluates the need to consider the volitional component in the trust concept. In this view, analyzing the epistemic and volitional components, he sees a close link with some types of emotions (regret, anxiety, hope).

15.2 Trust and Norms: a complex relationships

We will characterize and explain two main kinds of relationship between Trust and Norms:

- Trust is based on Norms;

- Norms are based on Trust.

15.2.1 Norms as a base for expectations

The existence of Norms in a given community usually (and correctly) is one of the bases for predicting agents behavior in that specific community. Even without previous experience and observation and some sort of "statistics" characterizing those behaviors, a foreigner, informed about the existence of that practice and (technical, social, legal) norm in the community, is entitled to expect certain behaviors by the agents, from simply assuming that they will respect the norm.

Except when X has specific reasons for assuming that Y doesn't know about the norm (N), or that Y has specific attitudes or habits against respecting norms or that kind of norm, or has specific contextual reasons for violating, X, by default, will assume and expect that Y will behave conforming to the norm N. In other terms, the awareness of N is taken as a basis for "predictions" about the behavior of Y, and thus as a basis for relying on it; that is as a basis for trust: X is confident that a given pedestrian will not cross with the red light, and on such a basis X will speed up and cross, risking killing the pedestrian, in the case of a wrong prediction.

Given this relevant role played by the Norms with respect to trust, can we say that predictions (and thus expectations, and thus trust) always are based on norms? Be they either statistical norms or deontic norms. We do not think so. There are many bases for predicting human behaviors: norm keeping or statistical distribution are just two of these bases [4]. Other forms of reasoning can be responsible for a given prediction: For example, *plan and intention ascription or recognition*. Since X ascribes to Y a given intention or plan (on the basis of Y's declarations, or of Y's current action, or of Y's characters, values, etc.) he will expect that Y will perform a given action.

Another basis can be *case-based, analogical reasoning*. Just on the basis of another similar circumstance, of another case, X predicts that Y will make a given move. Another can be simulation, to identify oneself with the other: X imagines himself in Y's shoes and expects that Y will do as he would do in those circumstances. In sum, we deny that predictions and expectations always and necessarily build on norms of some kind (at least, preserving a sufficiently well defined meaning for the notion of "norm", if not covering everything).

We can attribute to the Norms two different meanings: the first more descriptive, relating a regularity in behavior; N allows us to know if a given behavior/phenomenon is more or less strange, deviating, unpredictable, or *regular*, *conform*, to the standards presented in N, and predictable on such a base. The second one is more prescriptive, aiming at establishing a regularity of behavior. This is established via communication. The prescription can be explicit (norm issuing) or implicit/tacit; the N impinges on a set of autonomous, goal-directed agents (N's addressees and subjects). It presupposes an authority deciding what constitutes desirable behavior, issuing N, monitoring and possibly sanctioning the subjects. N can be originated by and reinforce usual social practices and conventions, or can be explicitly negotiated by the participants (collective authorities), or can be decided by an official (institutional) authority endowed with such a power and role. N involves different attitudes and roles; it is multi-agent construct: the role of the issuer; the role of the addressee/subject (which should respect N, and obey N); the role of surveillance (about violation or conformity); the role of punishing. These roles can be played by the same agent; for example, an obedient subject tends to watch and blame the violators. In a social context norms of the first type tend to become norms of the second type (not only predictions but prescription); and norms of the second type tends to create norms of the first type (regularities in behavior).

In our model [3] Norms are one of the possible bases for trust, but neither necessary nor sufficient. Moreover, there is no incompatibility between trust and formal

norms, controls, contacts, etc. This just means *that some forms of Trust* are insufficient (the merely interpersonal, either by default, or shared-value based, personal acquaintance-based forms of trust, or trust relying on goodwill, etc.), and that *other forms of Trust* are invoked. Without (specific forms of) trust norms, contacts, authorities, etc. are ineffective.

15.2.2 Trust is the necessary base for Norms and Institutions

An implicit or explicit form of trust, the development of some confidence, is a necessary step and basis for the evolution of spontaneous social conventions, based on tacit negotiation and agreements. In fact, there is a crucial and necessary transition in the formation of any convention and social norm, which is the very moment of the agent X having expectations about the behavior of the other agents, and basing his own (conforming) behavior on such an expectation. X's behavior is based on this expectation in two ways.

- On the one side, X adjusts his own behavior on the basis of the predicted behavior of the other for avoiding "collisions" (obstacles) and obtaining a profitable *coordination*. While doing so X is relying on the expected behavior of Y, and makes himself depending on Y as for the success of his own action and of the common coordination.
- On the other side, the expectation that the others (Y) will act accordingly, is also a *reason* and a *motive* for adopting the "prescribed/expected" behavior, for non-deviating from the social norm or convention. Since the others conform to (and pay their tribute) X decides to conform to as well, and gives his contribution to the collectivity and to its working and maintenance [3].

However, what eventually is such a *prediction*, *expectation* on the others' conformity and behavior, and the *decision to rely* on them? And what is this *confidence* in the behavior of the others while doing our part and share? It is clearly just "Trust". X trusts the others to act conformingly; and he acts so just because feels confident in this. No coordination, conventions or social norms might be established or maintained without this ground of trust: everybody trusting everybody to keep the convention and being predictable. X also trusts the others to understand his expectations, and to be in agreement, unless and until they do not explicitly manifest their disagreement. Without an explicit signal, X is entitled to believe and to trust them. In a sense, X also believes and wants the others to trust him based on conventional behavior. There is an implicit prescription of this: *you must trust me to be respectful, as I trust you.*

Trust in the systems, in the institution, in the authority, in the conventions, practices, and norms, is a fundamental basis for the functioning and maintenance of even the more formal and institutional norms and norm-related roles and acts. In fact, X is relying on the existence of a norm simply because he believes that there is some entitled, recognized, and respected authority issuing it, which is also monitoring

possible violations, and is capable of sanctioning bad behavior; moreover, there are also legal procedures and places for defending, etc.

In fact, what actually "gives" a policeman power, for example, is the recognition of his role by the public, the fact that people act conformingly with this recognition, and consider the policeman's actions as special (count as) actions (for example, arresting or prescribing, prohibiting or issuing fines). While accepting this they in fact give him (and to the delegating institution) this power of performing those actions. Institutional actions and powers require (unconscious) compliance and cooperation by people. But they do so only because and while they believe that the policemen is acting as policeman, not for example for his own private interest or disregarding the law; and they respect the policeman (or worry about him) because they predict his behavior and rely on this. In other words, they trust the policeman and his actions in a specific way. To consider him as a policeman and to act accordingly, and trusting him (and rely on him) as a policeman, are just one and the same thing. Without this no use of norms (contracts, etc.) is possible. Nobody would trust this, and norms would become ineffective or superfluous.

15.2.3 The micro-macro loop

What we have just claimed in the previous sections gives trust a primacy relative to norms: trust seems to be an evolutionary forerunner (regarding coordination, order, and safety) of norms, and also a presupposition for norm evolution, establishment, and functioning. But, it also gives rise to a loop between trust and norms; and this loop is also a micro-macro, top-down vs. bottom-up, circle [5, 7]. In fact, trust (individual attitude, choice and behavior) provides a ground for the emergence of conventions, norms, laws, institutions, etc.; but there is also a feedback to the individuals (and their representations) [1]: Norms and Institutions are the bases for new expectations about people, and are a new presupposition for trusting them, for depending and relying on them. Moreover, this circle is an evolutionary one: reliance based on norms and institutions allows more advanced forms of social coordination and cooperation that would be impossible at the merely interpersonal level; and those forms of cooperation allow new forms of trust based on new signals, on new grounds.

15.3 The Norms-Trust-Norms Loop

By describing how agents are expected to behave in particular situations, under social environments, norms can be an important source of information to assess the ability or willingness of agents to perform certain tasks. In particular, when norms are used as a regulatory mechanism to govern multi-agent activities, a norm

monitoring facility may provide important information regarding the abidance of agents with their social commitments

A number of trust models (e.g. [19, 16, 8]) have been designed that include an aggregation engine combining a set of evidences for a particular agent, and providing as an output a trustworthiness assessment of that agent. When governed by appropriate norms prescribing what agents ought to do, past interactions can be monitored in order to serve as a source for evidences. The different ways in which an agent may respond to the norms it is subject to comprise different evidences that a trust mechanism may handle differently.

Once some notion of the trustworthiness of an agent regarding a particular situation is derived, we may work the other way around: to change or adapt the norms so that the agents raise their positive expectation of what they may get from another particular agent for which some trustworthiness assessment has been computed. Norm changes may include, e.g., different sanctions to be applied in case of lack of compliance, with the aim of influencing the agent's behavior. Figure 15.1 shows this interplay that may be achieved between norms and their monitoring process, trust building, and trust exploitation by negotiating norms to govern further relationships.
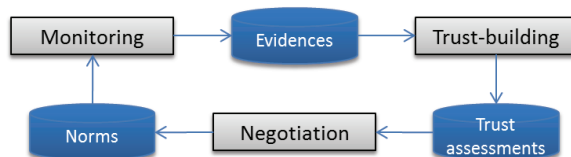

Fig. 15.1: Linking norms with trust with norms.

15.3.1 Generating evidence from norm monitoring

Different approaches to formalizing the notion of norms lead to different ways in which we might develop a mechanism for monitoring their compliance. Furthermore, in practical terms such compliance may be observed in a number of ways. The most simplistic one is to have a binary view and determine whether an agent either fulfills or violates a specific norm. This approach will, in turn, produce two kinds of evidences for trust building: either positive or negative. In some scenarios, however, we need to distinguish different cases in the gray zone; that is, cases where an agent has not fully complied with a norm but has nevertheless made an effort not to violate it. In this case we may have a number of different outcomes regarding the agents attitude towards the norm. And in turn, this means that we may have a richer set of inputs to feed a trust aggregation engine [18].

For illustrative purposes, let us focus on a norm specification that prescribes a particular obligation of the form $Obl_{b,c}(l < f < d)$ [12]: agent b is obliged towards agent c to bring about f between l (a lifeline) and d (a deadline). Different outcomes may be obtained from such an obligation. Let us distinguish those in which f is obtained from those where it is not. In the former case we may have (i) $f < l$, which denotes a lifeline violation; (ii) $l < f < d$, a perfect compliance; and (iii) $d < f$, denoting a deadline violation. Finally, (iv) where f is not the case we have a full obligation violation.

These different cases show disparate outcomes in the performance of an agent with regards to a norm it is subject to. The correct assessment of these outcomes is important when using such information to build trust, because each truster may evaluate differently the possible performances of a trustee (e.g., by giving more or less importance to delays). This approach also allows for richer trust models to be built, which take into account the context for which a trustworthiness assessment of an agent is needed [18].

15.3.2 Using trust for norm negotiation

Once we have some notion of the trustworthiness of agents for a particular situation, we may choose to avoid delegating any task to agents that fall below a certain threshold. Nevertheless, there will be cases when either we are short of alternatives or we need some extra confidence when delegating a task. This is when we can mix our trust in the other agent with some control mechanism [17, 6, 2] that allows us to influence his behavior.One such mechanism will therefore be to propose a particular set of norms to govern an agent interaction. Norms are in this sense negotiated in order to promote the desired outcome in situations where agents do not trust each other enough. The prescriptive nature of norms makes them useful for specifying the consequences that will be obtained in situations where the involved agents do not fully comply with the commitments they establish.

15.3.3 Norm enforcement as a source for trust

A normative environment is a common interaction infrastructure where agent behaviors are governed by norms. We can find at least two advantages of using such an environment. The first is related with the definition of the norms agents. A normative environment will include a normative framework that accommodates the joint activities that are to be regulated. The second concerns monitoring and enforcement of norms. Enforcement means that the environment will do its best in applying any corrective measures regarding lack of compliance. The normative environment may also include adaptive policies, by changing at run-time the shape of its normative framework when addressing the agent population as a whole (as in the approach

described in [13]). In this perspective, trust is built in a collective sense. Trust is pointed towards the enforcement capabilities of the normative environment, rather than directly towards other agents.

15.3.4 Application domains

The interconnection between different social aspects, such as norms and trust, is becoming increasingly important in diverse areas, especially where an open environment is the case. The vast amount of new applications exploiting the open nature of the Web are of particular relevance, including electronic contracting between both firms and individuals (where norms governing contractual relationships have a natural fit), and social networks that connect individuals whose acquaintance becomes at some stage questionable (where therefore trust issues are predominant). In any case, an appropriate balance between a regulative perspective on norms and interentity trust as complementary mechanisms seems to be the key to addressing open multi-agent scenarios.

15.4 Trust, Norms and Emotions

In [9] five different types of scenario were considered as illustrations of situations in which it would be true to say that some agent X trusts some other agent Y. In the interests of brevity, and because the current focus is on the relationship between norms and trust, here we rehearse just three of them:

- The obligation scenario (Oblig): X believes that Y is subject to a rule, or rules, requiring him (Y) to do Z (for, instance, to repay a debt) and that Y's behavior will in fact comply with this requirement.
- The role scenario (Role): X believes that Y occupies some particular role, and that Y will perform the tasks associated with that role in a competent and acceptable manner. (For instance, *X trusts his doctor, or X trusts his car mechanic*).
- The informing scenario (Inf): X believes that Y is transmitting some information, and that the content of Y's message, or signal, is reliable. (For instance, *X trusts what Y says*).

Regarding (Oblig) it was suggested that the two key features that comprise X's trusting attitude are X's belief that a rule applies to Y, and x's belief that this rule will be complied with. Accordingly, the core of trust in (Oblig) consists of *X's rule-belief* and *X's conformity-belief*, respectively.

It was further suggested that this same pattern of analysis of trust could also be applied to (Role), on the uncontroversial assumption that one of the key characteristics of any role is that the role-occupant is subject to particular rules requiring that certain standards of behaviour and competence are maintained. So x trusts his

doctor Y in as much as X believes both that Y's behaviour, qua doctor, is governed by particular rules, and that Y will conduct himself in a manner that complies with those rules.

Regarding (Inf), it was assumed that Y's communicative act of informing, whether delivered as a non-verbal signal, or as a linguistic speech act, would be governed by some convention which itself indicated what the communicative act means. So, by convention, hosting a particular sequence of coloured flags on board a ship conventionally means that the ship is carrying explosives; uttering the English sentence "The ship is carrying explosives" also conventionally means that the ship is carrying explosives. So Y's communicative act is made possible by the existence of a convention that stipulates what Y's act is supposed to indicate. It may be, of course, that Y flouts the convention (as he would if he were lying), but X trusts what Y says/signals to the extent that X believes, rightly or wrongly, that Y's behaviour will in fact conform to the convention, e.g., that Y signals that the ship is carrying explosives only if the ship is carrying explosives. In short, truster X believes that trustee Y is subject to a rule (here, the signaling convention), and x believes that the rule will be complied with. So the pattern of analysis applied to (Oblig) and (Role) applies to (Inf) too[1].

This account of trust, in terms of RuleBelief and ConformityBelief, exploits quite deliberately the ambiguity of the term *rule*. In (Oblig) and (Role) the relevant rules are *directive norms* that specify obligations to which trustee Y is subject; whereas in (Inf) the rule concerned is of type *convention*, or *constitutive rule*, a rule that specifies what the signaling act counts as indicating. Accordingly, the account supposes that there is an intimate connection between trust and rule, and, for specific cases of the kind exhibited by (Oblig) and (Role), between trust and directive norm. As regards the attitude of the truster, the [9] account focused exclusively on trusters' beliefs; it was admitted that a truster commonly *cares about* whether or not ConformityToRule (by the trustee) is forthcoming, and that this is why *trust* is often associated with the notion of *risk*. But it was nevertheless maintained that one can make perfectly good sense of a trusting attitude even when it is coupled with indifference. (I trust that the bureaucrats in my local council office will follow slavishly the application of council rules and regulations, but for many of these rules I truly do not care whether they are complied with or not.)

But suppose that we put those somewhat eccentric cases to one side: how then should the [16] account be supplemented in order to accommodate a volitional component, indicating that the conformity-to-rule that the truster believes will occur is also an outcome that he desires? This was the question raised, and to some extent addressed, in [11], and it led in turn to the suggestion that there may be a very close connection between this more complex notion of trust and some fundamental types of emotions, and in particular the notion of hope.

The reader is referred to [11] for details, but in only the barest outline that work starts from the modal-logical characterisation of emotions given in [14], in which the guiding intuition is that basic types of emotions consist of two distinct compo-

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[1] The convention-based account of communicative acts is developed in detail in [10].

nents: an epistemic component describing what an agent believes he knows about what may or may not be the case, and a volitional component describing what the agent wants, or does not want, to be the case. For the former, Porn combined normal modalities for knowledge and belief, and for the latter he employed an evaluative normative modality. (On the distinction between directive and evaluative norms, see [15].) So, for instance, the formula

$$BKp \ \& \ D\neg p$$

says that the agent (subscript suppressed) believes that he knows that the state of affairs described by proposition p holds, and furthermore he desires that it is not the case that p: an instance of an emotion of type regret. Similarly for

$$BK\neg p \ \& \ Dp$$

As further cases, consider

$$B\neg Kp \ \& \ B\neg K\neg p \ \& \ Dp$$

$$B\neg Kp \ \& \ B\neg K\neg p \ \& \ D\neg p$$

both of which represent an emotion of type anxiety, because they describe a situation in which the agent is uncertain about whether what he desires to be the case is in fact the case. Finally, consider

$$B\neg Kp \ \& \ \neg BK\neg p \ \& \ \neg B\neg K\neg p \ \& \ D\neg p$$

and

$$B\neg K\neg p \ \& \ \neg BKp \ \& \ \neg B\neg Kp \ \& \ Dp$$

which may be understood to represent hope: although the agent is not certain that that which he desires is the case, he nevertheless believes that the realisation of his desire is compatible with all that he knows. Consider now that the scope formula p itself represents the situation that was core to the [9] analysis: that a particular rule is in force and will be complied with. [11] arrive at the following three modes of epistemic/volitional representation of trust:

$$TRUST1 \quad BKp \ \& \ Dp$$

$$TRUST2 \quad Bp \ \& \ B\neg Kp \ \& \ Dp$$

$$TRUST3 \quad Bp \ \& \ \neg BKp \ \& \ \neg B\neg Kp \ \& \ Dp$$

This way of viewing trust helps to place it more clearly in relation to its near neighbour hope. For while it may well be agreed that TRUST1 does fit intuitively with the concept of trust, it might well be suggested that TRUST2, given the uncertainty expressed by its second conjunct, is more akin to hope, with TRUST3 perhaps exhibiting a "strength" that falls somewhere between trust and hope.

In our opinion, what we have here is a good example of the analytical value of these formal tools, which perhaps also brings out the futility of trying to "force" the vague notion of trust into one particular mould. The analytical tools enable us to articulate the spectrum of concepts to which phenomena of type trust belong. No single point on that spectrum tells the whole story about trust. But when we have a clear, preferably formal-logical model[2] of that spectrum we can, in designing particular systems for particular applications, identify the points on the spectrum of most relevance to the requirements specifying the task at hand.

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[2] We say "preferably formal-logical model" because of the obvious advantages such models bring in terms of testing for consistency and for relations of implication.

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