

The case of on-line trust

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Abstract. This paper contributes to the debate on on-line trust addressing the problem of whether an on-line environment satisfies the necessary conditions for the emergence of trust. The paper defends the thesis that on-line environments can foster trust, and it does so in three steps. First, the arguments proposed by the detractors of on-line trust are presented and analysed. Second, it is argued that trust can emerge in uncertain and risky environments and that it is possible to trust on-line identities when they are diachronic and sufficient data are available to assess their reputation. Finally, a definition of trust as a second-order property of first-order relation is endorsed in order to present a new definition of on-line trust. According to such a definition, on-line trust is an occurrence of trust that specifically qualifies the relation of communication ongoing among individuals in digital environments. On the basis of this analysis the paper concludes by arguing that on-line trust promotes the emergence of social behaviours rewarding honest and transparent communications.

Key words: on-line trust, trust, trustworthiness.

1. Introduction

The evolution of the World Wide Web into what is now called ‘Web 2.0’ (Oreilly 2007) has offered a standardised and open platform to support on-line social

interactions. MySpace,¹ Orkut,² Facebook³ or Twitter⁴ are among the most successful (eBizMBA 2010) examples of websites, which promote social networking by leveraging Web 2.0 applications. On-line social networks are not a small or niche phenomenon. Millions of people with different social, economical and cultural background connect daily to these sites creating networks of friends with whom they message, chat, share and comment information.

The rise of intrinsically informational and digitally networked social environments⁵ is posing original issues about the nature of the social interactions that they afford. Among them, the case of on-line trust has been elaborated by many scholars (see (Ess 2010) for a review of the relevant literature). One problem investigated in this research field is whether trust – intended as a relationship in which a trustor decides to depend on the trustee’s foreseeable behaviour in order to fulfil his expectations – can be used to describe a specific relationship between two or more peers that interacts exclusively on-line.

Trust is generally considered a fundamental aspect of off-line social interactions but it is debated whether the characteristics of on-line social interactions satisfy the minimal requirements for the emergence of trust. In particular, it has been argued that in an on-line environment it is not possible to satisfy two of the necessary conditions for the occurrence of trust:

- (i) the presence of a shared cultural and institutional background; and
- (ii) certainty of the trustee’s identity.

The debate on the possibility of on-line trust leads to two opposite positions. Some scholars (Pettit 1995; Seigman 2000; Nissenbaum 2001) defend the thesis that ‘(i)’ and ‘(ii)’ cannot be satisfied in an on-line environment and hence deny the possibility of the presence of trust in such an environment. Others (Weckert 2005; Vries 2006; Papadopoulou 2007) argue in favour of the presence of on-line trust insisting that either ‘(i)’ and ‘(ii)’ are not necessary conditions for the emergence of trust or that it is actually possible to satisfy ‘(i)’ and ‘(ii)’ in on-line interactions.

1 <http://www.myspace.com/>

2 <http://www.orkut.com/>

3 <http://www.facebook.com/>

4 <http://twitter.com/>

5 From here on this type of environment will be called ‘online environment’. The Internet is an instance of an online environment. All the explanatory examples used in this paper refer to the Internet as a case of online environment.

In the rest of this paper we will argue in favour of trust that emerges in an on-line environment, on-line trust for brevity. We will show that the arguments against on-line trust are mistaken, for the presence of a shared cultural and institutional background is not a necessary condition for the occurrence of trust, and the trustee's on-line identity can be diachronic and subjected to reputation evaluation. Specifically, we will refer to the sociological analysis of trust in uncertain environments provided by Yamagishi and Kikuchi (Yamagishi and Kikuchi 1999) to argue that trust does not require a shared ground of cultural and moral values in order to emerge. We will then focus on the conceptual understanding of trust so as to clarify the relation between trust, the trustee's trustworthiness and his off-line and on-line identity. Finally, we will refer to the theory of trust proposed by Taddeo in (Taddeo 2010; Taddeo Forthcoming) to analyse the nature and the role of trust in on-line social interactions. On the basis of this analysis, we will conclude that trust occurs in an on-line environment and promotes the emergence of social behaviours.

2. Two conditions for the occurrence of trust

Trust is generally understood as a decision taken by an agent A (the trustor) to rely on another agent B (the trustee) to perform a given action. A's decision to trust B rests on the assessment of B's trustworthiness. The act of trusting implies some risks: the trustee can betray the trustor by behaving differently from what was expected or agreed. Usually the trustor mitigates the risk of being betrayed by seeking guarantees on the trustee's behaviour, assessing, in this way, whether the trustee is trustworthy (Luhmann 1979; Gambetta 1998) and establishing the risk threshold he is willing to run depending on the availability of assurances on the damages he could suffer.

According to the detractors of on-line trust, the cultural and moral values and the social norms that are shared in the environment in which the individuals interact are a fundamental aspect to consider in deciding whether to take the risk of trusting another individual. These values and norms would support the trustor's belief that the trustee will behave as he is expected to do with a low risk of betrayal. Two reasons are presented to support this thesis. First, the shared values and norms provide a way for the trustor and the trustee to assess what a correct behaviour is. Second, the trustee feels a social pressure to behave according to the shared norms and values, a pressure that prevents him from betraying the trustor.

Nissenbaum (Nissenbaum 2001), identifies four elements that tend to characterise an environment in which trust can emerge. *Publicity*, understood as the routine of making public the cases of both betrayal and fidelity; *reward* and *punishment* as a consequence of an individual's conduct; the *promulgation of norms* (cultural and moral) that will orientate the actions of the individuals in that community; and finally the *set of public policies* that can "provide safety nets for those whose trust is betrayed", (*ibid.*). Nissenbaum concludes that none of these elements characterises an on-line environment and that an individual, when is on-line, cannot trust but must be cautious and retain reservations about the other's foreseeable conduct. This analysis rests on the assumption that the trustor's ability to assess the trustee's trustworthiness would be highly restricted while on-line owing to the lack of a shared background and that the trustor risk would be too high owing to the lack of appropriate guarantees.

Tuomela and Hofmann (Tuomela and Hofmann 2003) adopt a similar approach in their analysis of trust. The authors distinguish between trust and reliance. In both cases, an agent (the trustor) decides to depend on another agent (the trustee) for the execution of an action necessary for the achievement of the trustor's goal. In the case of reliance, such a decision is grounded solely on the trustor's expectation of the trustee's possible behaviour, and does not require the trustee's explicit commitment. In the case of trust, mutual respect, social rights and moral norms shared by the two agents are also required because they constrain the trustee to act according to the trustor's expectations. Therefore, social rights and moral norms allow the trustor to *feel comfortable* with the decision to depend on the trustee for the performance of a given action.

We could summarise Tuomela and Hoffman and Nissenbaum's positions by saying that an individual can accept the risks of trusting another one only when the situation is structured so as to imply 'social pressure' on the trustee and 'safety nets' in case of betrayal. The on-line environment has an un-structured nature as it lacks shared institutions, norms, and cultural and moral values. This is mainly a consequence of the heterogeneity of the members of on-line social networks, which belong to different cultures, religions, genders and nations. The high uncertainty of such an environment would prevent trust from emerging. While on-line, individuals could never hold "positive feelings" (Tuomela and Hofmann 2003) about depending

on someone else to achieve their own goals and would always be cautious, if not suspicious, about the behaviours of the others.⁶

These analyses of trust and the consequent objection to on-line trust rest on debatable assumptions about the role of social norms and infrastructures in the emergence of trust. In this respect, Yamagishi and Kikuchi (Yamagishi and Kikuchi 1999) have provided a revealing analysis of how trust emerges and affects social dynamics in uncertain environments.

The authors distinguish between trust and *assurance*. Both trust and assurance concern an individual's expectation of the cooperativeness of another individual but while trust rests on the assessment of the trustee's trustworthiness, assurance is grounded on the awareness of "[...] the incentive structure surrounding the relationship", (*ibid*, p. 132).

The distinction between trust and assurance is supported by the results of a "cross-societal questionnaire" that Yamagishi and Kikuchi presented to Japanese and American citizens. The survey reveals that the social interactions of American citizens are characterised by a higher level of trust compared to those undertaken by Japanese citizens. Yamagishi and Kikuchi argue that this is due to the different social and cultural systems of the two countries. Japan has a highly hierarchical and structured society in which everyone knows that the consequences of unfair behaviour will be hard and severe. In this environment, norms and moral values guarantee social interactions, which foster not trust but assurance. This is because the choice to trust is not grounded on the assessment of the other agent's trustworthiness and of the potential risk of the trustee's defection, but rather the guarantees that the social infrastructure offers to the trustor.

The social life of the citizen of the United States of America, on the contrary, is characterised by the presence of high level of trust because the USA society is less structured than the Japanese one. Unfair behaviours are less likely to be stigmatised and punished, and there is overall a higher level of uncertainty. The presence of trust turns out to be a key factor to cope with a riskier environment, because trust allows for the establishment of privileged and committed relations among the members of a social system (Kollock 1994). Yamagishi and Kikuchi argue that the existence of

⁶ The reader is referred to Taddeo, M. (2009). "Defining Trust and E-trust: Old Theories and New Problems," *International Journal of Technology and Human Interaction (IJTHI)* 5(2): 23-35 for an analysis of the conceptual misunderstandings on which such a thesis rests.

trusting relationships reduces the uncertainty of the environment because individuals develop their “social intelligence” (*ibid.* p. 155) and learn to correctly assess the trustworthiness of those with whom they interact.

This analysis provides a compelling argument against the idea that trust needs a constraining background of norms and values to emerge. The authors stress that trust depends not on safety⁷ but on the proactive answer of individuals to the presence of environmental uncertainty. Individuals can cope with the risks implied by the decision to trust because they are able to refine the criteria by which the trustworthiness is assessed. Trust occurs in dynamic environments in which (inter)actions evolve through time while been continuously assessed. When the assessment of trustworthiness fails, the trustor is damaged but usually not irrecoverably. Such a temporary failure is an opportunity for the trustor to make its overall interaction with the environment more robust and efficient. A certain amount of risk is acceptable in order to refine the assessment of trustworthiness. When risk is not involved or is largely constrained by social and moral structures, trust is replaced by assurance or degrees of it. Following this analysis and its supporting data, it can be concluded that it is assurance and not trust that often fails to emerge in unstructured environments.

In (Pettit 1995; Seigman 2000; Nissenbaum 2001) a shared background of social and moral values is not the only necessary condition for the emergence on trust. The ascertaining of the *diachronic identity*⁸ of the trustee and his physical characteristics are also necessary. Let us first focus on the ascertainment of the diachronic identity.

Identifying the individual with whom one is interacting through the course of time is necessary in order to relate the individual’s identity to her performance history. Such identification is considered fundamental for the assessment of the trustee’s trustworthiness. In Nissenbaum words: “[...] imagine identity as a thread upon which we string the history of interactions with others, [...] without that thread we lose the ability to learn from to past experiences of either vindicated trust or betrayal”, ([3], p. 647).

An individual’s *diachronic* identity is assumed to be difficult to be established in an on-line environment as interactions are often anonymous or do not require for the

⁷ Please note that the connection between trust and lack of safety is made also in Nissenbaum, H. (2001). "Securing Trust Online: Wisdom or Oxymoron." *Boston University Law Review* 81(3): 635-664. The difference is on considering trust as a minimizing factor of social uncertainty.

⁸ A diachronic identity is an identity that does not change over time.

individuals to reveal their off-line identity. Therefore, the detractors of on-line trust conclude that in on-line environments it is not possible, or at least unlikely, to establish the reputation of the potential trustee. As a consequence, it seems that “[...] trust is difficult to develop in an environment in which one cannot be sure of the identities of the people with whom one is communicating” (Johnson 1997).

It should be pointed out that, although on-line interactions offer the opportunity to adopt a fictitious identity it is true that identification, authorisation and accounting procedures are often in place so that, if needed, who interact in a given on-line environment can be univocally identified. This knowledge alone can make on-line interaction less suspicious or worrying, operating as a form of assurance in case of betrayal.

Even when identification is not possible and on-line and off-line identities cannot or should not be univocally associated, there is still scope to assess the trustworthiness of an on-line peer in order to decide whether he should be trusted. On-line identity can be *diachronic* and the history of the performances associated with that specific on-line identity can be recorded and made available. In this way it is possible to establish the reputation of an on-line identity without the need to also associate such a reputation to a specific physical individual. Reputation is widely recognised as one of the main criteria used to assess the trustworthiness of a potential trustee. For this reason, an agent can trust another agent only by means of on-line interactions.

Consider, for example, the reputation systems of the e-commerce portals eBay⁹ and Amazon¹⁰ or on the social networking site Flickr¹¹, dedicated to photographers. On these sites, users don't have access to each other physical identity, yet they maintain a diachronic on-line presence. eBay users bid with an high degree of trust in a purely on-line environment in which the reputation of both sellers and buyers is established accordingly to the history of their performances (Nwana, Rosenschein et al. 1998). Analogously, Amazon users trust the reviews written by registered users with a high percentage of positive feedback and trust sellers that have been positively reviewed by previous buyers. Flickr implements a reputation system based on safe/unsafe tagging depending on the kind of images that the users upload to their photo streams.

⁹ <http://www.ebay.com/>

¹⁰ <http://www.amazon.com/>

¹¹ <http://www.flickr.com/>

The evaluation of a trustee's physical characteristics is another aspect that is considered fundamental for the occurrence of trust. Pettit and Seligman point out that the direct observation of the trustee's physical characteristics is necessary to ascertain her dependability. As Seligman puts it, "[the trustee's] clothing, behaviour, general demeanour allow the trustor to form an opinion about her moral values and commitments" (Seligman 2000). More generally, according to this position, physical interactions allow for observing other traits of the trustee's character that help in establishing his reputation and are then potentially indicative of her future behaviour.

The problem here is whether a trustor, in order to assess the trustworthiness of a potential trustee, has necessarily to interact physically with him. An individual's trustworthiness is an assessment of the probability that he will behave as the trustor expects him to do. There are examples of such an assessment, which are based exclusively on reputation, without necessitating physical interaction. Imagine, for example, a seller and a customer who traded rice at the end of 18th century. Neither of them has ever seen the other and they interact only by writing letters to each other. After years of good interactions, the seller sends the rice to the customer before she receives the payment and the customer does not check the quality of the rice before paying for it. Both the buyer and the seller trust each other even though they have never experienced physical interactions. Their trust is grounded purely on the results of their past performances and on the information that they have collect about each other during previous years.

Long-distance interactions are not the only example of trust in which the physical identity of the trustee is not taken into account. This is true also for every situation that implies referral trust (Blaze, Feigenbaum et al. 1996; Ranjit 2007), an instance of trust that one develops in an unknown individual by considering only the information about that individual's reputation provided by other individuals or by other sources, such as newspapers or televisions.

We have to conclude that the trustee's physical characteristics are not necessary to assess trustworthiness and in turn to foster trust. A more fundamental part in this scenario is played by the trustee's reputation, resulting from the history of interactions between the trustee and the trustor or, more generally, from the history of interactions

that the same trustee has had with different individuals in the same environment.¹² On-line trust can occur and does not require the presence of a shared cultural and institutional background, certain knowledge of the trustee's identity, or physical interaction. The next step is to clarify the nature of on-line trust and of its role in on-line social relationships.

3. Trust as a facilitator of social interactions

The analysis of trust provided in (Taddeo 2010) offers a conceptual understanding of this phenomenon. This account of trust is particularly useful in addressing the case of on-line trust because it is general enough to identify the peculiarities of trust without being bound to its occurrences in a specific environment, would it be off-line or on-line.

According to the notions of trust already introduced, in (Taddeo 2010) trust is grounded on trustworthiness: "trustworthiness is the guarantee required by the trustor that the trustee will act as it is expected to do without any supervision" (p. 250). Taddeo's analysis of trust focuses on Kantian perfectly rational agents, who quantitatively assess the potential trustee's trustworthiness on the basis of the trustee's past performances – its reputation. Once quantified, the value of the trustworthiness is inversely proportional to the risk faced by the trustor that the trustee will not perform its operations as expected. As such, the trustworthiness can be used by the agent to define a risk threshold in order to decide whether to trust the potential trustee.

This analysis can be adapted to the case of less idealised agents by changing both the criteria by which trustworthiness is assessed and the threshold of risk that an agent is willing to face in order to trust. For example, an agent could ground his assessment on his feelings, social habits and conventions or religious beliefs alongside or instead of other rational criteria. This assessment would produce a subjective risk factor that would be evaluated against the risk threshold that the agent would be willing to run in order to trust. The risk threshold could be influenced by considerations about existing guarantees against betrayal and by the trade off between potential advantages and damages brought about by trusting.

¹² See Gambetta, D. (1998). *Can We Trust Trust? Trust: Making and Breaking Cooperative Relations*. *Trust: Making and Breaking Cooperative Relations* D. Gambetta. Oxford, Basil Blackwell: 213–238. and Taddeo, M. (2009). "Defining Trust and E-trust: Old Theories and New Problems,." *International Journal of Technology and Human Interaction (IJTHI)* 5(2): 23-35 for more details on role of reputation in the assessment of trustworthiness.

The differences between Kantian rational agents and individuals concern the way in which they assess the trustworthiness and risk threshold but not the properties of the concept of trust. Once that an agent has been considered trustworthy, both Kantian perfectly rational agents and individuals trust in the same way. The trustor decides to *delegate* to the trustee a given task¹³ functional to the achievement of the trustor's goal. The trustor does not supervise the trustee's behaviour and decisions as the trustee is considered trustworthy. Delegation and absence of supervision are then the defining characteristics of the occurrence of trust. Trust is a *property of relations* not a relation itself. Trust qualifies the relations occurring among the agents of a system changing the way in which they occur.

In this theory of trust it is particularly emphasised that a relation qualified by trust has the property of being *advantageous* for the trustor, because it “minimises the trustor's effort and commitment” in achieving his own goal. Here is the definition of trust offered in (Taddeo 2010):

“**Trust:** Assume a set of first order-relations functional to the achievement of a goal and that two agents are involved in the relations, such that one of them (the trustor) has to achieve the given goal while the other (the trustee) is able to perform some tasks in order to achieve that goal. If the trustor chooses to achieve his goal through the task performed by the trustee, and if the trustor considers the trustee a trustworthy agent and hence does not supervise the trustee's performances, then the relation has the property of being advantageous for the trustor. Such a property is a second-order property that affects the first-order relations occurring between agents and is called trust.”

An example will be useful to illustrate this definition. Suppose that Robert is the reader of a journalistic book reporting the events of the Vietnam War, and that Wanda is the writer of the book. Wanda has a very good reputation as journalistic writer, she is known for being an unbiased writer and she always grounds her reports on verified sources. On the basis of this reputation Robert considers Wanda to be trustworthy and uses her book to acquire information on the Vietnam War. Following the definition of

13 Please note that the task that an agent is trusted to perform may entail both performing or not performing a given action. Consider for example the cases in which A may trust B not to sell her a faulty product. In this case A expects B to perform the task of providing a perfectly working product. In the same way if A trusts B not to be violent, A is actually expecting B to be patient or quiet.

trust as a second-order property, there is a first-order relation of communication between Robert and Wanda, and this relation is further qualified by the presence of trust. We can recognise the occurrence of trust from two elements: Robert delegates the task of collecting information to Wanda, namely evidences about the Vietnam War, and he did not supervise Wanda while she was performing this task. The presence of the second-order property of trust affects the communication relation between Robert and Wanda, determining some advantages for Robert, whose effort and commitment to the goal of being informed about the Vietnam War are considerably reduced, i.e. he can acquire information on the War without having to collect all the necessary material by himself.

This analysis of trust casts a new light on an understanding of the role of trust in social systems. In section 2 we described Yamagishi's and Kikuchi's analysis, which shows that trust promotes social interactions while occurring in uncertain and then risky situations. Yamagishi's and Kikuchi's results are coherent with other philosophical and sociological studies (Luhmann 1979; Hume 1992; Gambetta 1998) in which it is argued that trust promotes the emergence of social behaviours in situations in which there are not (yet) social infrastructures. The more an individual trusts the others, the more the risk of subsequent betrayal diminishes. This happens because individuals learn on the basis of their experience to correctly assess the trustworthiness of the others.

Taddeo's analysis adds a significant argument to this thesis by pointing out that trust implies the prospective of a significant advantage for the trustor in achieving his goal. Such advantage is the reason for which an individual considers the possibility to trust other individuals, and to take the related risks. Hence the presence of trust *facilitates* the emergence of social behaviours and the growth of the social capital.

Now that the nature of trust and its role in social systems have been clarified we are ready to analyse the occurrences of on-line trust.

4. The case of on-line trust

So far we have argued that the presence of a shared cultural and institutional background and the ascertain of the trustee's physical identity and characteristics are not necessary conditions for the occurrence of trust. The next step is to clarify the nature of on-line trust and its role in on-line social interactions.

An insightful analysis of the nature of on-line interactions has been provided by psychological and managerial studies developed within the framework of e-commerce (Bhattacharjee 2001; McKnight and Chervany 2002; Corritore, Kracher et al. 2003). These studies stress what could be called the *mediating* nature of the on-line environment. The on-line environment affords the possibility of so-called computer mediated communications, and is the *locus* for the communication of information. Here ‘information’ should be understood in the general sense of meaningful content that can be transmitted from a source to a receiver.¹⁴ All on-line interactions concern the communication of some information, not only in the obvious cases of chats and e-mails but also, for example, when on-line sellers communicate to on-line buyers information concerning both the offered products, their honesty, efficiency, loyalty and so on (Corritore, Kracher et al. 2003). The whole point of e-commerce is the communication of the correct information in the most effective way, so as to capture the users’ attention and trust.

The example of e-commerce is useful to understand how trust applies to on-line interactions. Following the theory of trust outlined in the previous section, trust is not a relation itself but a second-order property qualifying first-order relations. In the case of on-line interactions, trust affects the relations of computer-mediated communication occurring among individuals. By means of his website, the seller S of an on-line shop communicates to the buyer B the cost of the desired good, the quality, the delivery time, and so on. Analogously, on the social networking portal, the on-line friend communicates information to another on-line friend about what he is doing at the moment, whether he likes a movie or a specific site.

In the case of an e-commerce store, B is said to trust S when:

- B and S communicate, also indirectly through the content and functionalities of S’s website;

14 For a comprehensive treatment of what is called ‘semantic information’ see Floridi, L. (Forthcoming). The Philosophy of Information. Oxford, Oxford University Press. The reader should note that in the studies mentioned above the term ‘information’ is used in a broad manner. The analysis of the epistemic nature and of the properties of information as semantic content falls outside the scope of this paper. For this reason we will disregard the distinction between information, dis- and mis-information and the related philosophical debate as well as the debate on the nature of information developed on the basis of Shannon’s Information Theory Shannon, C. E. and W. Weaver (1949). The Mathematical Theory of Communication. Urbana, University of Illinois Press.

- B delegates to S the task of finding out and tracking down the goods which B desires to buy, to assess its cost and quality, and to determine the costs and time of delivery; and
- B does not supervise S's performances of any of these actions nor does she verify the information communicated by B.

On-line trust is a particular instance of the second-order property of trust, characterised by it occurring in an on-line environment and qualifying only first-order relations of communication. Like off-line trust, on-line trust is grounded on the trustee's trustworthiness. Since on-line trust is successful when the communication between the two individuals is honest and transparent, then honesty and transparency are the criteria that should be endorsed in the assessment of the potential trustee's trustworthiness. It is not a case that an efficient and user-managed review system is one of the ubiquitous functionalities offered by e-commerce sites.

We now have all the elements required to define on-line trust:

On-line trust is a specific instance of the second-order property of trust. Such instance has the peculiarity of exclusively qualifying first-order relations of communication (referential trust) occurring in on-line environments and the effect of producing some advantages¹⁵ for the trustor.

This definition highlights that the peculiarities of on-line trust are not due to the environment in which it occurs but to the kind of first-order relations that it qualifies – i.e. on-line communications. The differences between the occurrences of off-line and on-line trust are *topological* and not ontological because the environmental factors have a role only in the process for the evaluation of the trustee's trustworthiness.

We shall now focus on the analysis of the role of trust in the on-line environment. Trust as defined in the previous section facilitates the emergence of social behaviour by providing the individuals in the system with the opportunity of advantageous social interactions. This effect characterises the occurrences of trust in off-line as well as on-line environments. Nevertheless, if observed more carefully, the occurrences of on-

¹⁵ Please note that no assumption is made on the type of advantage enjoyed by the trustor, nor on whether it can be quantified.

line trust are shown to have a peculiar impact on the development of the on-line social environment.

On-line trust makes interactions advantageous for the trustor, hence providing an incentive for the trustor to interact with other individuals. As a consequence, online trust increases the interactions and the social network of the individuals in the system. Furthermore, as Yamagishi and Kikuchi note, individuals refine their social intelligence – i.e. their ability to appraise the trustworthiness of the other – to avoid risky interactions. This initiates a virtuous circle that leads to a selection process, according to which trustworthy individuals are involved in a growing number of interactions, whereas, in the long run, untrustworthy individuals are progressively emarginated and excluded from the social system. These dynamics are quite evident when considering on-line communities, such as those of eBay's or Amazon's customers and sellers.

On-line trust is successful when the communication is *honest* and *transparent*, i.e. when the trustee does not lie and does not hide anything to the trustor (Demolombe 2004). Lack of transparency and dishonesty are the ways of betraying on-line trust. Consequently, transparency and honesty are two main parameters in assessing the potential trustee's trustworthiness.

The virtuous circle initiated by on-line trust enhances the dissemination of honest and transparent interactions. This becomes clear if one considers, for example, the strategies implemented by e-sellers to obtain the trust of Internet users. Transparency in company policies, stock availability, timeline and dispatch procedure, even on prices, are some of the most common policies put in place, together with the commitment to act honestly by delivering what the customer has seen on the website (Corritore, Kracher et al. 2003).

Trust does occur in on-line interactions and it also provides the means for a significant evolution of social behaviours in such environments.

5. Conclusion

This paper contributes to the debate concerning on-line trust with a critical analysis of the arguments against its existence, a definition of on-line trust and an evaluation of the role that this type of trust plays on the on-line social environment.

The proposed analysis of trust is based on distinguishing trust from the assessment of the trustworthiness of a potential trustee and clarifying the definition of the risk threshold that a trustor is willing to accept. More specifically, it has been argued that a shared background of social and moral values and physical interactions are not necessary for the assessment of the trustworthiness of an individual. Occurrences of referral trust have been used as a paradigmatic example of a type of trust that requires only the evaluation of reputation.

Following the definition of trust presented in Section 3, on-line trust has been defined as a second-order property qualifying first-order relation of communications occurring in an on-line environment. On-line trust is a type of referral trust and the on-line trustworthiness of a diachronic identity is evaluated on the base of its reputation.

A theoretical merit of this paper has been to show how a single theory can be used to explain the nature of trust independently from the environment in which it occurs. The differences between off-line and on-line trust are topological and not ontological. They differ in *where* they occur but not in *what* they are. Differences should be sought in how the trustworthiness is assessed and in how the risk threshold should be set as well as on the type of relation of which trust is a property.

The final contribution of this paper has been to show how on-line trust promotes a virtuous long-term circle that rewards honest and transparent communications between on-line peers. Exactly as it occurs off-line, on-line betrayals and scams are numerous and well studied (Baker 2002). Their continuous evolution indicates that the on-line community is developing and adapting its social intelligence in order to correctly establish the degree of trustworthiness of on-line peers. In this scenario, on-line trust provides a great opportunity for the development of the on-line environment and, as such, it should be embraced and promoted.

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