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Abstract

“Reputation systems” are widely used in e-commerce, crowdsourcing and crowdfunding platforms, as well as in a multitude of different web-based services. However, recent works stressed how the attribution of the reputation could be unrelated to the actual behaviour of the users. The aim of this study was to investigate which factors influenced the formation and the maintenance of the reputation in an online multiplayer game. Our study provided further and novel evidence of how people greatly rely on the previous acquired reputation of their interactors, whenever they are asked to rate them after a game’s interaction. The “Reputational heuristics” adopted by players appeared to neglect the actual interactor’s behaviour, in favor of a judgement in accordance with his behaviour.

Keywords

Reputation systems Reputational heuristics Human virtual dynamics Online cognitive dynamics

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1 Introduction

In virtual environments reputation based systems are nowadays very common and diffused in an increasing multitude of web based services. Information and Communication Technologiesn (ICTs) have facilitated the proliferation of systems based on online feedbacks [1]. For instance, e-commerce sites (e.g., e-Bay, Amazon) rely massively to them in order to discover the sellers' reliability, thus ensuring their own survival in the labour market. The same companies increasingly recognize the benefits associated with having a good reputation, and employ a considerable amount of resources and energy in reputation management practices [2, 3, 4]. Indeed, reputation seems able to exert an influence upon people behaviours, judgments, feelings and thoughts. Already Semmann et al. [5] noticed how people tended to be influenced greatly by the reputation of their interactors. Interestingly, also a huge set of projects concerning Collective Intelligence platforms owe their success to the ability of reputation systems to engage people and keep their interest alive through gamification [6]. For istance, the possibility to get badges, to climb charts or to acquire a certain level is what allowed Waze (i.e., a crowdsourced traffic monitoring application) to work and to be appreciated by a large number of users. The same results have been reached by applications related to education and learning goals, such as Duolingo and Khan Academy. However, despite all the aforementioned projects use reputation systems for their own well-functioning, barely new scientific evidence [7, 8] stressed the fact that reputation could be acquired in a manner partially disconnected from the "actual trustworthiness" of our own social partners. Thus, it became a very important issue to understand what happens when reputation is derived from the feedbacks of other individuals (e.g., e-commerce sites) and not from people's actual behaviour as in some experimental settings [5]. Is well known how individuals often use cognitive heuristics in their social decision making process [9], and how such "algorithms" frequently appear to violate the principles of rationality [10, 11]. For what concern the social judgments, people internalize behavioural rules of thumb from the very first years of life [12], and make their application automated. Moreover, as pointed out by Postmes and Spears [13], when people interact within a virtual environment, a psychological state defined as "de-individuation" could occur. In these circumstances the sensitivity of the individuals to local norms (i.e., those environmental signals that indicate which behaviour is appropriate and desirable in that context) increases. Moreover, the anonymity and the physical isolation that characterize many virtual interactions, have been found to push individuals to be more influenced by the set of local norms (e.g., subjects' reputation). Therefore, the aim of the present study was on the one hand to investigate whether or not individuals behaved as rational agents during reputational multiplayer online game (i.e., giving a positive feedback when they receive a gain, and providing a negative feedback when they receive a damage, disregarding the opponents' reputation). On the other hand, we wanted to make more clear which factors contribute to develop a good (or a bad) reputation during the virtual dynamics generated by the game. In order to investigate such a dynamics, we developed a Bargaining game with a reputation system, using the *Google Script* programming language. The game asked the participants to provide an evaluation of their opponents after certain game interactions, having clear their actual behaviour and current reputations.

2 Participants

The research was conducted respecting the guidelines for the ethical treatment of human participants of the Italian Psychological Association (i.e., AIP). A total of 113 subjects carried out entirely our experiment. 77 of them were adolescents (36 females) with an average age of 16 (s.d. 1.28) and were recruited in a high school in Prato (IT). While, 36 of them were adults (19 females) with an average age of 21 (s.d. 1.88). Both adolescents and adults were recruited through a complete voluntary census.

3 Methods and Procedures

Procedures and setting. The adolescents carried out the experiments in the computer lab of their high-school, while the adult participants took part in the experimental sessions in the computer lab of the Faculty of Psychology in Florence. Despite these two samples accomplished the experiments in two different locations the procedures and the lab environment were made as identical as possible. The participants seated at their computer positions that were separated by the others by means of partitions. Moreover, the subjects were strictly not allowed to talk one another and all the interaction between them were made anonymously via computer. Before receiving their access data, the instructions of the game were showed on the participants' monitor and read aloud by the experimenter as well.

Bargaining game. The game involved group of six players interacting one another for 45 rounds (15 in each role). In this game Receivers had to decide to accept or to decline a deal (exchange of resources) proposed by another player (i.e., Donor). The Receivers could only saw the amount and type of the resource offered by the Donor, but were unaware of what and how much the Donor asked them in return. To take their decision the Receivers could asked for a suggestion to an Observer that was identifiable only from his reputation. Indeed, the Receivers' available information about the Observers was limited to their reputation score. Thus, the Receivers were fully unaware about the actual Observer's previous moves. The Receivers couldn't select the Observer they wanted from all the other players that were playing that role, but they were matched each turn with a random Observer by our system. At the end of the game each Receiver was matched exactly three times with each Observer. However, matching did not ensure that the Receivers interacted (i.e., ask for a suggestion) with the matched Observer. Once the Receiver's decision has been taken, the Donor's request is revealed. If the Receiver asked for the Observer's suggestion (to accept or to decline the Donor's offer), he had the opportunity to feedback the Observer and thus contribute to the Observer's reputation. We specify that the players could rate the observer only after becoming aware of the real request of the Donor. In this way the receivers always knew if the observer had been "fair" with them or not.

Data Analysis

The preconditions necessary for the inferential analyzes were verified on the experiment's data. For the continuous observables that were under investigation, the normality of the distribution was assessed through the analysis of asymmetry and kurtosis values. Due to the repeated measures structure of the experimental data, the inferential analyses were conducted using a general linear mixed model (GLMM).

4 Results

To understand how reputation was attributed within our setting we focused our attention to the feedback behaviour of the Receivers. Indeed, was through these actions (give a like or a dislike) that the Observer's reputation was built. Therefore, we analysed the feedback behaviour by means of some generalized linear mixed models. The gender and the age of the participants as well as the game-related observables (i.e., the goodness of the suggestion provided, the previously acquired reputation) were all considered as parameters.

For what concerned the game-related variables, we defined them as it follows:

- The Observer provided a good suggestion when he suggested to refuse an offer with a negative difference between the amount offered and the amount required in return, and also when he suggested to accept a positive exchange offer. Instead, suggest to the Receiver to accept a disadvantageous deal as well as to refuse a positive one were classified as bad observations. A total of 810 suggestions have been categorized as good suggestion while 421 as bad suggestions.

- The Observer's reputation was defined by the difference between the likes and the dislikes received. Thus, a positive reputation was characterized by a positive difference between these two feedbacks while a bad one by a greater number of dislikes. In total 543 game records referred to negative reputational scores while 610 to good rated Observers.

To better represent the interaction between these two game-related variables and their distribution in our sample, in Table 1 we presented the percentage of good and bad suggestions for each reputation category (i.e., positive and negative).

Table 1.

Good and bad suggestions across reputational scores

	Bad suggestion	Good suggestion
Negative reputation	36.0%	64.0%
Positive reputation	30.5%	69.5%

The final and best model is reported in Table 2.

Table 2.

Generalized linear mixed models. Factors that influence the feedback behaviour of the receivers.

	GLMM best model LIKE			
Model precision	*Akaike**	**F**	**Df-1(2)**
Best model	74,4%	24.515	42.265***	2(317)
Fixed effects			
Factor		**F**	**Df-1(2)**
Reputation		74.154***	1(317)
Goodness of suggestion		27.078***	1(317)
Parameter		**Coefficient (β)**	**Student *t***
Reputation(-)		−2.257	−8.611***
Goodness of suggestion(-)		−1.448	−5.203***

*** = $p. < 0.001$; Reputation (-): Bad reputation; Goodness of suggestion (-): Bad suggestion.

Table 3.

Generalized linear mixed models. Factors that influence the feedback behaviour of the receivers when they have received a good suggestion from the observer.

GLMM best model LIKE - Good suggestion received

Model precision	*Akaike**	**F**	**Df-1(2)**
Best model 76,5%	13.422	49.251^{***}	1(215)

Fixed effects

Factor	**F**	**Df-1(2)**
Reputation	49.251^{***}	1(215)

Parameter	**Coefficient (β)**	**Student *t***
Reputation(-)	−2.443	-7.018^{***}

$^{***} = p. < 0.001$; Reputation (-): Bad reputation.

The Age and the Gender of the participants did not seem to influence the feedback behaviour of the Receiver neither directly nor trough interaction effects. Only two factor appeared to contribute to define the Observers' reputation. Specifically, good suggestions and positive reputations drew more frequently a positive feedback from the others. Conversely, providing a bad observation or having a bad reputational score, determined less positive feedbacks and more negative ones. Interestingly, the standardized β seems to highlight how Receivers could have been more affected in their feedback decision making by the previous acquired reputation of their interactor instead of his actual behaviour (i.e., the goodness of the suggestion received).

The influence exerted by the reputation on the Receivers' judgment has been further investigated through two other generalized linear mixed models. In each one of them we selected only one typology of suggestion. The first model (Table 3) refers to those cases in which the Receivers obtained good suggestions from the Observers, while the second one (Table 4) considered only those situations in which the Observers provided bad observations to the Receivers.

When the Observers provided a good suggestion, those of them with a good reputation attracted more positive feedback from the others respect to those with a negative reputational score (Table 3). The same pattern has been observed in those cases in which the Observers' suggestion damaged the Receivers (Table 4). Overall, for equal suggestion

received (i.e., identical actual behaviour) we observed a preference for those Observers who gained previously a good reputation.

Table 4.

Generalized linear mixed models. Factors that influence the feedback behaviour of the receivers when they have received a bad suggestion from the observer.

GLMM best model LIKE - Bad suggestion received			
Model precision	*Akaike**	**F**	**Df-1(2)**
Best model 70,9%	12.325	16.611***	1(101)
Fixed effects			
Factor		**F**	**Df-1(2)**
Reputation		16.611***	1(101)
Parameter		**Coefficient (β)**	**Student *t***
Reputation(-)		−1.897	−4.076***

*** = $p. < 0.001$; Reputation (-): Bad reputation.

5 Discussion

Understand how reputation is constructed within a widespread feedback system, like the ones used in e-commerce as well as in some crowdsourcing projects, is a major issue. Indeed, reputation systems are actually considered as the most effective mechanism to foster cooperation in virtual environments [14]. However, recent works suggested how this process could be biased [7, 8]. Our work provided novel evidence about how reputation is really “made” within such virtual environments. Differently from rational agents, people are not only influenced in their judgments by the actual behaviour of their interactor. Indeed, they seemed to be greatly affected also by the previous acquired reputation of their social partner. In general, people preferentially rewarded (i.e., provided a positive feedback) individuals who gained in the past interactions a good reputation and conversely punished (i.e., provided a negative feedback) more often participants who obtained a bad reputational score. This feedback tendency is maintained disregarding the actual behaviour of the social partner. Indeed, equally

trustworthy individuals (i.e., participants which shown the same suggestion behaviour) are treated (i.e., feedbacked) differentially according to their reputational rating. To put it simply, people seemed to use a sort of reputational "heuristics" to take a feedback decision that violated rationality (i.e., appeared to be disconnected from the actual behaviour). Our results highlighted a critical aspect of the use of reputational systems in virtual environments. Indeed, given this feedback tendency, reputation appear to preserve its state (i.e., to be maintained) even despite the actual behaviour of the social partner. In other words, reputation appear to have an inertia. Not only that, initial distinctions in reputation levels leaded to a different reputation rate grow. Indeed, good-rated Observers acquired more easily further social rewards whether they helped or damaged the Receivers respect to those Observers who were identified as bad partners. The great influence exerted by reputation within a widespread feedback system appear in line with de-individuation studies [13]. Indeed, reputation in such environments could convey that important social information to which people are very sensitive. The anonymity and the physical isolation that characterized such environments appear able to trigger the reputation heuristics decision making. This process ends up in reinforcing that social evaluations (i.e., reputation) that has been constructed by the whole group through the widespread feedback system. In the end our results stressed the necessity to further investigated the circumstances under which the reputation systems could work properly.

Notes

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