Chapter 8
Collective Intelligence in a Computer-Mediated Environment

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ABSTRACT

The role of the computer in the emergence of collective intelligence is most of the time underestimated. Outside the fact that it allows the collaboration between individuals, it modifies the interactions and memorizes the traces of the activity. These specific features lead to computer services becoming full actors of the interaction with their own influence like individuals. The resulting symbiosis effect boosts significantly the outcome of the human collaboration. Thus, the objective of this chapter is to deepen our understanding of these mechanisms in order to improve the management of collective intelligence.

INTRODUCTION

Collective intelligence is far from being a new concept. More than two thousand years ago, Aristotle (350 B.C.E) already states that:

The principle that the multitude ought to be supreme rather than the few best is one that is maintained.....For the many, of whom each individual is but an ordinary person, when they meet together may very likely be better than the few good...For each individual among the many has a share of virtue and prudence, and when they meet together, they become in a manner one man, who has many feet, and hands, and senses; that is a figure of their mind and disposition.

Actually, not only collective intelligence is not new, but it is evoked in a wide variety of fields ranging from theoretical issues to applied domains. Thus, why adding a new chapter to the huge amount of literature available? From our point-of-view, there are two major answers to this question.

DOI: 10.4018/978-1-4666-7266-6.ch008

First, because even if this topic has been widely evoked, we still know very little about this emerging phenomenon. Looking at the behavior of social animals (bees, ants, ..) or human collectivities we have, for a long time, observed the leverage effect of the group commonly described as providing more than the sum of individual contributions. This observation set apart, we don't know the precise conditions of this emergence and why a small cause can, sometimes, generates mass consequences. What are the factors that increase the group cooperation and is it possible to artificially enhance or forecast these conditions? We may also ask why a collective behavior can provide positive outcomes (knowledge, mutual assistance,..) or suddenly leads to uncontrollable results such as herd effect. Even if social sciences give valuable enlightenments to these issues, we think that the intake of computer sciences has to be reconsidered in a new perspective. Not only can it give complementary answers, at the image of what is being done in other scientific fields such as in biology (genome research) or in physics, but also because the role and the influence of computer devices in human interactions are now almost unavoidable. But, what is this role more precisely?

The answer to this question is actually the main topic of this chapter and constitutes a change of point of view in front of a purely human-centered scientific posture. In our investigation, the computer is not seen as a passive device, but as an actor to full-fledged of the collective activity.

If it is obvious that the spreading of interconnected computer environments offers new opportunities for the cooperation between individuals, the understanding of the underlaying cooperation mechanisms is still limited. This contribution can seem evident when having in mind initiatives such as open projects like *Wikipedia.org*. We can also cite the popularity of opinion polls on a large scale such as those operated by *Change.org*. The surveys launched by an individual or a small group aspire to mobilize large numbers of citizens lobbying for a wide range of causes. In some cases, such initiatives may even influence governments policy. These results of the collective intelligence are favorable to the decision-making and generate structured knowledge or high value software. But here, the computer is seen as a service support, outside this added value, its own influence is not addressed.

Actually, another role sometime underestimated is that computer environments modify the interactions features and consequently their potential outcomes. A basic example of such changes appears if we remember that the non verbal interaction is often lost in computer communications such as in e-mail. It was shown that this loss of information can have unexpected consequences in human relations. Let's imagine that a small joke can be misinterpreted and can be felt as an affront without a smile or the adequate voice tone. Another example is that of the interactions delays reduction favored by the computers. It is no more necessary to move or to wait, a lot of things can be done from a smart-phone. The drawback is that such "time compression" gives more weight to impulsive behaviors, sometimes irreversible compared to those in the "real life". These phenomena are particularly sensitive to certain forms of mediated interactions such as those observed in on-line share trading. Given that collective phenomena can be sensitive to small variations, as amplified by snowball effect (see chaos theory), it seems necessary to seek to deepen the role of the computer in human interactions.

A third role, that we can evoke, starts from the observation that the interconnected computer environments such as Internet are actually a huge memory that keeps the traces of users activities and interactions. In theory, this large amount of data as well as in the general field of experimental sciences, can provide clues explaining complex emerging phenomena. In this way, traces analysis can be a useful addition to psychosocial assessment in the understanding of collective intelligence. For example, we will see in this chapter that the coherence of the group structure, measured from