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The Descent of Pluto: Interactive dynamics, specialisation and reciprocity of roles in a Wikipedia debate ☆

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ABSTRACT

This research focuses on analysing collective activity in Wikipedia, conceptualised as an Online Epistemic Community ("OEC"). Previous research on Wikipedia has shown that widespread participation, coupled with the principle of neutrality of viewpoint, has led to 'editing wars' and associated high coordination costs. The question that we address is therefore that of how to analyse the interactive dynamics of conflictual OEC discussions. To address this issue, we performed a longitudinal analysis of a specific case-study within the French-speaking "astronomy" Wikipedia OEC, revolving around the renaming of the article on the celestial body "Pluto", given the 'descent' of its scientific status from that of a planet to an asteroid. Our choice was to focus on the analysis of *dialogic and epistemic roles*, as an appropriate meso-level unit of analysis. We present a qualitative-quantitative method for analysis of roles, based on filtering major participants and analysing the dialogic functions and epistemic contents of their communicative acts. Our analyses showed that online epistemic communities can be communities in the true sense of their involving cooperation, in that roles become gradually specialised and reciprocal over sequences of the discussion: when one participant changes role from one sequence to another, other participants 'fill in' for the vacant role. Secondly, we show that OECs, in the case of Wikipedia, do not function purely on a knowledge-level, but also involve, crucially, negotiation of images of participants' competences with respect to the knowledge domain. In that sense, OECs can be seen as socio-cognitive communities. The originality of our research resides in the qualitative-quantitative method for analysing interactive roles, and the results of its application to an extended longitudinal case study.

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1. Introduction

Over the preceding decades, new forms of distant computer-mediated collaborative work have emerged, termed "online epistemic communities" (OECs[1]), whose *raison d'être* is the creation of various kinds of knowledge-objects, such as software in Open Source Software communities, or encyclopaedias in Wikipedia communities. A knowledge object is a technological-semiotic entity that both embodies knowledge and provides means for its further elaboration (e.g. Hakkarainen et al., 2011).

OECs originated from the FLOSS movement (Free, Libre, Open Source Software, see for example Ducheneaut, 2005; Barcellini et al., 2008a) and more generally from a new socio-economic system, referred to as Commons-based peer production (Benkler and Nissenbaum, 2006), facilitated by digitally networked environments on the Internet. More recently, building of encyclopaedias by OECs has grown very quickly, and particularly in the case of Wikipedia (e.g. Kittur et al., 2007; Suh et al., 2009). Indeed, participation in Wikipedia requires no specific knowledge of programming languages, and is supported by wiki technology (Bryant et al., 2005). Moreover, the rules within the community encourage

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[1] The term "online epistemic community" has been proposed in Barcellini et al. (2014). It integrates the two notions of online communities (Preece, 2000) and epistemic communities (Cohendet et al., 2003) in referring to online communities in which collective activities are finalised by the common objective of knowledge construction, such as in Open Source Software (OSS) or in Wikipedia.

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free participation of everyone. This leads to low participation costs that have resulted in a very fast growth in general public participation, supported by egalitarian principles (Reagle, 2007).

However, widespread participation, coupled with the principle of neutrality of viewpoint, has led to 'editing wars' and attendant high coordination costs in Wikipedia. Vandalism can be revealed by repeated deletions (partial or total) of content and "revert" actions in article pages. This is now largely controlled by "bots" (robots), for which machine learning techniques have been proposed (Smets et al., 2008). Moreover, with the growing maturity of the Wikipedia OEC, the nature of participation has tended to change over time, with a migration of conflicts to discussion pages (Viegas et al., 2007; Suh et al., 2009). These conflicts, despite their having often high costs in terms of communication, time and effort, can nevertheless be productive, in terms of the collaborative elaboration of shared knowledge in the OEC. Genuine discussion of contentious points in an article, involving a broad range of participants over sufficient time, together with an appropriate resolution procedure, has potential for creation of valuable 'knowledge objects', allied to the building of the online community itself. It is therefore important to understand the dynamics of such conflictual discussions.

The term "conflictual discussion" is central to this paper. By this we mean a discussion (a verbal exchange) that involves: (1) a socio-cognitive conflict (Mugny and Doise, 1978), i.e. an explicit disagreement between social actors ("socio-") with respect to proposals or points of view ("-cognitive"); (2) (possibly) an interpersonal conflict, involving personal attacks and other highly face-threatening utterances (Brown and Levinson, 1987); and (3) exchange of (counter-)arguments with respect to 1 and/or 2, i.e. an "argumentative discussion" (Van Eemeren and Grootendorst, 1984) or "debate", and/or a "quarrel" (Walton, 1989), in the case of interpersonal attacks. As we describe in detail below, the extended conflictual discussion analysed here satisfies all three criteria, to greater or lesser degrees, depending on its evolution.

Our choice of a conflictual, argumentative discussion as a case study was thus motivated by: (1) the importance of conflicts in these communities, (2) existing research that insists on the role of argumentation in knowledge building (see Section 2.1 below), and (3) by the fact that extended and rich dialogue for analysis effectively seems to be elicited above all in the case of conflict and ensuing debate. Finally, we consider that certain types of argumentative discussion can be highly collaborative, in that they can force participants to come to terms with each others' views (in order to critically assess them, and build compromise) and thus contribute to community building. The main research question that we address here is therefore that of how to analyse conflictual Wikipedia discussions in a way that brings to light the unfolding of their interactive dynamics over time. This is a precursor to understanding their potentials for community building and collective knowledge elaboration processes in OECs.

There is now a growing research literature on the analysis of collective activity in Wikipedia (see e.g. Jahnke, 2010). Most existing approaches depend on either 'mining' and automatically processing logfile data (edits, messages) to derive network structures, or else on questionnaires and interviews. Our approach is based on the view that it is necessary and enlightening to enter into detailed qualitative analysis of the content, form and meaning of discussions, in relation to the texts being collectively edited, in order to understand knowledge co-elaboration processes.

In this direction, this research is based on the longitudinal analysis of a specific case study within the French-speaking "astronomy" Wikipedia OEC, whose main socio-cognitive conflict (see above) revolved around the renaming of the article on the celestial body (significantly here, not the cartoon character) "Pluto". The discussion was made necessary by a decision of an international scientific body that required Pluto to 'descend' from its status of a planet to that of an asteroid (the 'descent' of Pluto). Although this may appear an almost anecdotal case (the title), the discussion that ensued, extending over two years, brought out fundamental issues concerning the audience and rules of Wikipedia, as well as the interplay of participants' images of each others' knowledge in the domains of astronomy and Wikipedia aims, rules and practices.

The analysis of such extended and complex discussions requires careful choice of units and levels of analysis. Our choice here was to focus on the analysis of *dialogic and epistemic roles* emerging from interactions[2] (interactive roles, as opposed to statuses: see Section 2.2), as an appropriate meso-level unit of analysis. We present a qualitative-quantitative method for analysis of interactive roles, based on filtering major participants and analysing the dialogic functions and epistemic contents of their communicative acts. The terms "dialogic function", "epistemic content" and "communicative act" are discussed in detail in subsequent sections of the paper. Preliminary working definitions are as follows. The term "communicative act" (Bunt, 1989, 1995) refers to an extension of the concept of "speech act" (Searles, 1969) to include communicative action that is not necessarily accomplished by speech (it could also be performed by gesture, or a written message), whose semantic content is not necessarily propositional (e.g. utterances such as "Your turn", or "What did you mean?"), and is analysed as having a "dialogic function" (a function in dialogue that can go beyond the speech act performed; e.g. an informative dialogic function could be performed by a "question" speech act; a regulatory dialogic function could be realised by an "assertion" speech act). The term "epistemic content" refers to a semantic content of a communicative act that refers to the knowledge domains (e.g. astronomy, Wikipedia rules, the discussion participants) with respect to which the discussion takes place.

We found that interactive roles of participants could be derived on the basis of a small number of dialogic functions — informative, argumentative and regulative — allied to epistemic contents that distinguished subcategories of the task (problem domain; Wikipedia rules) and interpersonal contents (referring to the group, or specific participants' competences). Interactive roles along each dimension (dialogue, epistemic) were derived using statistical techniques on frequencies of categories of communicative acts, that differentiate participants from each other in these terms.

Our analyses show that online epistemic communities can be communities in the true sense of their involving cooperation, in that interactive roles are reciprocal and evolve over sequences of the discussion: when one participant changes role from one sequence to another, other participants 'fill in' for the vacant interactive role. We see this as an emergent property of the interaction (see above), eschewing considerations of intentionality or causality (i.e. we make no hypotheses as to participants' intentionality with respect to the evolution of the roles that they effectively adopt). Secondly, we show that OECs, in the specific case of the Wikipedia discussion considered here, do not function purely on a knowledge-level, but also, crucially, on that of the negotiation of images of participants' competences with respect to the knowledge domain. In that sense, OECs can be seen to be "socio-cognitive" communities, involving interpersonal relations. It transpires that, despite or because of Wikipedia rules of free participation and the possibility of anonymous participation at a distance, in certain cases participants become concerned by the

[2] In stating that these interactive roles "emerge" from interaction we make no assumptions concerning participants' intentions or awareness of their adoption of these roles, seen as regular and distinctive aggregates of ways of participating in the discussion, nor do we assume that relations between interactive roles are "causal", cognisant or intentional.

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