

Digital bugs and interactional failures in the service of a collective intelligence

Samira Ibnelkaïd

Caroline Vincent

The emergence of communication networks and interfaces has brought about a reconfiguration of individuals' modes of presence and modalities of interaction. Onscreen interactional experiences have led to the creation of new linguistic resources and of a renewed relationship to space and time, as well as to others and to oneself.

The reticular and diffracted aspect of these new forms of interaction entails the development of a new technobodily literacy. Individuals need to adapt to the conversational failures inherent to all social interaction (Kerbrat-Orecchioni 1990; Traverso 1999; Béal 2010) and the "technical bugs intrinsic to digital technologies" (Vial 2012). The versatility of digital matter (Vial 2012) and the fragility of social interaction (Kerbrat-Orecchioni 1996) show how much communication is co-constructed and based on cooperation. During their onscreen experience, individuals need to collaborate in order to initiate, maintain, preserve and repair the flow of communication, in particular, during critical episodes that are inevitable in polylogal, polyartefacted interactions.

This raises the question of the methods used by interactants to deal with these critical episodes. How does the group identify and overcome digital bugs and interactional failures during onscreen interactions, and how does it enact a collective intelligence?

Our study started with an ethological description of a critical episode in which we observed the difficulties participants encounter in trying to make their activities accountable and the ethnomethods they develop to overcome these difficulties. This description was accompanied by a

transdisciplinary synthesis of the results of the three main axis of our research : the study of attention from a communicational point of view, that of corporeality in a phenomenological approach, and that of politeness from an interactionist perspective. Finally, these new theoretical-analytical findings were linked to the discursive analysis of the final assessment questionnaires completed by participants, in particular, on the key points of their experience and their recommendations.

Failures and bugs : Incidents inherent to (onscreen) communication

Verbal interactions and their failures

Interactional felicity

During their interactions, individuals are constantly trying to understand their interlocutor and to make themselves understood by them. Participants employ a variety of multimodal and multisemiotic resources to maintain this intelligibility.

Interactional felicity thus consists in the speaker being able to express a thought, to make it understood or gain approbation for it, to share an opinion, etc. (Cosnier 1996). This felicity is determined by the answers to the speaker's four questions : Do you hear me? Are you listening to me? Do you understand me? What do you think about it? (Cosnier 1996).

Interactive bricolage

But this affective framing does not come into being without incidents. The constant search for interactional felicity regularly entails adjustments inasmuch as communication necessarily involves malfunctions. The interactionist approach defines an interactional malfunction as "a linguis-

tic phenomenon that transgresses a rule of the ideal functioning of interaction” (Sandré 2009, 69). These malfunctions are interactional failures (Kerbrat-Orecchioni 1990; Traverso 1999).

These conversational incidents reveal the processes through which interactants engage in a cooperative process that seeks to prevent communication from coming to a full stop. It is thus clear that a social interaction rarely takes place without linguistic snags; failure is an intrinsic element of communication. What is important for participants is not simply trying to avoid failures, but, above all, learning to deal with them and to overcome them.

Digital technology and its bugs

The volatility of digital matter

When interactions take place through screens, participants also have to deal with incidents related to digital technology. Technology is itself a source of failures. As Stéphane Vial (2013, 213) explains, versatility is one of the intrinsic structural characteristics of digital phenomena, since “bugs are consubstantial with calculated matter” (2013, 213); a digital artefact “cannot live without bugs” (2013, 214). Although, software programs and algorithms were created by humans, they do not guarantee perfectly controllable functioning *a priori*.

Nonetheless, it is still difficult to understand and accept the element of the unknown and unpredictable that digital technology introduces into our communication and our experience of the world, in the sense that there is a paradox between the growing power of these tools and their permanent fragility. Their users expect these ultra-connected, high-performance devices to respond to their needs right away, and they thus become more and more intolerant of technical incidents or bugs. Inasmuch as this instability is

intrinsic to digital equipment, we need to develop a digital literacy that includes education about digital versatility. We need to learn to live with bugs : to accept their effects and to circumvent the damage they cause (2013, 216).

The collective and its intelligence

Construction of membership

Well-functioning onscreen interactions are based on the participants' ability to make themselves visible and to make their productions and the activities in which they are situated intelligible. How social actors grasp the construction of intelligibility is at the heart of ethnomethodological research. This approach

seeks to analyse the social world not as it is given, but rather as it is continually in the process of being made, continually emerging, as an orderly, intelligible and familiar objective reality (Quéré 1990, 75).

Harold Garfinkel (1967), the founder of ethnomethodology, defined it as an approach that

analyzes everyday activities as members' methods for making those same activities visibly-rational-and-reportable-for-all-practical-purposes, i.e., "accountable", as organizations of commonplace everyday activities (1967, vii).

The concept underlying this whole approach, accountability, alludes to the fact that (re)cognisability, intelligibility and describability are essential properties of action (Mondada 2006, 117).

Participants in the interaction then have to share a natural language in common ; they draw on specific ethnomethods to organise their interaction. These shared ethnomethods form the basis of membership. Participants become "members" of a group by mastering a common language, which

also includes unsaid elements, allusions and deictics (etc.), which are not intelligible to non-members.

Enacting collective intelligence

The actions undertaken by members of a group that is part of a collaborative arrangement can thus be viewed as the co-construction of a form of collective intelligence (Levy 1994). This means

understanding in a more and more precise and operative way how human groups function when they are engaged in a cooperative activity using networked computers or mobile terminals (Levy 2003, 106).

Collective intelligence can take various forms depending on the contexts in which it emerges, the communities and their members. However, its co-construction involves invariable underlying characteristics : local and limited information from each member of the collective, a restricted set of basic rules, multiple and reticular interactions, and an emergent structure that is beneficial to both the individual and the group.

In a general sense, collective intelligence is thus defined as “the emergent behaviour of a heterogeneous network dynamic involving people, technical devices and messages (composed of symbols)” (Levy 2003, 113).

Three types of networks are outlined in a dynamic of interdependence :

- A network of signs (knowledge and messages),
- A network of beings (ethics and people),
- A network of things (abilities and equipment).

The sense of personal efficacy

There is an unbreakable link between an individual and the community in which they evolve. In order for individuals to feel involved in collective evolution, they have to

become aware of their relevance and their efficacy within the group. Albert Bandura (1980) developed the concept of the sense of personal efficacy (SPE) and introduced the idea that individuals' subjective perception of their chances of success has a decisive influence on their behaviour.

We employ the concept of SPE to measure its diachronic evolution among the seminar participants.

Analysis of the onscreen enactment of collective intelligence

Here we examine the ethnomethods used by interactants to deal with critical episodes occurring in a polyartefacted, screen-based hybrid experience. How does the group identify and overcome digital bugs and interactional failures in digital interaction and how, simultaneously, does it enact a form of collective intelligence?

Ethological observation of a critical episode

In keeping with our reflexive, ethological and ethnomethodological approach, we start by observing the occurrence of a critical episode (analysis available in the digital version of this manuscript).

Description of a critical episode

We define critical episodes as moments in which communication for one or more participants, who are unwittingly excluded from the participation framework, has to be re-established in real time.

The ex-situ participants could not always easily verbalise a technical problem : verbalisations interrupt the seminar and require the group to focus momentarily on the technology, thus generating an interactional fail. In the case of a conference, for example, giving an alert would mean interrupting the lecturer(s), which could be problematic if the

participant(s) were not fully confident in the ability of the group to re-establish communication swiftly.

The lived experience varies for participants situated in different communicative spaces. This asymmetry of perception, along with the impossibility of fully comprehending the subjective experience of the other, leads the participants first to wonder – does the sound problem signalled on Adobe allow adequate listening comfort for the remote participants? Do they need help? Can I do something about the problem or is it simply a bug that I cannot do anything about? Am I capable of intervening? – and then to undertake a collective effort at co-constructing durable ethnomethods that allow them to make communication intelligible and fluid and their activities accountable.

It is also important to make one's own perception intelligible and visible to others, so that they can choose to act (or not) upon obstacles, failures or other bugs.

In the conditions of this experience as it was unfolding, a devolution (Brousseau 1998) was required for the seminar to function smoothly for the remote participants : i.e., responsibility is transferred from the latter who are experiencing difficulties to the participants who are physically present in the seminar room.

On the importance of managing critical episodes and their diachronic evolution.

Disengagement

Critical episodes are thus crucial moments, since how they are dealt with may lead participants to disengage from the situation.

If participants in difficulty did not receive the expected help during the critical episode, this does not mean that the others were indifferent to what they were experiencing. On the contrary, we see that the difficulties of the remote parti-

cipants also constrained their own participation and made them uncomfortable. At that precise moment (situated at the very start of the seminars), they simply did not know how to deal with the situation and undoubtedly were reluctant to interrupt the guest lecturers yet again.

Diachronic evolution

Our results showed that not only the group's technical skills, but also the sense of personal efficacy (Bandura 1980) of both the group and the individuals evolved over time. The number of technical problems (whether reported or not) did not decrease, but participants became more confident in the group's capacity to resolve them swiftly and efficiently, so that they do not refrain from signalling them when they did occur. This phenomenon is confirmed by the questionnaires completed at the end of each seminar and by the verbal interactions recorded during the seminars, in which we found self-congratulations and references to the fact that the bugs and failures were resolved more and more quickly.

Key points on the subjective experience of participants and recommendations

The focus of our interest here is, more precisely, the first and last questions addressed to the twelve participants in the final assessment questionnaire.

Question 1 : "What are the most striking aspects of your experience in the seminar this year?"

In addressing this question, we can distinguish between approaches depending on the modalities and instantiations of presence. We bring together the responses of members who regularly :

- made use of ex-situ artefacts (Amélie, Christelle, Liping, Samira),
- embodied the role of sentinel (Caroline, Jean-François, Joséphine),
- embodied the role of technical or verbal procurator (Christine, Dorothee, Morgane),
- embodied the role of witness (Mabrouka, Yigong)

It should be noted that these categorisations are fluid and dynamic and that a member can be affiliated with several of these categories in practice.

The ex-situ artefacted members have in common the fact that, in their responses, they emphasised their relationship to the artefacts more than to the other participants.

As for the members who regularly embodied the role of sentinel, they point out the permanent need to be alert, as well as the innovative character of the experience, which entailed multidisciplinary and a divergence of profiles, but a convergence of objectives.

The members who mainly embodied the role of procurator invoke above all the group's benevolence and the solidarity of the collective.

Finally, the members who mainly embodied the role of witness emphasise, above all, the reflexivity and distance taking that is specific to their experience.

The key points identified by the participants in this hybrid experience match the properties of collective intelligence as defined by Pierre Levy (2016). The ex-situ artefacted members highlight the network of things with their focus on resources and equipment; the sentinels, the knowledge network with epistemic and message capital; and the procurators, the network of beings with ethical and social capital. The complementarity of the actors and the maintenance of the networks thus allow this unique group to enact a form of collective intelligence.

Question 4 : “Which advice would you give to someone who would like to use a mixed on-site/remote system?”

Here again, the participants’ responses reveal elements that are characteristic of the co-construction of membership and the enaction of collective intelligence transcending interactional failures and digital bugs. The participants who made the recommendations summarised here are indicated in parentheses.

Regarding the network of signs :

- Create shared and participatory online spaces and take notes in them, so that everything is accessible to everyone, anywhere and at any time (Caroline, Christelle).
- Establish rules of communication prior to the hybrid experience (Christine, Jean-François).

Regarding the network of beings :

- Designate specific roles (Christelle, Christine, Samira) or at least choose a moderator to be on the lookout for signs from the participants and to distribute speaking turns (Joséphine) or create in-situ – ex-situ pairs (Samira).
- Develop multimodal attention competencies (Liping, Yigong, Joséphine) and learn how to manage artefactual affordances, gazes and postures (Jean-François).
- Preserve the necessary mutual understanding in the group (Morgane).

Regarding the network of things :

- Integrate the different artefacts gradually within the overall apparatus as each becomes stabilised (Amélie, Dorothée) and choose which to use depending on roles and activities (Christelle, Samira) or make use of a single type of artefact (Mabrouka, Yigong) and, in that case, prioritise the robots (Jean-

- François and, more specifically, the Kubi for participants and the Beam for speakers (Christelle).
- Provide back-up equipment and a plan B for all the elements of the apparatus (Caroline) and pay special attention to the quality of the equipment (Morgane) and of the Internet connection (Dorothée).
 - Rely on the technical team to install and maintain the digital set-up (Caroline, Christelle, Joséphine, Morgane) or give each participant training in how to use the artefacts or provide a sort of instruction manual for the communication tools (Christine, Jean-François, Samira).

The recommendations make clear that the participants have a common perception of the socio-technical challenges involved and an implicit awareness of the network dynamics underlying the emergence of collective intelligence and based on the complementarity of the members and their confidence in their ability to cooperate. One of the participants formulates the main recommendation that transcends all the others : “accept that technical problems are an integral part of the set-up” (Joséphine). Participants thus simply need “to try to keep the margin of improvisation to a minimum, since something unexpected is going to happen no matter what” (Caroline).

The multidimensional approach in this reflexive ethological study of the enaction of screen presence has elucidated the ecology of the unique experience of a hybrid polyartefacted research seminar in a transdisciplinary way. The ethnomethodological description of a critical episode, along with the transdisciplinary synthesis of the results of the work done along the three main axis of our research and the discursive analysis of the final assessment questionnaires, have revealed what we call the technobodily ethno-

methods used by participants to anticipate, work around or resolve incidents that occur during critical episodes. Our approach to this hybrid experience reveals that identifying and resolving interactional failures and digital bugs requires mutual attention, precautionary face work and distributed agency. Moreover, technical and conversational incidents prove to be beneficial inasmuch as they contribute to the co-construction of collective intelligence (Levy 1994) and enacting a group ethos that does not reduce the number of critical episodes, but qualitatively improves how they are dealt with. This process reinforces the sense of efficacy (Bandura 1980) in both individual and collective capacities for remediation. Presence is maintained in a dynamic process of balance and interdependence among the networks of subjects, of things and of signs.

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