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## ***Collaborative Technologies, Applications and Uses<sup>1</sup>***

Is it still possible to draw up a state of arts about collaborative technologies?

For twenty years now, reflections on these technologies have become the subject of a scientific discipline in its own right: *Computer Supported Cooperative Work* (CSCW). Since this term was fashioned in 1984 by Irene Greif and Paul M. Cashman, research scientists of extremely diverse disciplinary origins (ergonomics, psychology, linguistics, sociology, etc.) have invested in research which has been presented in a large number of conferences (the main one being the bi-annual «CSCW» conference which spawned a «sister» conference in Europe called «ECSCW»), in a specialist magazine (CSCW), in dozens of books and hundreds of articles.

Since their inception, collaborative technologies have been considered as being one of the technological innovations which has best managed to associate the social sciences in its development. While in the majority of domains, a watertight boundary may be observed between a sociology of the techniques which analyse how a technology is produced and a sociology of uses which studies the social effects of these same technologies, in the collaborative technologies there is to be found a specific configuration where the sociology of techniques and sociology of uses dialogue one with the other to propose rapid and iterative improvements to software design (Kies, Williges, Rosson, 1998).

This proximity between the social sciences and the conception of collaborative technologies has had consequences on the way in which these technologies are conceived. Indeed, for all those who work in this field, it would very clearly seem that design and uses are not two instants which succeed each other in the life of a technological innovation but two activities which should interpenetrate so as to produce innovations which respond in the most effective way possible to the real needs of the users (Akrich, 1998). The CSCW has thus more particularly developed the processes of «user-centred design», a «co-design» or a «participative design» where the users are incorporated in the different phases of the design process through the medium of statistical surveys, descriptions of work situations, videos of users in activity, locations in experimental sites or even of the deployment in a natural situation (Boullier, 2002). Very numerous methodologies have therefore been mobilised in an attempt to design technologies which incorporate as heavily as possible the real preoccupations of users in the design process.

Besides this permanent concern to put the user in the heart of the design process, the multitude of articles attached to CSCW share a common attachment to the notion of cooperation. It is this which has enabled them to differentiate themselves from the two pre-existing disciplines: the study of information systems on the one hand (*Office Automation, Management Information System* or IS) and on the other hand the design applications

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intended for individual computers (*Human Computer Interaction* or HCI). While the discipline of Information Systems is working on the design of the «large» systems for firms (company servers, Electronic Data Interchanges (EDI), reservation, command or transaction softwares between customer and supplier), the HCI discipline is involved in the design of computer tools which are used to construct a dialogue between an individual and an isolated machine. Compared with these two disciplinary «monsters», the CSCW has made an effort to occupy a domain which both of them perceived badly: the organisation of cooperation of small (and medium) groups of people who work in networks or in project groups. By attempting to orient the needs of isolated individuals (taken into account by the HCI) and the collective and organisational dimensions of Information Systems, the work in the field of the CSCW have as their common aim to attempt to «equip the professional interactions of tools instilling between remote people a sufficiently relevant «effect of presence» for real work cooperation to develop through the communication networks» (Cardon, 1997).

But, beyond this common attachment for the instrumentation of cooperation in groups, the growing inflation of articles in this discipline leads to a very wide diversity in the scientific work, the machines and the software. Thus, it is delicate to propose a typology which puts order into this diversity. However, in Cardon (1997), the author proposes to organise all collaborative technologies by using three complementary variables:

- *time* (synchronous/asynchronous),
- *space* (in presence/remote; room/office)
- and the different *representation and visualisation techniques* (audio/photo/video; board/computer screen/video monitor/virtual reality).

Using these variables, he distinguishes seven sets of different technologies:

1. *Shared design spaces*: e.g. Videodraw, TeamWorkStation...
2. *Mediaspaces*: Collab, Videowindow, Thunderwire (audiospace) ...
3. *Asynchronous cooperative tools*: Lotus Notes, LinkWork, Coordinator...
4. *Cooperative PC*: Cruiser, Piazza, Forum, ...
5. *Electronic tables*: LiveBoards, Smart,...
6. *Electronic meeting systems*: Colab, Groupsystems, Dolphin...
7. *Virtual environments*: Dive, Massive, Freewalk...

As with all kinds of typologies, the latter is open to discussion. It would, however, seem that it may be used to come to terms with the diversity of the technical innovations produced in the domain. Its usefulness does, however, derive more from the examples that it gives which may be used to illustrate the field of this discipline than its comprehensive character. Indeed, it seemed unprofitable to us – and perhaps even impossible – to propose a typology which might attempt to organise artificially a production which is from the origin marked by the multitude of specific uncoordinated developments. The point was made above: what really unites the works associated with the CSCW, are the common principles of the «user-centred» approach and the support for activities of cooperation. The technologies, the methodologies and the epistemologies have always been diverse and the multiplication of the work will doubtless only further reinforce this diversity.

In the domain of collaborative technologies, it would therefore seem, at first sight, that literature reviews of quality have been carried out and tracing the prospects has become delicate. In reality, it also appears to us that the situation is not exactly what it seems to be for paradoxically, while it has placed the uses at the very centre of its reflection, the CSCW talks little of «real» uses for their technologies. Indeed, the uses mentioned above are more often

those of the designers themselves – who test their tools in an attempt to improve them – or those of specific users, often placed outside their classical work conditions, put in the specific position of «testers» of a technology. Indeed, if scientific works and prototypes proliferate in the CSCW community, the successful implantations of software remain rarer (Grudin, 198; Markus, Connolly, 1990; Bowers, 1995; Olson, Teasley, 1996). This fact makes the analysis of uses more delicate since it is known that the users positioned in a role of «co-designers» do not have the same behaviour as the «real» users and these test situations (even reconstructed or within the context of an experiment) are rather different to real use situations (Bardini, Horvath, 1995 ; Woolgar, 1991).

In-depth work therefore remains necessary to evaluate and analyse the «real» uses of these collaborative technologies. Some have set themselves the objective of analysing these real uses. Showing that the interest of this research has been perceived for a good number of years by the community, certain of these studies are even relatively old (Bowers, 1995). Thus, from 1997 onwards, whereas the collaborative tools were still quite rarely really deployed in firms, D'Iribarne, Lemoncini and Tchobanian carried out case studies on the real use of different technologies in a large Telecommunication firm (1999). They thus analysed the use of five types of different collaborative tool: two forums, an intranet site, a «workflow» and a collective management tool. They observed extremely diversified uses of these technologies which themselves are highly diversified. But even taking an identical technology, the two forums, for example, they achieve some particularly stimulating results.

Firstly, they show that the designers of this technology made the implicit hypothesis that a forum functions on its own. They thought that when the players in a firm are given a new channel of discussion and exchange, they will discuss and exchange. Real use shows that they may, on the one hand, really not discuss or exchange or that they may use another channel to do it (e-mail or informal discussions in the corridor, for example). The firm studied had perfectly well identified this difficulty since at this time it had already systematically associated a coordinator with each of these forums put on line, whose role was to answer to certain questions, feeding the forum with information if necessary, facilitating exchanges, etc. Specific work would moreover permit to identify more precisely what competences (specific and important) make a “good forum coordinator”.

However, while both the forums in this enterprise were associated with coordinators, they did not function in the same way. This difference of use may be explained, not by the particular requirements of the technology (since it is the same) but by the way in which these forum interlinked with the former professional practices of the potential users. The first forum was specific to a regional head office of the company and covered a management theme. It was used by sixty or so people of different hierarchical levels during a period of around two months. This asynchronous and remote decision-making process enabled the production of proposals for traditional working parties (meetings with the physical presence of the participants). The success of this forum may on the one hand be attributed to the effective coordination which the young HR executive provided but it would above all seem that its success derived from the fact that these people, belonging to the same regional head office, knew each other prior to the start of the forum and the problem of management put forward was a concrete and common problem in their daily activity. The second forum studied had the opposite fate. Its objective was to favour exchanges between trainees originating from several establishments of the firm who were taking part in training on the evolution of their human resource management role. It was to enable them to face up to the individual tasks that they were undertaking during the periods of intersession, based upon orientations and tools

proposed in the training and in preparation of the training sessions yet to come. It was therefore really a collective working space but it was characterised by low level of activity: few proposals were made there and those which were made were very little discussed. Even when associated with a coordinator, a forum which is supposed to make people who do not know each other discuss (because they do not belong to the same establishment of the firm) a subject which they do not concretely live (since their role as HR manager was a «future» role still to be imagined) would seem therefore to have little chance of functioning.

Other works analysing real uses has been carried out (Pérocheau, 2007; Guiderdoni, 2006; Oiry, 2006; Fribourg, 2005). These monographs inform us about the way in which these uses take their place in the organisational configurations. However, it would seem that a specific framework to take into account the diversity of these real uses is still missing. One line of research to come may therefore be the consolidation of such a theoretical framework.

As was mentioned above, sociology – and particularly the sociology of uses – has already largely contributed to build the initial foundation stones of this theoretical framework. In this way, it is laying the foundations by proposing a precise definition of the term «use». Lacroix thus defines the «social uses» as: «modes of use demonstrating with sufficient recurrence and in the form of uses which are sufficiently integrated in daily life to be able to insert and impose themselves in the range of pre-existing cultural practices, to be able to reproduce themselves and eventually resist as specific practices against competing or connected practices» (Lacroix, 1994, p.147). Sociology of use even develops crucial concepts such as that of the «genealogy of use» (Jouët, 2000) who proposes replacing each use in a trajectory of the uses of one user so as to produce a dynamic analysis of it.

But, while fundamental, these reflections suffer from a limitation which has often been underlined (Cardon, 1997). Indeed, after having proposed precise definitions of uses, this sociology more often satisfies itself with the observation of their diversity and explains it by the generic phenomenon of appropriation (Grimand, 2006) or «domestication» (Silverstone, Hirsch and Morley, 1992; Lelong and Beaudouin, 2001; Haddon, 2003). Furthermore, the sociology of use often focuses on the user alone. It identifies the uses which are made by different people of the same tool but it is often satisfied with an explanation of the diversity of the uses by the diversity of the appropriations which are themselves explained by socio-organisational variables (such as age, sex, position in the organisation, professional identity, etc.) (Jouët, 2000). However, while a “shared design space” has technically little to do with a “electronic meeting system”, it more often omits to attach the diversity of these uses to the technical specificities of a tool. The work of the sociology of uses is useful since it is proven that the use of a tool depends directly on the socio-organisational characteristics of the user and his environment. Whereas, to be complete, this theoretical framework should give the characteristics of the tools as much attention as that given to the characteristics of the individuals. But, it is on this very point that the dividing line mentioned above between the sociology of uses and the sociology of techniques is the most problematic. In the majority of studies, the characteristics of the tools are only referred to very rapidly in a generic way as if the tools constituted a homogeneous and monolithic whole (Cardon, 1997).

From our point of view, to be able to explain the diversity of uses, sociology lacks a framework for the analysis of management tools. A tool analysis grid to enable this approach to be completed was proposed in 1992 by Hatchuel & Weil. Since then it has been tested on several occasions (Gilbert, 1997; David, 1998; Oiry, 2004). For this reason, it appears extremely solid. This grid demonstrates that tools are not homogeneous objects but the

articulation of three very heterogeneous elements: a formal substrate, a managing philosophy and a simplified representation of the role of the players (Hatchuel & Weil, 1992):

1/The formal substrate of a tool designates the set of concrete supports in which the tool is embodied. In the example of the forums referred to above, this formal substrate corresponds to the computer interface through which a user passes to create a proposal on the forum. This interface has an effect on the uses since it only allows for example asynchronous exchanges. It therefore enables certain uses but also makes others impossible, such as synchronous exchanges, for example.

2/The management philosophy behind this tool corresponds to the set of arguments which, in describing its expected effects, attempts to convince the various players in the organisation that it is in their interest to use it. This dimension was hardly referred to in the presentation made above but implicitly, it would appear to be clear that in this forum, as in the majority of forums, implementation is based upon the conviction that remote cooperation better enables the production of concrete results than the isolated work of the players. We were able to observe that if this philosophy was partially applied in the case of the first forum, it was not verified for the second.

3/The simplified representation of the role of the players corresponds to the fact that during the design of a tool, the designers are necessarily led to make hypotheses (at times implicit) on how the users should behave in order that the tool functions well. We have also referred above to the fact that the designers of forums had made the implicit hypothesis that if employees are offered a new channel for exchanges, they will use it. Observing that this hypothesis was not valid, they appointed coordinators for the forums.

This analysis grid therefore may be used to show that, to be correctly defined, a tool should be deciphered on these three dimensions. It is then possible to represent it in the form of a triangle:

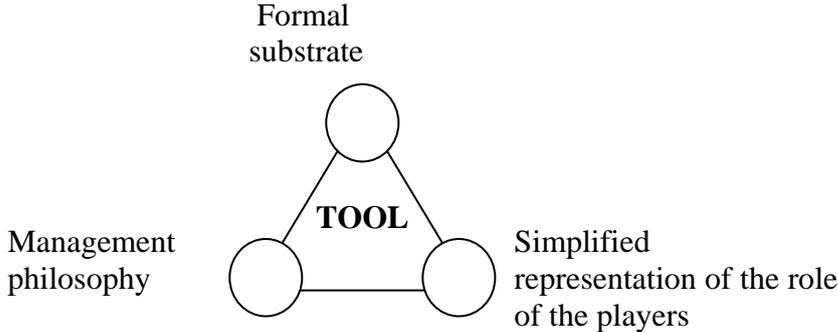
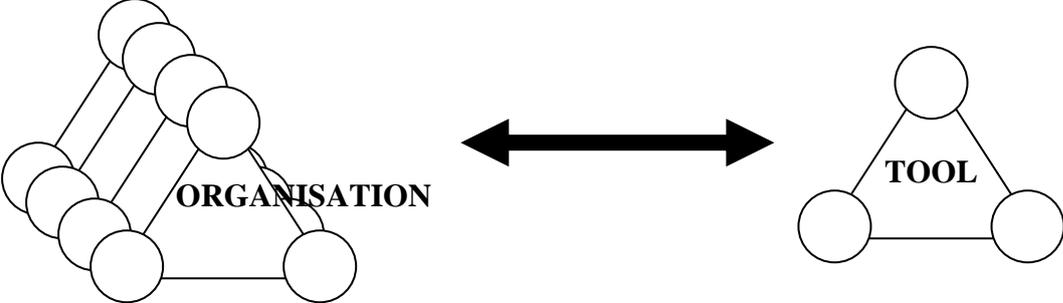


Figure 1: Summary representation of a collaborative tool

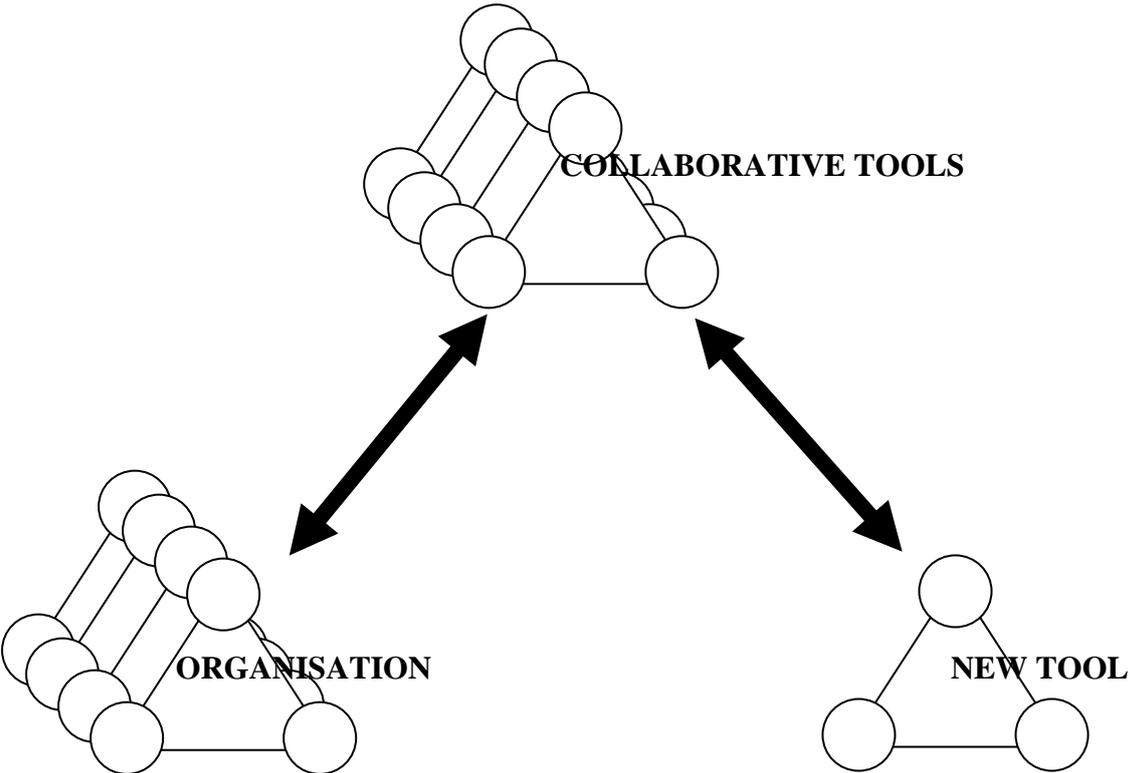
However, the work of the sociology of uses has enabled it to be shown that the precise analysis of the tools does not allow account to be taken of the diversity of uses made by the different players. We have affirmed in the case study presented above that even when both are associated with coordinators, the two forums were not used in the same way. David (1998) re-used the theoretical framework of Hatchuel and Weil (1992) to show that these real uses (when they exist) correspond in fact to an articulation between the characteristics of the tool and the characteristics of the organisation which may also be described thanks to the conceptual triptych: formal substrate, management philosophy and simplified representation of the players. An analysis of this eventual articulation between the organisation and a tool is

nevertheless, made complex by the fact that the individuals, groups and organisations mobilise a very large number of formal substrates (the different management tools, for example), different elements of management philosophy, etc. An inserted representation of these different facets of organisation may be used at least visually to take account of this complexity.



**Figure 2: Summary representation of uses as an articulation between an organisation and a collaborative tool**

Finally, despite the risk of making the analysis still more complex, it seemed necessary to take into account the fact that a new collaborative tool should not merely articulate with the pre-existing forms of the organisation but also with the already existing collaborative tools. The failure of a forum is therefore not necessarily due to the fact of its own ineffectiveness, but perhaps quite simply due to the fact that the players of an firm or a department perceive e-mail or even informal discussions as more effective collaborative tools. Following the work of Rabardel (2005), to understand the uses, it seems necessary to take account of the addition of a new collaborative tool in a portfolio of collaborative tools where it is put under much more competition than was immediately considered relevant. Therefore, it is a new triangle of cooperative tool – organisation – portfolio of collaborative tools which would seem to be the better theoretical framework to take account of the diversity of the uses really observed in organisations.





**Figure 3: Summary representation of uses as an articulation between an organisation, a portfolio of collaborative tools and a collaborative tool**

The diversity of uses brought about by such a complex theoretical framework reinforces the conviction which is emerging increasingly strongly in the CSCW community: if it is indispensable to integrate users in the design of tools, it is illusory to envisage a design which might succeed in anticipating all these uses. It would therefore appear more relevant to turn towards an initial sub-specification of the tools which might enable the users to master them according to the logic which are their own and later undertake a detailed analysis of these real uses so as to favour them and develop them in an improved version of the tool (Bentley, Dourish, 1995; Schmidt, Simone, 1996; Mallard, 2003).

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