# LEARNING AND DISTRIBUTED DECISION IN A COLLABORATIVE PLATFORM

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**Abstract:** this paper describes and justifies the methodological combination of Participatory Action Research and Actor-Network Theory, using concepts of Organizational Learning and Communities of Practice, in the design of a cooperative inter-institutional meeting platform, addressed as a "knowledge network". This platform supports a community of key organizational actors, from several public institutions, which have significant decision-making power although framed by rules, laws and scarcity of recourses. The knowledge network is a conceptual and operational framework that allows the promotion of new ways of analysing facts and issues and their cooperative discussion, in view of a more effective decision-making process. The facilitation of this process should contribute to organizational learning and knowledge management. The paper also deals with the paradigm underlying the methodological approach, and the methods and tools used.

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#### 1. Introduction

Cooperative networks, as infrastructures to allow analysis of facts, laws and rules, discussion about how to act, and decision-making, can merge virtual and real communication enhancing a learning context where knowledge emerges. To better decide, act, and improve the throughput of our community of key actors, we need to manage and facilitate. As a facilitator in the group we are not neutral. An observer that participates in the group meetings should be neutral and not act at all. A facilitator must act over the context, instead of acting over the content, but has a wide range of opportunities to participate actively. A facilitator also needs to care about enhancing the skills of the actors involved, continuously enriching the context. In this facilitating process in a situated context, knowledge has to be managed in a triple sense approach: share; reflection; and need of use.

So, our infrastructure must be specifically designed and developed to be able to provide the building of this intangible artefact that can be recognised more by its results and application then by its corporality - *knowledge*.

We also assume that the infrastructure we address is partly human and partly a thing, partly tangible and partly intangible, partly a concept and partly a context for practice. As practice we mean a reflexive practice, as concept we refer to a cultural environment that frames all the action. Partly tangible and intangible in the sense that the infrastructure is made of technology, applications that work with this technology, and people using both technology and applications in a community of practice. Partly human and partly a thing because it deals with values, rules, laws, regulations that frames the field of action, and also with the emotions communities always tend to produce and suffer from.

In section two, we try to explain and justify the importance of context and the need for a socio-technical constructivist approach. As our methodological approach uses multimethodology, in section three we describe and justify the use of both Action Research and Actor-Network Theory. Section four is dedicated to describe the information platform as an action context guided by the methodologies used. Section five tries to introduce the tools, situating technology into a limited and controlled context for learning and knowledge development. The tools are described in section six, where we try to explain a two phases calendar to take a better advantage of technology and lower negative resistances. Finally in section seven we align some broad and general conclusions.

#### 2. A Social context

Research in the Information System field tends to follow technical approaches that can achieve good results in some specific projects, but are inadequate to many others. Our view of the social context in which the systems are to be implemented is of dramatic importance when we deal with complex environments. And the average complexity of systems has increased with time. We believe that in the last sixty years we have been living in one or more of three different paradigmatic situations.

The *Industrial Society* was dominated by a mechanistic, Cartesian, and Positivist paradigm. *Content*, and the rationality of content, was the key issue to focus upon. It was a time when the *offer* of products was much bigger then the *demand*. The challenge for product quality was low, in the sense that competition was much more based on the simple existence of products and production capacity than on their specific quality. So, the goal was product content, product innovation in terms of new functionalities, ways of innovating in production processes. We had the right paradigm for that time.

The *Information Society* induced a shift in the offer/demand relation. Consumers increased their power, in the sense that *substitutes* gained a significant importance. A consumer that can shift between brands imposes a complete different shape to competition. Products needed to establish differentiation through their intrinsic quality. In that sense, we were still focused on *content*, specifications and quality of products. In those days there was an uncomfortable feeling of paradigm cohabitation: on one side the Positivist/Mechanic/Cartesian and on the other the Constructivist/Interpretivist paradigm. With paradigmatic views of such a difference, research approaches were creating an uncomfortable sense of philosophical clans. *Content* was still the focus, but epistemologies were taking battle positions. The stronger side was the one where scientific thought had originated – the mechanist and Cartesian approach. But things were changing.

The Connective Society where we need a different way of looking at things. Especially in what concerns products and industrial climate. A prolonged exposure to content excellence had already driven us to quality assurance. Today, even car brands normally targeting low prices, like Fiat or Skoda, can guaranty reliability. BMW, Mercedes, Volvo, Saab, for instance, are fighting in another arena – status! In an era in which basic quality of normal products is high, the real focus must be elsewhere. That is why the focus shifted from *content* to *context*. *Context* is the way products are presented, the ways services are designed around their distribution, the adequate positioning of the goals intended, the excellence of communication about the product by itself, the demand, the offer and overall back-office and front-office logistics, the feedback and interactivity over the logistic chain, the transactions abilities, some in purely virtual environments. Context is mainly the result of an increasing search for all that interactivity and transaction abilities. To really understand this profound change, and to be able to cope with it, we need different approaches with new insights. The many to many interactivity actual communication systems and Internet technology allow builds-up a collective mind much demanding and refined then the sum of the discrete multiple minds involved.

At this stage, we are convinced that a Constructivist/Interpretativist paradigm needs to be more then just an emergent approach, it needs to be dominant. Orlikowski considered three broad research paradigms (Positivist, Interpretivist and Critical) and found that between 1983 and 1988 97% of IS research articles used a positivist framework (*Orlikowski*,1991). Less then ten years later, in 1997, Nandhakumar found that 16% of IS research papers used a broadly interpretive approach (*Nandhakumar*,1997).

In our case an interpretive approach is assumed and, according to Mingers, our conceptual framework needs to be aligned (Mingers,1997). By this conceptual alignment we intend an alignment between paradigm, methodology, method and tools.

This is the approach we follow in the design of our *knowledge network*, a conceptual infrastructure, a situated platform able to provide creative interaction (Wenger,1991), motivation, learning context, decision-making facilitation and knowledge management opportunities to solve problems and take actions. This conceptual infrastructure involves a cluster of four institutions of the Public Sector, all concerned with a same goal, Road Safety.

# 3. Multimethodology

We have been involved in action-reflective (Schon,1983) practices and found Participatory Action Research (AR) a very suitable methodology to use in our research. Taking another perspective, being involved with key actors from different institutions, each of them with a wide liberty and power to take decisions, we felt that some of the instabilities, consequence of power and territory disputes, needed to be specifically addressed. That is the reason why we decided to adopt Actor-Network Theory (ANT) to try to deal with this tensions and conflicts, and try to translate and inscribe the different actor's behaviors. An actor-network is a set of evolving links between actors, their actions and all the surrounding influencing factors. This means both that their behavior is translated, that is, re-interpreted or appropriated by other's interests, and inscribed, that is, embodied in patterns of use in the network. The identities and qualities of the actors are defined and refined during negotiations. The most important of these negotiations is translation, an interaction in which actors develop common definitions and meanings, define representatives, and co-opt each other in the pursuit of individual and collective objectives. "Translation rests on the idea that actors within a network will try to enroll (manipulate or force) the other actors into positions that suit their particular purposes. When an actor's strategy is successful and it has organized other actors for its own benefit it can be said that the actor translated the other" (Latour,1987). The infrastructure must then stabilize: "stability should be seen as a function of the interaction of heterogeneous elements as these are shaped and assimilated into a network" (Law,1999). This stability, meaning sustainable order, is continually negotiated as a continuous process of aligning interests.

The result is an infrastructure that is able to deal with laws, norms, behaving cultures, styles, skills, practices, organizational arrangements and contracts, in an environment of ongoing cooperation-negotiation that shares a goal. In this case Road Safety. This infrastructure must be stable (Callon,1993) in an *ANT* sense. "The more stable a network is, the better it defines its components. The possibilities decrease for other

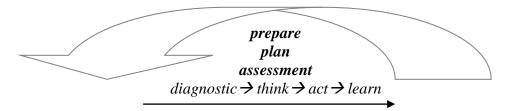
networks to untie the connections in order to redefine an actor for his/her/its own purposes" (Stalder,1997).

So, we use both *Action Research* and *ANT*. Is this a problem, or a lack of objectivity, to use different methodologies in our research? According to Mingers, to use more then one methodology is a way to "focus on different aspects of reality and that, therefore, a richer understanding of a research topic will be gained by combining several methods together in a single piece of research or research program" (Mingers, 2001).

# 4. Action context and methodology

Consistently with the interpretivist paradigm and action-reflection participatory methodologies we adopted, we have built a platform to communicate, a situated learning context to reflect, decide and act. In this collaborative platform, the "learning by doing" and "thinking by acting" paradigms, both in an actor network topology context, are our main drivers. In our community we need to promote trust, an aspect that is either built by behavior, style, and by the use of the right tools. We also need to act in such a way that all the actors involved fell that they are taking individual benefit from the community. To be creative, we need to break some rules, to think out of the box, that is, we need double loop thinking (Argyris, 1974). Innovation, most of the time, demands a pattern of thinking that rethinks values, frames and goals in a realigning way. Disruption, or creative disruption (Lagadec, 2000), is made out of new patterns, some of them defying the pre-existing frame of values. Innovation and creation are unbounded. But ... we are in the Public Sector ... where some constrains are irrevocable. And technology? is technology something trustable to our purpose? In our view technology is trustable only when it is really adopted (used) and "controlled" by a strategy. A strategy oriented by a method, within a methodological framework.

The adopted AR method comprehends three states (*prepare*, *plan and assessment*) and four steps (*identify*, *reflect*, *act*, *learn*), one in each state. This process evolves like in a hermeneutic cycle:



The diagnostic, think, action and learn steps must explicitly integrate awareness about change. Change is either a consequence of action and/or a cause of action/reaction. Furthermore, change is a reflexive concept that must be internalized as a process by itself. We need to work on the perception of what to do with the consequences of our action, that is, we need to work on inductive generalization. The assessment phase evaluates action and its consequences. We need to prepare and plan each of the steps in a cyclic-hermeneutic approach. The way we use this method, with three states and four steps, is similar to the one used in the *SWOT* strategic matrix and is exemplified in table 1. The idea is to cross the axes of the step and state and sort out the most important aspect or action. This is done by the actors, in collaboration, in a free and

informal interaction, with the active (not always neutral) help of the facilitator researcher, that questions and rebates, changes the scope of thought, stimulates better results, and makes his better efforts to grab the participation of all the key actors for the subject in discussion.

3 states 4 stens	prepare	plan	assessment	
identify	- common areas for key aspects - sharing processes - how different actors are affected	- priorities in common action - resources - different levels of acting	- what to access - clients for assessment - possible metrics	
think	- how actors are affected - common values and interests	<ul><li>which strategies?</li><li>prepare field of action</li></ul>	<ul><li>key aspects</li><li>project</li><li>impacts</li></ul>	
act	- allocation of resources - common action viability	- focus on common subjects - regenerative action plans	- assessment coordination - grab necessities	
learn	- different perspectives, why and how to share - different ways of acting	- strengths and weaknesses off project - how to motivate and support action	- effects at different levels (local, regional, country) - diffusion off results	

table 1

The three state four steps method we use in our *AR* approach emphasizes a learning and collaborative action process with the participation of all the identified *key actors*. The actors are enrolled in their actions and their behavior is reflected in the conceptual network. The design and re-design of the network is continually evolving in our *ANT* approach.

# 5. Knowledge, learning and Web technology

But, being technology trustable if controlled, can it be a driver to such intangible entities as knowledge and learning that we intend to address? Is it technology a possible answer to the needs of such entities, growing in organizations? To try to answer to that let's first see how important are knowledge and learning to organizations and then the role of technology in these fields. Learning is as old a concept as human life itself. We tend to agree that the more learning abilities one have, more chances one has to better survive. This applies to individuals, to groups, to communities, to organizations and to societies. An ability to learn is difficult to define, but we can say that it implies an ability to understand and to reframe different problems as they evolve and change by themselves. Putting things in this way it is very easy to see how important are learning abilities to human beings and human communities. In fact the learning ability is not only correlated with surviving, but it is also responsible for being able to see facts in new perspectives, in a wider context, guiding the progress into earlier causes for phenomena, as well as going beyond the

related consequences. In fact, the more you learn the more you know, the more you are able to learn fast the earlier you know, and these are both survival capacities.

Knowledge is also an old concept, and it is probably even more difficult to refer to then learning. We have already stated that they are two related concepts. Knowledge could be defined as our know-how, what we keep inside our body and soul after forgetting about the related learning processes. It is the ability to understand, decide and act, in a complex chain of life. It is the fuel for satisfying courses of action with controlled benefits for some, or for all. It is a sustainable self that allows us to progress, not only allowing us to see further and clearer, but definitely allowing us to better decide and act! And can the knowledge aspect known as tacit-knowledge be represented? Can we produce, transfer or save it in a machine memory? We deeply think we can't. It is not a tangible thing. The operations allowed with tacit-knowledge are not of that genre. We can provide a clime in which it emerges more easily, we can build a context where it can be produced, but whatever we can do would always be indirect. What we can is to create conditions in which knowledge grows and flourishes.

And technology? Can technology push and boost a knowledge process by itself? We think not. Technology can be used as a booster (Carsten,2002), as an enabler, as a context to facilitation, that is, as an indirect entity that contributes to built and define the right clime, contributes to an acceptable context to learning and knowledge flourishing.

## 6. Tools

Our idea is that Web technology can provide such a context. A virtual community can be animated in such terms that in the process of analyzing, discussing and deciding about things, a context for learning and manage knowledge is shaped, constructed and adjusted. It is a tuning process with a goal – to create better conditions to learn and produce knowledge, and decide about action.

So we can use technology, but sometimes technology is to complex, difficult to assimilate. So we need to look for usable technology. Simple technology we mean. Technology in our view should always be at human service and should never be a restriction or an imposed element. Technology, to be helpful, must first be internally understood, easy to use and adopt, and only after being accepted it can (or not) be assumed as a contribution to better provide interesting outputs. That is, if technology is well accepted it must be adopted, if not it must be rejected! But we need to understand that what we reject today can easily be adopted tomorrow so any decision concerning these choices must be revisited and re-analyzed as processes evolve.

In our concrete situation, we are involved with a small team, a community that joins elements from different public institutions. The kernel of this community is a small group of five elements belonging to five different institutions. Time-to-time, different experts can join and take part on the discussion. These elements meet in physical terms every two weeks. This was the way they used to discuss and analyze problems, to have physical meetings in a same room. These meetings take two solid afternoons every month. The contact between the elements is mainly easy and open, each of the elements using either the institutional phone, or the cellular phone from each other.

The use of mail was not very encouraged, although it was an accepted technology (to other purposes).

Now, with our research, the approach changed. The physical meetings keep on going and we are involved in them, but we are part of the team mainly as a facilitator, and our facilitation is mainly through technology. We enlarged the meetings into a permanent virtual community meeting because we could use Web technology, as fortunately every element of the group was already a Web literate.

As already stated, technology should not push, so the tool we begin using is basically an email list, all the members of the group being members of that list. We begun to agree on some main and very broad aspects on the way that list should operate. Then the list became an arena for discussion and new ideas. The way discussion goes along and the way new ideas are debated increased a lot the productivity rate of the team. That is assumed and measured in ways we describe in a different paper. But the way we keep track of processes is not so explicit. The email list can surely be a learning tool, but it is a poor knowledge tool. This is the reason why we are now evolving to the introduction of a content manager as a second, more sophisticated, tool. The content manager can provide and articulate relations and connections that with the list management alone are normally lost. For that second step in technology we arranged a partnership with a local developer (*Escrita Digital*). We use the tool for free, the return being suggestions of new features and a critical reflection about the existing ones.

## 6.1 email lists

We organize different lists of discussion, segmented not by function, but by goal. All the actors attend one or more of the lists, some actors attend one group of lists, others attend a different group, as we describe in table 2.

	f	a1	<b>a2</b>	a3	a4	a5
list 1	X	X	X	X	X	X
list 2	X	X	X	X	X	X
list 3	X		X		X	X
list 4	X	X		X		
list 5	X	X	X			X
list 6	X	X	X	X	X	X

table 2

The researcher, as a facilitator, referenced by the letter  $\mathbf{f}$ , is involved in all the lists. Each institution has one column of the table, referred as an  $\mathbf{a_i}$ , or actor.

**list 1** is context oriented, we discuss ways of working with the different lists and general procedures. We develop common meanings and try to build up a sense of belonging to a group in a situated learning environment. All the actors attend this list. We also identify and try to learn in all the three states of the AR model adopted;

*list 2* is specifically oriented to boundary responsibility definition. There are subjects that must be attended by two, or all of the institutions, and others that must be attended at least by one of them. If there is responsibility concurrence we need to

provide specific rules to deal with it, and if there is no one attending a specific area, we need to assign it to at least one institution;

*list 3* is specially concerned with road pavements. Ways to attribute responsibilities in deficient maintained roads and ways to accept notification from drivers. We design specific circuits for quick action response to the problems detected. We also try to define and improve certification processes;

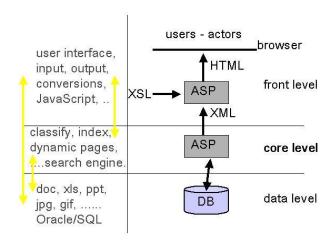
*list 4* is specially concerned with signalisation. Ways to attribute responsibilities in deficiently maintained road signals and ways to accept notification from drivers. We design specific circuits for quick action response to the problems detected. We also try to define and improve certification processes;

*list* 5 is specially concerned with driver behaviour control. Ways to attribute responsibilities in deficient controlling policies, strategies for enlarging control efficiency and effectiveness;

*list* 6 is designed to discuss and analyse filtered messages from drivers and ordinary citizens. This list is also attended by at least one actor of every institution. We specifically stress the importance of this last list because it represents an independent and critical observation of the system. A system that is critically observed tends to be more reasonable and sensitive then another that doesn't have these feedbacks.

## 6.2 Content manager

We use a content manager on the Web, with user and password access control. The structure of a content manager can be seen in figure 1. In figure 2 we see a screen to manage the colour of documents but, on our left side, we see the links to manage (from top to bottom) users, confidentiality, groups, collections, categories, files, html generation, documents, glossaries, mailing lists, sites and statistics.

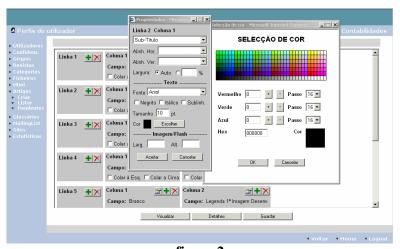


May 2003 / adapted from ED

**figure 1** (ED-Portal, Content Manager Architecture)

A content manager provides an easy to use publishing system featuring editorial workflow, document versioning and categorization. We can instantly publish new content, archive old content and push/pull content through/from the website. So we

can collect, create, classify, store, publish, distribute and diffuse all types of content files, including multimedia. Collection, for example, involves the verification and aggregation of content from multiple authors. Management includes the indexing of documents, the addition of metadata tags, as well as an effective storage/retrieval process to this content. Finally, publishing consists of determining how to format the content to appropriate delivery mechanisms (Web, \*.doc paper), decisions about whether this content can be syndicated, and considerations about how to handle "royalty rights" to authors.



**figure 2** (ED-Portal, Documents Management)

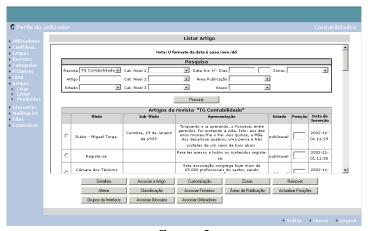
For example, features like the ones following are typical in a content manager:

- Creation, or article authoring a content manager normally has an easy to use HTML editor, much like a cut down version of popular word processors. It provides the usual formatting functions, including insertion of headings, images, links and tables.
- Classifying, or content categorization a hierarchical categorization system lets us group articles by subject, topic etc., enabling us to control where articles will appear on the website and allowing the website to have advanced searching.
- Version control each time an article is updated the content manager keeps a
  copy of the previous version for reference at a later stage. This allows for the
  tracking of changes and a full historical archive of documents.
- Editorial workflow control content manager is configured to reflect individual roles within the publishing process e.g. author, editor etc. Each user account can be set-up with any combination of rights to author, release, pull or archive content.
- Related content linking documents created within the system can be crosslinked to other related articles or with other website resources. Linkages can also be created to other types of information in the content manager.

We use a Portuguese version of a content manager, designed and developed by *Escrita Digital*. This application is referred to as *ED-Portal*. We can manage the users' attributes through a signature process and assign the users different access levels. We have a site user registration form, a member profile management, and an

administrative security assignment. We can explore seven different types of user, always ensuring perfect security. The other features are like the ones already described. One final specific feature of *ED-Portal* is the ability to produce combined statistic analysis (authoring, productivity, participation).

With this tool and the already described group of mailing lists we try to create a situated learning context, a knowledge support to decision-making and action, organizing information, events and discussion outputs in ways we can deliver them at the right place at the right time. We support the decision-making process at any level, with different scopes of action. Figure 3 represents a screen to search for documents of a same collection.



**figure 3** (ED-Portal, Collection Management)

# 7. Knowledge platform, an entity and a concept

It is usual in organizations and communities not to keep track of the discussions, passed decisions, styles of acting, positions of each actor on each discussion subject, and that means we cannot know and measure assumed positions, behavior patterns, subtleties of action taken. We cannot understand, remember, measure, which means we cannot improve, and that is part of the inability to provide better solutions to problems, so that is a process against knowledge building. The simple fact of being able to "see" things organized and arranged in ways that can show different points of view at a given time, and the specific evolution of each point of view over time, is a learning experience by itself. But this platform that uses Web technology and well adopted tools, email lists and a content manager, promises more then a window to a scene and the possibility to put this scene in motion over time.

In fact this platform provides an interactive context that enables us to follow specific and well-identified strategies. Using this platform in the way we tried to describe enables us to create and explore new directions and new approaches to analyze and resolve problems, new ways to control that these solutions are committed to action, so this context actually influences the course of action.

Underlining the potentialities of this virtual platform we nevertheless would like to stress the importance of the real physical contact. It is very important that the elements of the community see and talk face-to-face often. In our case that was a problem already resolved, since we have face-to-face meetings every two weeks. In a face-to-face interaction we can assess and observe character and behavior details inaccessible in virtual space. And these aspects as the styles of each element of the community are of paramount importance to the facilitator. Only deeply knowing each actor's personality can the facilitator provide a good guidance to the context management and to a fluid course of action.

Our contextual platform, our knowledge network, is concept and entity, it is real and virtual, it involves men and applications, technology and laws, out of the box thinking and frame limited action, it is in fact a complex socio-technical infrastructure.

In our knowledge network actors interact, facilitator included, in a collaborative continual process. But as competition sometimes improve with some forms of collaboration, also collaboration sometimes doesn't evolve without some forms of competition – "coopetition = cooperation + competition" (Nalebuff, 1996). The mirror effect is not valid here. Improvements happen with collaborative competition mainly because of profits and gains on sharing risks, investment and resources. At the beginning it was difficult to imagine and accept this "intrusion" of collaboration into the competitive arena, but after it was evident that in such situations the pie to be shared does not stay the same, it enlarges. The pie enlarges with the cooperative policies and practices. A win-lose situation evolved to a win-win perspective with gains for all. In different terms, collaboration sometimes also gains with competition. Mainly as a stimulus to performance and innovation, with actors trying to outperform the others. Different causes, similar consequences. In fact we talk about different causes and similar processes. The learning challenge in a merge and sharing a foreign market is similar to the one we verify in a community of practice where it is important to understand your partner not only in terms of pure collaboration, but also in terms of your own performance in that community. In a community of practice, a professional environment, you often need to demonstrate that you are as good as all the others, if not much better. And this is not ridiculous, because it satisfies your ego and improves your throughput, which means improving the community throughput.

The learning challenges when you deal with competition in collaborative processes are not only an accelerator to the collaborative process in itself they are also an enabling and stimulating factor to knowledge enlargement and learning. This challenge is an added value to the effectiveness of the knowledge network.

## 8. Conclusions

Tools, like technology, are nothing by themselves. We strongly believe that only when we put tools and technology in context we are able to define goals, procedures and appropriate uses for them. The context we have built up is a situated platform where we facilitate discussions, induce different approaches for problems, promote innovative ways of accepting external inputs, analyze best feasible answers to real problems, analyze repetitions and inconsistencies, and make decisions about courses of action.

This platform is better defined as a social environment then as a technological entity. It is, in fact, a socio-technical entity. The interactions in this socio-technical platform are guided by a methodological approach we align and continually re-align and

continuously redefine, using the described tools and pursuing the intended goals. Our goals as an action-researcher, a reflective-practitioner, a facilitator are: social results, experimenting on institutional learning, and improving on methodological approaches to inter-institutional collaboration.

Knowledge is a cumulative asset of a community, but it is always situational. During the research it is very important to separate the process of acting, the context, from the content. Key actors discuss operational and strategic subjects, the researcher-facilitator needs to focus on the processes of interaction and participation by themselves.

In this project we generate lots of content. So it is very important to create validation processes and to be specifically attentive to the "life cycle" of information, window opportunity of decisions and update of results (the content manager and the version update module can help).

The conclusions we are constantly finding and constructing along our research are specifically related with Public Sector institutions, but we feel that they are broadly useful in any inter-organizational context. In our view Public Sector has more restrictions and sometimes a different logic.

The way we measure our results is still in evolution. The informal actor's opinion and their formal report about the project are important contributions to measure the main lines of evolution, but we need to be able to measure the real results in the real world. We need to adopt procedures to listen to the opinion of the Clubs and Associations of the sector, as we need to listen to the citizen himself. Papers on this subject are under way.

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#### **References:**

Argyris, C. and Schön, D. (1974) *Theory in Practice: Increasing Professional Effectiveness*, Jossey-Bass, San Francisco.

Callon, M. (1993) Variety and irreversibility in networks of technique conception and adoption, In Foray and Freeman (Eds.) Technology and the wealth of nations: the dynamics of constructed advantage, Pinter, London.

Carsten, S and Masao, K. (2002) *Knowledge Discourses and Interaction Technology*, Working Papers Series, Department of Information Systems, London School of Economics and Polical Science.

Escrita Digital, 2003, ED-Portal.

Latour, B. (1987) *Science in action: how to follow scientists and engineers through society*, Open University Press, Milton Keynes.

Lagadec, P. (2000) Ruptures créatrices, Les Echos Editions, Éditions d'Organisation.

Law, J. and Hassard, J. (1999) Actor Network Theory and After, Blackwell Publishers, Uk.

Mingers, J. (2001) Embodying Information Systems: the Contribution of Phenomenology, Information and Organisation (formerly Accounting, Management and Information Technology).

Mingers, J. and Gill, A. (ed.) (1997) Multimethodology, John Wiley & Sons.

Nalebuff, B.J and Brandenburger, A. (1996) *Co-opetition*, Harper Collins, London.

Nandhakumar, J. and Jones, M. (1997) Too close for comfort? Distance and engagement in interpretive information systems research, *Information Systems Journal*.

Orlikowski, W. and Baroudi, J (1991) Studying information technology in organizations: research approaches and assumptions, *Information Systems Research*, 2(1), March.

Orlikowski, W. (1995) Evolving with Notes: Organizational Change around Groupware Technology, working Paper, Center for Coordination Science, Massachusetts Institute of Technology.

Schon, D. A. (1983) How professionals think in action. New York: Basic Books.

Stalder, F. (1997) *Actor-Network-Theory & Communication Networks: Toward Convergence*, working paper, University of Toronto.

Wenger, E. and Lave, J. (1991) *Situated Learning: legitimate peripheral participation*, Cambridge University Press.