10-2008

CREATIVITY AND VISIONS IN SPD PATHS: USING CIBORRA'S LABYRINTHS OF INFORMATION IN CO-CONSTRUCTING

Gian Marco Campagnolo
Department of Sociology and Social research, University of Trento, Italy, gianmarco.campagnolo@soc.unitn.it

Claudia Cattani
Department of Sociology and Social research, University of Trento, Italy, cattani.claudia@gmail.com

Gianni Jacucci
Department of Sociology and Social research, University of Trento, Italy, gianni.jacucci@unitn.it

CREATIVITY AND VISIONS IN *SPD* PATHS: USING CIBORRA'S LABYRINTHS OF INFORMATION IN CO-CONSTRUCTING A SUSTAINABLE ENTERPRISE SYSTEM

Gianmarco Campagnolo, Department of Sociology and Social research, University of Trento, Piazza Venezia 41, I-38100 Trento, *gianmarco.campagnolo@soc.unitn.it*

Claudia Cattani, Department of Sociology and Social research, University of Trento, Piazza Venezia 41, I-38100 Trento, *cattani.claudia@gmail.com*

Gianni Jacucci, Department of Sociology and Social research, University of Trento, Piazza Venezia 41, I-38100 Trento, *gianni.jacucci@unitn.it*,

Abstract

This paper demonstrates the use in Social Practice Design (SPD) interventions, of Claudio Ciborra's phenomenology derived concepts in the social study of IS, while applying Rogers's attention points specifically addressing communication and relationship. In a large automotive manufacturer, CAR, interested in fostering the sustainable implementation of EES - a long introduced, company wide, experimental, enterprise system -, in the course of a EU research project, innovative model-based *approaches are proposed and introduced to refurbish and provide new impetus to EES, furthering its implementation. The human centred, Participatory Design oriented, SPD approach, is proposed within the EU project, and partly deployed in the firm to facilitate the introduction of technology innovation, and organisational change. The case is followed during the 30 months of the project, describing the Action Research type intervention, and identifying steps forward and points of breakdown. To allow success, SPD leverages Carl Roger's attention points of communication and trust relationship establishment, and Ciborra's phenomenology derived concepts from the social study of information systems. The SPD approach realised evolved through: a) establishing personal relations of trust with managers and personnel of the company, respecting Rogers' facilitator qualities; b) the analysis of, and the awareness-creation on, the main traits of the extant situation, through open conversations, meetings, and user workshops, with some EU research project staff as facilitators; c) the joint identification with the company's personnel of crucial* how questions – *e.g.,* how can we foster our mission critical enterprise system*; d) the conception and co-production of* visions of solution*, enabled by Ciborra's concepts. The case is analysed in the paper by exploiting results of open conversation in user workshops, and of counselling-like sessions with the manager, and the data is discussed within the theoretical framework of the SPD approach - Rogers' and Ciborra's strongholds in particular -. An evaluation of the value of SPD in the case is carried out following indications from basic Action-Research-in-IS literature. Contributions of SPD to practice and to theory are identified, together with the satisfaction of pre-set evaluation criteria.*

Keywords: enterprise systems, socio-technical infrastructure, social practice design, phenomenology, counselling

1 INTRODUCTION

This paper describes experiencing with Social Practice Design (SPD) as a Participatory Design (PD) approach to the implementation phase of technology innovation. Its focus is on the use, in SPD interventions, of Ciborra's phenomenology derived crisp concepts on extant social issues, in need of solution in IS development and implementation (Ciborra 2002). While also applying, in the necessary personnel facilitation work, Rogers's equally crisp attention points on counsellor qualities, needed for trust building in establishing personal relations (Rogers 1951; 1967). While Rogers' points are mainly used here to address *communication*: establish and cure relationship, favour sense-making on the perspective of others, and the associated learning processes, Ciborra's points are mainly used here as conceptual *archetypes* to help sense-making in the analysis of the organisational situation and context, and so help give rise to *visions* of solution to existing problems. Both types of points we consider to be elements of a *second order* level of concerns in interventions, the addressing of socio-technical 'functionality' being considered of first order, in this respect (Jacucci and Martin 2008). While evidence for the validity of the use of Rogers' points in SPD is addressed elsewhere (Cattani, Calzà, and Jacucci 2008), in this paper we address specifically the issue of gathering evidence for the validity of the use of Ciborra's points in SPD.

SPD is a multi-perspective, evolutionary approach characterized by different phases (initial conversations, ethnographic observations producing tentative *how questions*, co-construction sessions producing consolidated *how questions* and *visions of solution*, implementation, evaluation), partly iterated according to need, the sequence of which being not strictly fixed (for an extended discussion on SPD approaches see: Jacucci 2007; Jacucci, Tellioglu, and Wagner 2007, 2008; Cattani and Jacucci 2007). The initial conversations phase consists in opening the process of interaction with users to capture their declared objectives and perceived problems. Together with ethnographic field studies, they constitute the *observational side* of SPD. SPD intends to promote change, not just to observe a situation in the world: as in all action research, we need try to change the world in order to learn about the world; and, we want to learn about the world, in order to be able to promote change. As a consequence, a further step in SPD – the *design side* to it - is the conception and co-construction, with clients' managers and personnel, of a *vision* for the solution of the problem(s) at hand. Facilitating solution in SPD explicitly includes support to people in letting emerge new work practices, and in co-designing supporting technologies. In particular, co-producing a *vision* is attained by jointly elaborating strategies and generating further meeting sessions with all concerned: i.e., *user workshops*, as well as *training sessions,* for all, including managers that will plan for, and moderate, change.

2 THEORY

2.1 Epistemology introduction: Ethnography, Ciborra, and SPD as an intervention approach

Social Practice Design relies on the ethnographic approach as a means towards critical conceptual analysis, and new concept emergence, as has been used for example by Claudio Ciborra, in his essay 'From Control to Drift' (2001). Ciborra discusses ideas, models and receipts coming from managerial literature regarding the construction, implementation and monitoring of corporate information infrastructures. The innovative concept of global information infrastructure is coined (large scale information infrastructures for global enterprises). It is said that the literature that faces this theme lacks of originality, proposing the same style of debate in the field of IS. In particular, the *vis critica* of the essay regards the concept of *alignment* between business strategies and information infrastructures. Strategic alignment in managerial literature means the matching between information infrastructure functions and business strategies.

The study of the concept of strategic alignment is for the author an appropriate context for questioning the status of the abstractions that are frequently found in management science literature and their relationship with what happens in the field. What is questioned is: *what happens when the various areas of strategy, organization and technology are connected in the same geometrical representation*?

Do we have a new and better organizational performance? The answer is *no*. Such a geometrical representation has a limited impact on the *primordial soup of anonymous practices and events* (De Certeau 1998) of the organization. This is because the knowledge and exposure to theories might not be enough to learn a new behaviour (Argyris and Schon 1996). In the author's perspective a representation that doesn't work, such as that of strategic alignment, causes a breakdown. It offers the opportunity for a different vision of the lived world of the organization. More tied to evidence, intuition, and empathy, than to the interest for geometrical models.

2.2 Ethnography-like observations

The ethnographic approach derives form Garfinkel's ethno-methodological critic to the Durkeimean conceiving on the nature of social facts (1967). Contrasting the Durkeimean vision that considers as a fundamental principle of sociology the objective reality of social facts, the ethno-methodological perspective assumes as principle that the reality of social facts might be a process in continuous accomplishment in the concert of daily life activities. Thus the mission of the ethnographic approach is the study of artful and ordinary modes by which the process of accomplishment is learned, applied and taken for granted by members. Applied to the study of physical and biological sciences facts as social facts, the ethno-methodological perspective is oriented to clearly distinguish between situated practice and planning, describing representations in their use. In the study of cognitive science practices, Suchman (1990) elaborates a critique of planning model. In the planning model, a representation is conceived as capable to control human action. The plan, considered as a set of detailed actions, operates as a programme apt to control human action. The action is viewed as derived from the plan, and consequently the plan becomes a substitute for the action. Once this substitution is accepted, the problem of action is taken as solved. The remaining task is to refine the model. In Suchman's perspective, however, the plan is a useful tool to talk of and discuss human action. But its relationship with action is not of substitution but of resource, as part of the situated practice. The function of the plan, in this perspective, is not that of giving a specification or a structure to control local interactions, but to orient before the course of action. Plans specify to the extent the specification is useful, and are vague precisely to the extent it is meaningful to rely on availability of contingent and ad hoc answers.

2.3 Relation between SPD, and Ciborra's social study of IS

Social Practice Design is a form of intervention research. It recognises the epistemological postulate that *we can learn about the real world only by trying to change it* (Lewin, 1946). The clue concepts of the SPD participatory design approach to intervention is that it addresses socio-organizational change by leveraging on two strongholds:

- The counselling-like qualities of facilitators, from the person-centred approach (Rogers 1959)
- The set of phenomenological-apparition-derived key concepts (Ciborra 2002).

In essence, and practice, performing the participatory design SPD approach includes, in addition to open conversations and ethnographic observation, two *visionary* phases, *en aval* of activities of improvisation and *bricolage*, two distinct, basic phases of the approach to innovating social practice, that are both deeply rooted in the two strongholds mentioned above:

- An ethnographic analysis phase to unveil, and let emerge in strict cooperation with clients, problems and resources in the area of social practice (the *how questions*)
- A creative design synthesis phase for developing, by co-constructing with clients, the social practice innovation (the *visions of solution*).

It should be emphasized that there is no presumed *universality* for the outcome of the design activity: the outcome is characterised by the fact that *"it could have been otherwise"*, e.g., with different designers, it always could have been otherwise. Not absolute or universal, but *relevant*. The motivation of SPD is an epistemological one, as in the words of Claudio Ciborra: "… *to challenge the overwhelming presence of positivism brings towards control …"*. So, including practice as an object of design is not a sign of positivism. As Pelle Ehn was doing in the 80's (Ehn and Kyng 1991), we like to construct fake computers with *shoe-boxes* to make users play with and participate. Co-constructed mock-ups, shared with users in user workshops, are good examples of positive outcomes of SPD

activities towards sustainable design of people, computers and work. SPD has its own strategy in design, the one spelled out by Ciborra (2002): to put at the centre *human existence in everyday life*:

"The current description of the design, implementation, management, and use of information technologies in organisations are largely founded on notions of rationality, science, and method. This is probably because the initial diffusion of business applications of computers and networks, and the highly formalised nature of programming and software, suggested a vigorous and structured understanding and representation of the multiple systems practices, from requirement analysis to use, maintenance, and documentation. … (we) attempt to engage the reader in thinking and articulating his or her practices otherwise. … (we) put forward a significant shift from the scientific paradigm that looms large over the multiple facets of the introduction and use of information and communication technologies in organisations. In particular they point to an alternative centre of gravity: human existence in everyday life. Such a Copernican revolution is accomplished first by unveiling the hidden or dark side of information systems, or, to put it differently, focusing on the obvious, the workaday, and the very well known to any practitioner in the field. These are events, episodes, practices, and related narratives seldom hosted in the neat representations of systems, data flows, processes, entities, and relationships; rather they are made popular by the swapping of war stories among practitioners. Indeed, activities such as hacking, improvising, tinkering, applying patches, and cutting corners seem to punctuate ubiquitously the everyday life of systems." (Pg. 1,2) "I suggest that the information systems field, with its rational views of knowledge, decision making, strategy, and orderly systems development, is based on a narrow model of rational, ideal actors. In this book, by focusing on the mundane and the existential, I want to contribute to a transition of the field towards ….passion and improvisation; moods and *bricolage*; emotions and workaday chores; existence and procedures will become integral to systems design and use, casting new shadows and lights on the unfolding world of technology (in its deployment and management in organisations and society)." (Pg. 9)

SPD has two dimensions: it is a way to design, in addition to being an aid to design. In SPD we invent, we use our creativity to construct facilitating and training paths (open conversation, awareness raising, good practices, building of communities of practice, co-constructing) taking inspiration from many domains. It is an integrated approach, co-constructed by users, designers, managers, and facilitators, a path individual to them, strictly contextual to them, to the needs majeutically made emerge as awareness in first meetings, and then allowed to grow by co-construction together with sense making, newly appraised motivations and goals, accompanied and delimited, opening new fronts here and now.

Here are the guiding principles that are been considered as a help in proposing *visions of solution* for matching *how questions,* drawn from Ciborra (2002):

- *'Cultivating the infrastructure'*: *'infrastructures are considered as always already existing, they are* never *developed from scratch, when a* new *infrastructure is designed, it must always be integrated into and thus be an extension of others'*;

- *'Riding drift'*: *'ICT as an encompassing infrastructure can be looked at as the unfolding process of connecting and scripting, and a receptacle of moves (inventions, design, cultivation, modes of use) and constraints'*.

- *'Promote* bricolage *and hacking, rather than systematic method'*: *'in designing a strategic application, do not limit to formulating strategy before the fact, based on a careful analysis, but allow competitive advantage to stem from the exploitation of unique, intangible characteristics, and the unleashing of innovative capabilities'*.

- *'Hosting the novel IT with care and dedication'*: '*the notion of hospitality offers n opportunity to explore anew the complexities of designing, developing, and implementing systems in an organisation… a new constellation of issues, words, and understanding, referring in particular to existential dimension, such as life world, identity, and commitment* ';

- Exploit *'shih'*: ' *managers in high-tech firms ought to admit that their job in coping with the technological discontinuities is not to make decisions at the centre of a networked firm, rather is to tinker at the periphery of the pasted-up organisational platform they constantly enact*';

- Improving *'mood'*: '*when we encounter the world in a situation, certain things, people, or circumstances matter; this 'mattering' is grounded in one' affection; hence affectedness discloses the world as a threat, boring, or exciting; it sets the stage, shaping problem definition, solving, design, and action*'.

3 ON THE VALIDITY OF CASE INVESTIGATION

The ethnographic approach used in the SPD intervention in this case, is based on the notion of *case study*. There are two aspects of proceeding with the notion of case study that must be clarified in relation to the present model-based organizational accounts. The first is that the ethnographic approach adopts an *interest-model*, that is the member's point of view (Wagner, Schmidt, and Jacucci 2008). This position can also be defined *ethnocentric*. While the ethnocentric interest-model can be considered as a top-down procedure, thus privileging the point of view of a specific community, it can be seen as non-absolutistic in its deliberate adoption of a value-laden position. Temporary points of view, instead of absolutistic positions, can be comprehended among the methodological instruments of the organizational design based on the ethnographic approach. A second aspect, related to the first, that distinguishes the ethnographic approach from typical model-based approaches, is that the case study is used as evidence of which methodology can work best, without deliberately adopting any point of view from the beginning. According to this approach, we can learn *how to learn*. The evidence of a methodological choice derives, according to this approach, from the success of the case study realized and this evidence cannot be established before use. The point to use a specific methodology will be pragmatic and temporary. This approach recalls the fact that the starting point for a research is the point where we are. This model can also be opportunistic, and adopt whatever methodological approach can seem adequate or relevant for the case. There is no reason to think that the contextualization of the approach can be considered as a scientific de-legitimation: local practices, fallible and historical have not to be considered scientifically illegitimate. The anti-essentialist position brought forward by SPD based on the ethnographic approach does not correspond to maintaining that all universal arguments are false. We argue instead that there is no universal scientific method to study organizations. The restriction of the point of view to a specific community (the member's point of view) seems to exclude the possibility of any generalization. But this is not automatically true. It can be possible to identify a consistency that does not have anything to do with the adoption of an a-priori position based on a top-down approach. And this consistency can be considered epistemically independent. In other words, it is necessary to evaluate case by case the appropriateness of presuppositions. It is often thought that local, non-theoretical analysis, are inadequate to support a normative position, that local knowledge can be only descriptive. These preoccupations are too abstract, and based on a foundationalist model of grounding. Local analyses will be as large as they are made. If a way is to be found to create connections between disparate events, the result will be to have an extended analysis. As Callon and Latour emphasized (1981), the lesson to be learnt is that the connection between historical actors and ideas must be shown at the local context. There is anyway no theoretical limit to the scale of the analytical network that can be created.

4 THE COMPANY EXPERIMENTAL ENTERPRISE SYSTEM (EES), AND THE MODELLING USE CASE SCENARIO

The technology application studied in the present case, or *use case*, consists in a *model-based* (Wagner, Schmidt, and Jacucci 2008) upgrade of the company enterprise system in a car manufacturing company (here named CAR), followed during the 30 months of a EU project (here named MODEL). Main SPD activities in the use case are of kind *observation*, and of kind *design*.

Observation: field ethnographic observations of ongoing work with EES as well as of modelling sessions; observations concentrate on the use of modelling intended as a "substitute" of current consolidated document-based and EES-related working practices.

During ethnographic observations, descriptions of documents and practices related to EES as a central artefact of Target Setting Process (TSP) have been produced: the interactions between different parties and exchange of different kind of documents mediated by the EES, presenting the results of a light ethnographic activity on the use of EES carried out in CAR.

During the observation of modelling sessions, problems concerning the use of MODEL-SW modelling intended as a "substitute" of current CAR consolidated document-based and EES-related working

practices emerged, providing an understanding the MODEL-SW modelling related requirements. In order to implement the work process associated with EES in an MODEL-SW model, a number of preliminary decision have been discussed: where to start modelling, how to tune current and new modelling approaches, define how to decompose a document into a model, define the implications of migrating from a static to a dynamic enterprise view, manage access rights to enterprise models, and define how to import and export information from/to a model.

Design: the co-construction of *how-questions* and *visions of solution* with CAR personnel.

Design activities will be described in more detail in the paper, as this paper concentrates on the performance of *design* activities of the SPD intervention in the case. We start by introducing the use case scenario.

4.1 The modelling use case scenario

A special focus in the *use case* scenario is on the Target Setting Process phase of car development. Inspection immediately revealed the centrality of an in-house, experimental Enterprise System software application (here named EES), used in the CAR group (CAR is here both the name of the auto manufacturing firm, and of the associated holding company, or group, that includes additional related companies, manufacturing respectively trucks (TRUCKS), tractors (TRACTORS), etc.). EES is used to manage the integration and the performance of all vehicle systems and parts (the so called 'tuning of products' activities) and support the concurrency.

Along the entire development of the vehicle, there is a document that contains the entire history of the product: the SOR or Statement Of Requirements. This document is created at the beginning of the development process (thus it represents the input of the Target Setting Process), and during the process execution it is gradually filled and completed. TSP starts just after the company decision of developing a new vehicle. Therefore, the SOR contains, at its beginning, some necessary information - mainly constraints on the new product definition; as the maximum engine power; the market sector in which it will be placed; the product range; the maximum price of the final product; and so on. Actually the SOR is a collection of heterogeneous documents. The SSTS (Sub System Technical Specification) is one of the most important elements of the SOR, because it contains all the technical details required for the internal product design as well as for the external supplying of the parts that will be outsourced. Target Setting Meeting (TS Meeting) is a weekly held meeting within TSP in CAR auto. The meeting is held between 9 and 11 a.m. on each Wednesday. In this description, we focus on the activities linked to refinement and testing of the targets. Participants involved look e.g. for side effects of changes in subsystems or for impacts on other sub-systems. The TS Meeting is used to discuss work-in-progress, open issues and planning for further activities in TS Process. It involves OEM (Original Equipment Manufacturer) and suppliers:

- OEM: the automotive large enterprise component of CAR auto, with
    - M1, the owner of the development
    - M2, the assistant of M1. He acts on behalf of M1 for technical and administrative issues.
    - Approx. 20 Performance Engineers (PEs) who are responsible for the target definition and achieving of sub-systems. M3 is the performance engineer responsible for the climate system.
    - 2 Managers
- 4-5 Component Suppliers who supply systems, sub-systems or components in co-design with CAR auto.

Between two TS Meetings, suppliers sent M3, or eventually M2 information on their new offers, which include the specifications and technical performance of the refined components. M3 receives the supplier's updated offer and updates the simulation data in the central repository of simulation data containing all specifications of all subsystems. M3 can also trigger the simulation. The simulation repository keeps track of different versions of simulation results and the specifications that were used to configure simulations. The supplier always contacts directly the performance engineer (in this case M3). For critical subsystems, the supplier sends the information to both, M3 and M2.

During the whole TSP there are several interactions between different parties. They exchange documents and use normally different – mostly not compatible – applications. For instance, the OEM use the CATNET tool to send the requirements to the Test Suppliers. The result are transmitted using another system (email, or other not specific systems). During the TSP performance specifications are exchanged with suppliers via OEM. Concurrency in the TSP is a big challenge. Currently there are 25 different systems, which again have their own subsystems. The performance tree is used to design and manage different targets of a car. It is managed by an in-house application called EES. It manages all the testing activity. Only and CAR have access to EES and cannot be used by suppliers.

To require services from suppliers, SOR is sent to the supplier with the target clearly defined. The supplier is expected to fill in some specific data like links to drawings, the part numbers and names, some relevant properties of the parts and the name of the contact person at supplier as well.

4.2 EES and MODEL-SW

One implementation issue in the project has been the need to manage the interoperability, both from a technical and from social point of view, between the model-based software application (here named MODEL-SW), used in the modelling approach in project MODEL, and EES. While several project deliverables described the role of EES from a technical point of view, and demonstrated how technical interoperability issues between the two systems have been solved, this paper here addresses how SPD attempted to tackle organizational, motivational user problems facing the application of a generalized MODEL-SW modelling approach to the current working practices and systems, involving some EES users, developers and managers.

Opportunities of use of the MODEL-SW modelling as an extension (not a substitution) of current Target Setting practices have been co-constructed with EES managers, users and developers. MODEL-SW modelling has been proposed in this context as an EES support in connecting all actors involved in the car design process (suppliers and others) together.

While the EES resulted as a winning cross-organizational enterprise system (spreading from CAR to its associates in the holding, that is from cars to trucks and tractors manufacturing), it seemed not being equally successful as a consolidated pervasive practice within the single organization's different actors (production, marketing, suppliers, post-sales areas and their personnel). This dimension, although being the target of socio-organizational attentions by CAR people, as emerged by the interviews, still lacks a coherent technological solution. In this respect, MODEL-SW modelling finds its role, and the vocabulary in which it can be predicated.

5 CO-CONSTRUCTING A STRATEGY FURTHERING THE COMPANY ENTERPRISE SYSTEM

We focus and describe in particular results of open conversations in a first user workshop, held 3 months after the beginning of MODEL, leading to the generation of problem-and-resources-related *how questions*; and of a second user workshop, some 20 months later, complemented with counselling-like meetings/interviews with the manager, where consolidated *how questions* emerged, accompanied by corresponding *visions of solution,* co-constructed by managers, personnel, and facilitate-ors.

5.1 Initial conversations with EES users, developers and managers

After field visit and observations of modelling sessions, a workshop was held in CAR to discuss the organisation of use pilots of the modelling approach and technologies in MODEL. During the workshop, a number of conversations have been gathered with EES users and developers and with the manager of knowledge management department. The goal of the workshop was to:

- Provide support to the pilots in several contexts and levels
- Understand the impact of the social dimension on modelling approach and on MODEL-SW use
- Work on various mediation of methodology related results

- Answer the question: "*when a problem/need occurs, how should users act to get support?*"

We had conversations with an EES user (FD1), a key EES developer (P2) and a manager of the EES initiative (ML3). The main results were that the MODEL pilot could have been of interest for CAR while connected to:

- Quality and physical test feedbacks on the performance tree
- Relationship between EES (documental aspects) and visual aspects (cad design, style)
- Inclusion of supplier interactions in EES
- A demonstrated specific interest for CVW approach (Collaborative Visual Workspaces) and product modelling.

Here is a somewhat condensed recount of these open conversations.

The impact of the social dimension on the modelling approach to upgrading the enterprise system has been understood in initial conversation with personnel. Comparing target setting activities in CAR auto with the same activities in other CAR group branches, the concept of user requirements for a vehicle and that of concurrent management resulted central yet very difficult in the organizational culture of manufacturing in CAR auto. In fact, it implies a high level of collaboration and data sharing between different performance engineers and product responsible.

"*Target Setting and the concurrent management of the performance tree is a new concept for CAR tractor. Users requirements were not considered as a design core in the case of farm tractors*", said FD1, an EES user. And ML3 added: "*EES is not a system. It is a revolution. Passing from the single to the collective is not easy. The individual perceives formalization and sharing as an extra load. The first step is to convince them that EES is an useful tool for all the company*" (ML3). Another important social aspect in NMEN, was the contrast between marketing and engineering culture in the target setting process: "*In Target Setting there are two worlds: marketing that wants to follow user requirements to the end, and engineering that wants to freeze the requirements very soon*" (FD1).

The management role in the EES initiative has been that of understanding that such a system "*could have not be initiated by the IT department, because informatics people can not understand the problems*"(ML3). The strategic management trusted the EES initiative and understood its peculiarity. The EES project involved the human resources department. "*The IT innovation department did the less*"(ML3). A system like EES requires that those who are in charge of the development must know in detail how things are done by different experts (performance engineer, test manager etc...). "*At an organizational level*", continued ML3, "*the IT department must be dissolved. If we want to innovate the only way is to flank technology people with methodology people. It is a power game, but we have to do what the user needs at the end. IT people must be distributed in various company areas*". ML3 argues against the way the IT department solves problems by acquiring best of the breed technology from external vendors: "*they spend a lot of money. Knowing nothing about the work, they rely upon big names that can solve the problem without knowing how things are done*. Specifics must be made, of course, because users do not have an idea of it. But work-practices must be understood, to make the specifics and to show them to users. Ask in the field if that direction can be practiced or not. "*Do you like the system? Would you use it?*" "*Then show it to the boss. It is all a job of sensitivity and internal creativity.*"(ML3)

As part of our conversations, we had also the opportunity to interview P2. P2 has been one of the most active EES developers. His role has changed in time: formerly a simple developer, he is now sent around CAR auto to support and motivate people using the EES. His knowledge of the system is very technical and he is explaining us where and how EES is filled by project responsible managers and performance engineers with information that allow them to produce a trial plan. However, in his new role of 'EES missionary' in CAR auto, he realized that, for some users, EES is not seen as a solution. Users goal is to build a car, and the EES is seen as a constraint. The project supervisor can see the value of it, because EES facilitates concurrency management and saves the time spent in a lot of coordination meeting. The strategic management sees the value of it too, because the time to market is shortened. While talking to performance engineers (those who have to fill and update the EES with all the data concerning their tests), however, P2 says that while some of them are realizing the value of EES, because "*if the project manager calls them at 10 pm, they can answer: 'go and see it on the*

EES"", still some performance engineer wants to keep things for himself: "*one PE said in a meeting: 'I have my excel sheet'*". P2 says that there is also a "*discourse of responsibility*" in sharing the information concerning the tests on the car performance, since they are building cars that will go to millions of people. He says about EES, that: "*finally there is a system that makes things visible to all*". P2 confirms that this is a "*revolution*" (using that same word that ML3 used) and it is often difficult to make users understand: "*a commitment from the strategic management is needed, because single teams tend to do what they want*".

Another critical issue was the time issue. The strategic management idea was to have the system running in four months: "*they saw the power point and they expected the system running in four months*". The developers said that they needed six months just to elaborate the system and much more time to populate it with real data. There were two major issues: one was to build the system; the other was to build the knowledge about the system in the company.

5.2 A first how question, and a first set of visions of solution, at CAR

The initial theme of SPD at CAR has been EES as a successful enterprise system. The first version of *how question* addressed was: *How can we successfully further implement EES, our enterprise system?*

The *vision of solution*, emerged after initial conversations, has been to promote organizational change and technology development through SPD towards:

From the perspective of organizational change:
- (for users) Enforcing participatory design approaches to ensure user control over further development of the enterprise system
- (for managers) Integrating upper management strategies into EES.
- (for developers) Distributing IT design experts within user groups, while cultivating a sound IT design community of practice, and caring for designer's career and continuous training;

From the perspective of technology development, employ MODEL's model based approach to help integrate onto EES:
- CAD design and simulations;
- Holistic feedbacks from final quality evaluations and tests on real cars;
- Suppliers interactions and negotiations;
- Strategies of company upper management.

5.3 Co-constructing and consolidating the *how question* and the set of *visions of solution*, in subsequent conversations

With the *how question* emerged after initial conversations, and some germs of *visions of solution* in mind, we then proceeded further with the SPD design phase. In conversation with personnel, we discussed and modified the tentative *how question*, co-constructing and consolidating it. The consolidated version of the how question has come out as the following: "*How can we further develop and successfully implement our enterprise system EES with model-based approaches to integrate the interactions and negotiations with our suppliers?*"

The co-construction and consolidation of the *how question*, has been mainly accomplished with the participation of ML3, manager of the EES initiative. ML3 said that the EES is very powerful and it covers a wide range of production activities. EES will be used from now on also in other branches of the CAR group. But each branch has its own world.

The initial strategy proposed by CAR to export the EES experience to these other braches has been presented by ML3 in this way: "*it is a software. Let us adapt it. We will make a EES for TRUCKS and another EES for TRACTORS. So we will have three different EES instances*." But this vision revealed problematic. They decided to better foresee a common core letting each branch to have their specificities. "*This 'restructured vision' of the software*", says ML3 "*is better for portability and maintenance. Now there is a common core and each company has its specific functionalities*".

The process that led to the adoption of the EES started from the production. Additional software modules have been introduced for the particular services afterwards. The intention to include different functionalities in the EES was there since the beginning of the project. "*EES was born as built-in unit. Then, reasoning from the top of more companies, we did the adaptations. That was the first phase. A second phase was adding other functionalities, for different activities: after sale, support services...*"(ML3).

"*All these activities must be seen in correlation. But at the moment*", says ML3, "*this is not the case*." ML3 said that the feedback from post-sale services and customer information after sales could be better included. The EES is a six-year long project. Its development involved seven people for five years. The direction is now towards modelling: "*everything must be connected, this is a vision we have, and this is necessary done with models*"(ML3). Currently there are unrelated pieces still to be integrated. Physical tests, subjective customer evaluations; the virtual simulations are some of these. Among them, the supplier is the most relevant missing link. 50% of the design work is outsourced. But the supplier is not included in the EES plan, and the documents coming from the suppliers are lost, and some tree's branches are empty.

5.4 *Why EES developers have to turn the EES architecture in a model based architecture?* Implementing *visions of solution* in innovative social practices and technological proposals

Standardization dynamics involved in the diffusion process of EES in CAR seem to take place in two directions: one is the horizontal direction, where the assumed singularity of the reference context (cars, trucks or tractors manufacturing) is challenged by the need of the software suppliers (CAR in this case) to create a generic system that can be applied in different sectors (the EES); the other is the vertical direction, where competences, training needs and working relations are re-negotiated by the strategic management in order to 'make place' for the new system. While ML3 interview revealed a strategy to tackle horizontal standardization issues, P2 was more concerned with vertical standardization issues: how data structures and definitions, formats and business processes required by the new system can work across organizational actors (strategic management, project responsible, performance engineers...). The solution found within the EES development project was to restructure the EES vision across time from a built-in system to foresee a common core letting each CAR group branch to have their specificities, thus solving difference and similitude relationships between different industrial sectors. Vertical standardization issues (how the organizational structure, human resources and training needs must be reconfigured in order to match to the procedure imposed by the new system) was addressed by P2 with a sensitivity for providing motivations for different perspectives on the use of EES: EES was presented as an additional resource to make performance engineers work accountable to managers.

If the restructured EES vision is revealing a successful initiative to tackle horizontal standardization issues and replicate the system across different manufacturing contexts (in the CAR group) better than any off-the-shelf generic enterprise solution, large improvements opportunities are still there to develop a vertical standardization strategy. Reasoning from the top of more companies using the same system, the original view of EES as a built-in system was taken over by a modular view of it. This restructured vision is now spreading over the way CAR people approaches standardization issues connected to the pervasiveness of the system through the different level of the single organization (vertical direction). As ML3 says, the CAR vision is now towards connecting all development activities that are currently unrelated (post-sales services and customer information). However, EES has a logic that comes from the production area. Marketing and engineering were presented by FD1 as two contrasting world already present in EES. Suppliers and physical tests people can have further diverging perspectives on how the EES is currently arranged.

The role that is emerging for MODEL-SW modelling in this context is to provide *a technological point of view* on P2 sensitivity for the vertical standardization issues, using the CVW (Collaborative Visual Workspaces) to furnish customized interface for all the actors working with different knowledge on the car value chain (especially suppliers, that own the 50% of the production effort). A technological solution to vertical standardization issues can lead MODEL-SW modellers to provide

customized solutions to include all actors in the production process. A solution like this has to take into account the extent by which each actor has to be involved in the production and post-production process, providing a specific view for each of them. The modelling rationale can fertilize the EES logics extending it with model-based customizable workplace views. In this context, the attention to product modelling is less central. A role for MODEL-SW modelling is to provide a *technological perspective* on EES that is less centred on production (meaning with it a specific, partial view on the overall manufacturing-related work practices), being more attentive to the inclusion of a variety of actors (and especially suppliers) with the provision of specific system functionalities.

Additionally, the care for different perspectives (not only the production perspective) represented by the MODEL-SW modelling initiative can be a successful motivation for EES users to undertake the transition to a model-based approach to EES, as an answer to questions like: *Why EES developers have to turn the EES architecture in a model based architecture? What is the value of it for them? Additionally, what are the consequences of this change for EES users?*

6 OPEN CONVERSATIONS WITH THE EES MANAGER

We briefly report here the outcome of couselling-like open conversations with ML3 on EES, its genesis, different perspective phases in its development, its features and problem issues, managers' view on it, the struggle between ICT versus process views, and power struggle: system versus process and company, the use of UE project. The co-constructed strategic direction facilitated by the interaction includes letting emerge the need to include model-based approached onto the existing EES, rather than starting a completely new and different ES project, and the need to anchor the project in the company by enrolling upper management strategies.

"EES is very powerful, it covers a great part of the production process. Now we bring it also to TRUCKS and TRACTORS. But every company has its own world of problems…EES is the model behind it all, the macro process is the same, but each company has its own specificity. To bring it to TRACTORS and to TRUCKS EES must be adapted, there are lines of products: earth motion, agricultural machines…At the beginning we said: it is a software application, we shall adapt the software. We shall make one EES for TRACTORS, and we get two instances of the software, then we make a third EES for TRUCKS … But this vision is a problem: better take a common nucleus, then each company has its own specificity: this restructured representation of the software is better for portability and maintenance: we now have a common nucleus, and each company has its own specific functionalities…For next year we try to redefine the architecture with models.

At the beginning we considered the production process, then software modules for particular services. Our intention has been immediately of activating different functionalities. EES has been born as a single block, then, reasoning in terms of several companies, we have carried out the adaptation to different companies (first moment)…In a second moment we have added other functionalities, dealing with other company activities: production, after-sale, services. Eventually, these functionalities should be correlated among themselves …Now it is not like that: for example, repairing, if there were linking with production, it would be better, the whole know how generated in design would be made available in a different format during repairing…Client information, problems, recording onboard the vehicle, how could we reuse them to improve project quality…

A for our vision, we are working still with the vision of the EES born 6 years ago…we proceed adding additional processes, clients provide information fro new processes. It is a loop, it must be understood and managed, all languages must be coherent. Must link the whole into the one vision produced, we go by force towards models, unavoidable collecting all information, how they interact, how they are linked. An extremely long work, we are just started, but his is the direction. Isolated parts to be integrated: physical test, must become a workflow test request – result. CATNET: each company in CAR has its own, that must be integrated into EES. EES defines the technical parameters, and tells you how the test should be made. We have a physical experimentation, and a virtual one, and, there is the client experimentation: for example users provide an evaluation on panels.

Foe the physical experimentation tools exist, each company has its own, integrated in some way, EES establishes the plan of the tests, it issues a test request to the CATNET test flux management, collects signatures, requests, etc., it activates the person that actually carries out the test, and it fills in the test results. But for the virtual part there is no integration, PSI suggests the tests to do, but there is no integration with the software, an with tests. For the client it is needed tracing final evaluation on EES…

Suppliers, is the single most important missing piece, 50% of the design is still left out of EES, suppliers are not being managed into the flux, documents get lost, for some branches of the tree there is nothing. Then: integration with the system to carry out failure mode analysis: the preventive analysis of failure: building the table of possible failures, compiling reports – in the field of aeronautics, but also of auto – a sacred piece for after-sale, for repair, take the car, how can we do this in complete isolation, in a way which is not linked to the know how of the car. This is of recent interest, the analysis of defects after-sale, it indicated critical components in the sold, to improve the quality in the manufactured. Take CAD: it is managed in the company by the PDM system, a closer link would be needed, e.g., for recording the CAD version used, but the problem is not perceived enough. On client test we said already, on the prototype, at the end of the story it has a life o its own, important to integrate them in, the information of first lots produced.

Upper management has starter to understand the issue, allowing the deployment of a system of such huge dimensions to capture the know-how of the company. It is clear that this vision, based on models, on components that talk to one another, still escapes, quantify the advantage is difficult…

EES is born in CAR on public financing (luckily, otherwise the money would not have been found), 7 people working on the project in the last 5 years. We went to a top ICT manager, saying: we have used your process, but rather than going on employing excel sheets of different format, difficult to monitor, we provide you with the system, a bit more than a structured power point. He said yes, provided financing for year 2002, we started. With only one problem: he saw it all in power point, and expected the whole system done in 4 months, but it was only a mock-up. There are two big issues: building the system, and gathering the whole widely spread knowledge to be put in it. In two months the system existed but its knowledge database was empty. We said, every one will fill it its bit, in one year it will be done, but there was no coverage of the whole model. But EES is also something else, there is the concept of standard, a new model, it is interesting to see how managers realise that the system is something that allows them to reorganise the company knowledge, diffuse it, make use of it. To TRACTORS we say: there are functionalities, we ask you to define your expectations on tractor functionalities, etc. The AD pushes: EES structures the company know-how pushing everyone to do things in a given way. Top management is getting it, is getting there, many use it, each thinking to it in its own way, it is a mechanism...

How do we face the organisational problem: we meet people in their various workplaces and we ask them what they need. Now and then the process breaks down, and PSI is not used yet. As PSI provides important info on where we are in the process, piece by piece, we say: we provide to you the report of PSI, if you have received a hand made report, and this does not correspond to PSI, stop: the system is not working correctly …We need a push from above, the system must be used, some more some less, but all must use it. Otherwise the system tells you that it does not have your information in input. This is the right strategy to face this problem.

In TRACTORS, S1 asks: how do I link performance to component. EES developers are not IT designers, are process people. On this we have come into conflict with the IT department of the company. PSI for them does not exist. They wanted a PDM. We don't want to have anything to do with the concept of an IT person, but process person…At the beginning I have antagonised them, but for the after-sale issue I have gone to them, I have spoken to them. I have also wandered why are the IT people in the company all the same, all trained in the same way, while at the organisational level people have a functional dependence from a process responsible: they are two separate sectors…These are just power games: on the one hand the organisational part must be made by project, the case of business information technology; then the AD comes along saying that this group is no use, we take its leader and we put her under the ICT head, but she blew up: "I am a process

person", she refused to depend from the ICT head. A view reducing everything to the concept of a system, versus understanding the company… Upper management thinks that EU projects are useless. We think that EU projects do not push you out of path, it may not provide you with the solution, but it provides you with ideas and pieces, if we do without this then why not calling our division services, rather than researches…We have to revise the architecture. EES was born as an enterprise knowledge management system. Then we understood that it was necessary to take a process perspective. EES must be constituted in a process perspective. We will face this issue next year, MODEL is fundamental in this respect, framing methods and knowledge. Models bring along conceptual power. It would be nice to have a next EU project to do it: make a revision of EES in a model-based perspective. Now we have all the roles of who does what, all the different phases of operation, we can take this vision and make a link to the software…"

7 INTERPRETING CASE DATA

In Section 5.4 it has been shown how, in conversation with personnel, we discussed and modified the tentative set of *visions of solution* co-constructing and consolidating them, to the co-constructed *how question*: *"How can we further develop and successfully implement our enterprise system EES with model-based approaches to integrate the interactions and negotiations with our suppliers?"*

We can see that conversation data quite spontaneously offers *apparitions*, on the base of which appropriately corresponding guiding principles from Ciborra (2002) prompt *visions of solution.* Let's list here below outstanding pairs: *apparition* → corresponding-principle: *vision*.

"… EES is already a proper enterprise system. Wanting to introduce a model based enterprise system in CAR, we should modify EES making it model-based, rather than attempting to substitute the EES implementation project - with its already created digital-type barrier in the company -, with a completely new one, before even its completion …" → 'cultivating the infrastructure': *do not give up the installed base, rather promote its further development and implementation*.

"… In a second moment we have added other functionalities, dealing with other company activities: production, after-sale, services. Eventually, these functionalities should be correlated among themselves …" → 'riding drift': *allow new objectives/functions enriching EES.*

"… how do we face the organisational problem: we meet people in their various workplaces and we ask them what they need. Now and then the process breaks down, and EES is not used yet. As EES provides important info on where we are in the process, piece by piece, we say: we provide to you the report of EES, if you have received a hand made report, and this does not correspond to EES, stop: the system is not working correctly …" → 'hosting the novel IT': *with care and dedication for EES.*

"… upper management has starter to understand the issue, allowing the deployment of a system of such huge dimensions to capture the know-how of the company …"; "… the restructured model based EES vision is revealing a successful initiative to tackle horizontal standardization issues and replicate the system across different manufacturing contexts better than any off-the-shelf generic enterprise solution …"; "….large improvements opportunities are still there to develop a vertical standardization strategy. The CAR vision is now towards connecting all development activities that are currently unrelated (post-sales services and customer information). The role that is emerging for MODEL-SW modelling in this context is to customized interface for all the actors working with different knowledge on the car value chain (especially suppliers, that own the 50% of the production effort). The modelling rationale can fertilize the EES logics extending it with model-based customizable workplace views…." → exploit 'shih': *integrate top management strategies onto EES.*

"… distribute EES designers onto user groups for dedicated local care and adaptation of the work oriented information infrastructure …"; → 'promote *bricolage* and hacking, rather than systematic method': *look for ad hoc solutions, rather than for abstract top down approaches*.

"… should network designers onto a community of practice, and care for their career and continuous training, while involving users into IT infrastructure implementation practice and control….." → 'mood is all important': *improving the mood of relevant personnel*.

We conclude therefore, that Ciborra's concepts are found to provide correct phenomenological lenses to understand and guide implementation projects of IS in enterprises, while leading the way to opportunities for creativity and innovation in human interaction and social enterprise.

8 CONTRIBUTIONS TO OUR KNOWLEDGE ABOUT IS DEVELOPMENT AND IMPLEMENTATION

Facilitators are encouraged to inspire their *visions* on Ciborra's concepts. From reflections on this case, we have provided evidence about the suitability and application of SPD as a research intervention method, and in particular of the use of Ciborra's crisp, phenomenological *apparition* based concepts, or principles, in supporting interventions of IS development and implementation towards success. The contribution of the paper resides in how interpretations and findings complement with practice based evidence our knowledge about the use of Ciborra's critical conceptual work.

We judge the quality of the SPD research intervention approach in the case, by three requirements (Baskerville and Myers 2004): a contribution to practice (the action: in the MODEL project, CAR group users were able to voice their need for, and designed, a path towards building a new model based EES instrument, with a different philosophy, which went beyond what the designers had thought), a contribution to research (the theory: Ciborra's concepts are found to provide correct phenomenological lenses to understand and guide implementation projects of IS in enterprises), and the satisfaction of pre-set criteria by which to judge the research (Satisfaction of company manager, personnel, and facilitators/ researchers, respectively, for change produced and results obtained).

Acknowledgements

We had extensive discussions with Ina Wagner and Hilda Tellioglu for. Research carried out in the context of EU project MAPPER (Model-based Adaptive Product & Process Engineering) IST-016527.

References

Argyris, C., Schon, D.A. (1996) *Organizational Learning*, Reading, Addison-Wesley.
Baskerville R., and Myers M. D. (2004) Eds. Foreword, MIS Quarterly Vol. 28 No. 3, pp. 329-335
Cattani, C., Jacucci, G. (2007) From software development service provider – helas, a captive resource! - to one's own products and brand. AIS eLibrary Proceedings of MCIS2006 in Venice, It
Cattani, C., Calzà, D., and Jacucci, G. (2008) Applying lessons learned, AIS eLibrary MCIS2008
Ciborra, C. (2000) From control to drift, Oxford University Press, Oxford.
Ciborra, C. (2002) The labyrinths of information. Oxford University Press
De Certeau, M. (1998), The Practice of Everyday life, University of California Press, Berkeley, CA.
Ehn P., Kyng M. (1991)Computer: Mocking-it-up or Hands-on the Future. In *Design at work: Cooperative design of computer systems* J.Greenbaum, M.Kyng (eds.). Hillsdale, NJ
Callon M. and Latour B. (1981) Unscrewing the big Leviathan:, in K. Knorr-Cetina and A.V.Cicourel (Eds) Advances in Social Theory and Methodology, Boston: Routledge & Kegan Paul, 1981.
Garfinkel, H. (1967) *Studies in Ethnometodology*, Englewood Cliffs (NJ), Prentice-Hall.
Jacucci, G. (2007) Social Practice Design, pathos, improvisation, mood, and bricolage: the Mediterranean way to make place for IT? AIS eLibrary Proceedings of MCIS2007 in Venice, Italy
Jacucci, G., Tellioglu, H., and Wagner, I. (2007) Design Games as a part of Social Practice Design:. AIS eLibrary MCIS2007; (2008) Proceedings of the ECIS2008, AIS eLibraey.
Jacucci, G., Martin, M. (2008) A second step back for managing ambiguity. AIS eLibrary MCIS2008
Lewin, K. (1946) Action Research and Minority Problems, Journal of Social Issues, 2, 34-46.
Rogers C.R. (1951) Client-Centered Therapy, Houghton Mifflin Company, Boston
Rogers C.R. (1969) Freedom to Learn. Columbus, Ohio, Charles Merrill
Rogers C.R. (1980) A Way of Being, Houghton Mifflin Company, Boston
Schon D. (1991), editor: The Reflective Turn: Case Studies on practice and in practice Donald, Teachers College Press, New York

Suchman, L. (1990) *Representing Practice in Cognitive Science*, in Micheal Lynch (eds) R*epresentation in Scientific Practice*, Cambridge (MA), MIT Press.
Wagner, I., Schmidt, K., and Jacucci, G. (2008) Herding cats, AIS eLibrary Proceedings of MCIS2008