Modelling IT Use: An Archetypal Approach

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Abstract: Since Barley's use of Giddens in 1986, structurational approaches have become an important theoretical perspective within the IS research community. This paper introduces an intermediate theory of this stream through three socio-technical archetypes, i.e. stylised socio-technical situations (neutral, regenerated and disrupted) and two appropriative trajectories, that is to say two a combination of archetypes (the balancing point and the improvisational dynamics). The resulting theoretical framework is then applied to four case studies illustrating the implementation of Intranets in French firms. Finally, the general relevance of the structurational reading-grid is demonstrated. But the study also sheds light on some limits of the conceptual scheme. Intranets are only an opportunity for very local and limited structuring processes. Besides, a third appropriative trajectory is also suggested (the catalytic dynamic) and the model is partly accommodated.

Keywords: IT use; structurational approaches; Critical Social theory; Structuration Theory; archetypal model; appropriative trajectories; Intranets; IS qualitative evaluation.

1. Introduction

Over the last 15 years, structurational approaches have become an important theoretical perspective within the IS research community (Jones, 1999; Poole and Desanctis, 2000; de Vaujany, 2001), and exert an increasing influence on management studies as a whole (Whittington, 1992; Rojot, 1998; Giordano, 1998), whether in French or English-speaking literature.

What does this theoretical perspective consists in and how can one account for its breakthrough? As regards Information System research, it seems that the structurational framework is particularly relevant to understanding the potential "social innovation in use" IT implementation can result in. Basically, structurationists illuminate on a fundamental socio-technical dynamic. IT implementation can be either neutral, regenerative, or disruptive for a given organisation. This paper uses both a pure structurational perspective (Giddens framework) as well as a rival model (the morphogenetic approach), in order to deepen these basic states and to develop a qualitative evaluation of IT use.

In the first part of this article, structurational approaches along with three "socio-technical archetypes" are introduced. They enable the reader to capture the gist of structurational approaches. A dynamic way of combining them is also proposed, by means of two appropriative trajectories. Then, in a second part, the preceding reading grid is illustrated and accommodated through four case studies.

2. Structurational approaches: an overview.

2.1 The sources of structurational approaches

The IS research community, like many other communities in social sciences, can adopt several theoretical stances to study its object of research. On the whole, they vary in accordance with the importance they give to action or structures, to human agents or the system they belong to, to functionalism or emergentism (see table 1). Thus, from Archer's (1982, p 455) point of view, "successive developments have tilted either towards structure or towards action, a slippage which has gathered in momentum over time". It is nonetheless very rare that social theory really makes it possible to combine action and structure in a dynamic way[1].

Taking this starting point, structurational approaches, whether Giddens' Structuration Theory (Giddens, 1979, 1984), Bhaskar's TMSA[2] (Bhaskar, 1979), Archer's morphogenetic approach (Archer, 1982, 1995)

[1] Archer explains that "On the one hand structuralist Marxism and normative functionalism virtually snuffed out agency. The acting subject became increasingly lifeless whilst the structural or cultural components enjoyed a life of their own, self propelling or self maintaining. On the other hand, interpretative sociology busily banished the structural to the realm of objectification and facticity-human agency became sovereign whilst social structure was reduced to supine plasticity because of its constructed nature." (Archer, 1982, p 455). Giddens (1979, p 1) defend a very near point of view when he says that he "undertook critiques of two broad programmatic approaches in social theory, hermeneutics or forms of interpretive sociology and functionalism."

[2] Transformational Model of Social Action.

or some institutionalists[3], have tried to develop some kind of an integrative perspective. Structurationists have worked out general frameworks aiming at grasping the way people produce or reproduce social structures in societies. The gist of the matter for them is thus to understand the various conditions in which the role system a society is based on can evolve, putting together action and structures. Up to a certain extent, structurationists' problematic is a very general question regarding every social scientist.

In accordance with Jones (1999) and de Vaujany (2001c), it is important to notice that structurational approaches, in spite of being consistent, do not form a homogeneous stream of research. Some researchers give a certain exteriority to structures, a "causal efficacy", in order to study the interplay between action and structures. They adopt a very analytic way of analysing IT use. Other researchers try to "conflate" action and structures. Considering structures only as "mnesic traces" in the mind of actors, they view their conditioning power as depending on users' willingness. The resulting theoretical framework then draws on a psychosocial perspective. In a nutshell, these are the main differences between the morphogenetic approach[4] (cf. Archer, 1995) and Structuration Theory (Giddens, 1979, 1984). Archer puts forward two basic propositions that underlie her model:

(i) "That structure necessarily pre-dates the action(s) leading to its reproduction or transformation"

(ii) "That structural elaboration necessarily post-dates the action sequences which gave rise to it » (p 15)[5]"

In line with these propositions, Archer takes three social steps into account: structural (or cultural) conditioning, social (or cultural) interaction, structural or (cultural) elaboration. Past actions thus have effects "in their own right" later on. They constrain and facilitate actors' actions by means of a conditioning process, i.e. they "simply set a price on acting against one's self-declared interest and a premium on following them (consequently detectable regularities do not even approximate to constant conjunctures" (p 90). This principle does not result in a new form of determinism. The middle part of the morphogenetic/morphostatic cycle includes a potential "promotive creativity", innovative actions. Besides (and this is a key difference), Archer's model integrates various kinds of actions, linked to two sorts of agents: "corporate" and "primary" agents. The first category has a lot of resources, clear-cut projects, and strong group awareness. The second category has only marginal resources at its disposal, no group consciousness and no projects motivated by a common interest. The first group plays a much more active role in structures evolution"[6]. But in both cases, the final form of the social system is not produced by a specific groupal action. "Unexpected consequences", emergent properties define the final outcome. The latter can be described through four "second order emergent properties" (Archer, 1995; p 218): necessary compatibility or incompatibility; contingent compatibility or incompatibility. They each correspond to four situational logics: protection, compromise, elimination, opportunism.

To conclude this brief presentation of the Morphogenetic model, it is important to stress an important point. Even specific, Archer's model shares a common matrix with Structuration Theory, which makes it possible to present it as a global stream of research. Starting with the same project (recombining structures and action), they both agree on the following propositions (Hodgson, 1999)[7]:

[3] As regards this specific point, the reader can consult either Barley and Tolbert (1997) or Hodgson (1999). Drawing on DiMaggio (1988, 1991), Oliver (1991) and Strang (1994), Barley and Tolbert (1997, p 95) thus notice that "like structuration theorists, institutional theorists acknowledge that cultural constraints do not completely determine human action (…) through choice and action, individuals and organisations can deliberately modify, and even eliminate, institutions."

[4] Itself part of a broad « critical realist » stream. For a general introduction to this school of thought, we recommend to read Mingers (2000), Hodgson (1999) or Dobson (1999, 2002).

[5] According to Barley and Tolbert (1997, p 99), "Unless an institution exists prior to action, it is difficult to understand how it can affect behaviour and how one can examine its implications for action or speak of subsequent affects on the institution. Thus, to reduce the empirical problem of conflating action's subsequent affects on the institution, one needs a diachronic model of structuration process (…)".

[6] « Interaction of corporate agents generates emergent properties ; actions of primary agents produce aggregate effects », (Archer, 1995 ; p 265).

[7] In his essay, Hodgson affirm that institutionalism is a very different perspective, taking into account instinct and natural aspect of social life along with intentionnality and knowledgeability. We believe that this position is somekind of an eccletivism placing together theoretical parts with different fundings and that, on the whole, institutionalism, critical realism and structuration theory share both the same epistemological project and an interactional point of view.

a) Dependance of social structures upon individuals;
b) Rejection of methodological individualism
c) Dependence of individuals upon social structures
d) Rejection of methodological collectivism

Nevertheless, structurational approaches are not a "ready to use" research framework. Washam introduces Structuration Theory by speaking about a "meta-theoretical" approach (Walsham and Han, 1991; Walsham, 1993), [Structuration Theory would thus be a perspective "within which to locate, interpret and illuminate other approaches" (Walsham and Han, 1991; p 79).] which needs to be associated with intermediate theories, that is to say a web of concepts more linkable to the study of a concrete setting. Structurational approaches are then a sort of theoretical galaxy which will "sensitise" the researcher to some important aspect of the social phenomena under study, and which will help her/him to give a minimal coherence and relevance to her/his construct.

Table 1: Perspectives on IT-organisation relationship: an overview.

PERSPECTIVES	FUNCTIONALISM	EMERGENTISM	STRUCTURATIONISM
Principle	Structure (whether social or technical) determines action	Action is the starting point of any social construction	Action and structure can not be separated; structure is both a mean and a constraint to action, a conditioning and an habilitating factor
Theoretical roots	Normative Functionalism, Marxism, Structuralism.	Interpretive sociology, some forms of Social-Constructivism and Hermeneutics	Structuration Theory, Institutionnalism, Morphogenetic approaches
Intermediaries theories in social sciences and organisation sciences	- Cues-Filtered-Out Theory (Sproull and Kiesler, 1991) - Social Identity of Deinviduation Effects (Postmes, Spears and Lea, 1998). - Theories about the effect of IT on organisations (Huber, 1990; Elam and Leidner, 1995 - Theories about the effect of social context on IT use (Jones, 1990; Fulk, 1993)	- Hermeneutics (Doolin, 1998) - Some Social constructivism and some interpretive research (Fulk and al 1987; Jones and Saunders, 1990), - Strategic analysis (Crozier and Friedberg, 1977)*	- The structurational model (Orlikowski, 1992) - Genre Theory (Yates and Orlikowski, 1992; Orlikowski, Okamura and Yates, 1999) - Barley's model (Barley, 1986) - Actor-Network theory applied to IS (Fung, Lea and O'Shea, 1995) - The archetypal model (de Vaujany, 2001 b and c)
User status	A passive and determined agent	An active and autonomous agent	An interactive and recursive agent
Technology status	A determining object	A malleable object	A "technology-in-practice" (Orlikowski, 2000).

*In a later contribution, Crozier (1983) came back to the first modelisation he did with Friedberg, where actor is autonomous and where technology is a political objet that can be appropriated by people in multiple ways. Crozier advanced the idea of "the logic of computer" (p 93) which give a more structurational dimension to IT appropriation.

2.2 Three socio-technical archetypes to condense the structurational framework.

How can the structurational approach be applied to the case of network technology implementation[8] ? As suggested before, an intermediate theory is required. It is proposed here to use an archetypal model consistent with a structurational stance. This archetypal model consists of different stylised elements (three socio-technical archetypes and two appropriative trajectories) which will be helpful in shedding light on socio-technical dynamics.

A socio-technical archetype is a "structurational state, a long-lasting socio-technical configuration described by means of structurationist dimensions". In other words, it is suggested that the social dynamic linked to the use of IT can be described using three basic ideal-types: Neutral (N), Disrupted (D) and Regenerated (R).

In the regenerated situation, the use of IT results in new ways of interacting. New social structures are produced. Roles within the organisation are redefined, which may also translate a deeper change in organisational norms, interpretive schemes, or facilities. Barley (1990) explains why the role system is studied to examine the evolution of social structures: "If one conceives structure as a

[8] More precisely Intranet's implementation.

global pattern that emerges from the relationships that exist among all members of a collectivity, then it is possible to link shifts in role relations directly and empirically to structural change by examining properties of social networks" (p 69). Barley (1986; p 83) also suggests to find out organisational scripts, i.e. "Outlines of recurrent patterns of interaction that define, in observable and behavioural terms, the essence of actors' roles" (quoting Schanck and Abelson, 1977). This is the precise technique implemented by Barley (1986; 1990) to study the opportunity for structuring implied by the use of scanners in hospitals and the changes in the radiologist-technician interactional scripts.

In the neutral case, either the use of IT dissolves into pre-existing social structures or it is not used at all. The role system is kept and technology is implemented in a routinely. Organisational scripts are not modified. The "government co-ordination agency" case as presented by Walsham (1993; p X) illustrates this situation. Studying one of the systems implemented, Walsham explained that: "(…) the routinisation of the activities outside the GCA was not disrupted by the Intis system; they carried on largely as before with little change to their structure of signification with respect to their role and work on development activities, and the need to be coordinated between agencies".

In the disrupted situation, structures are destroyed by IT use or create tension with specific social structures. This last configuration can thus be an archetype "per se" [When some organisational routines are interrupted] or can be superimposed on the two preceding archetypes. For instance, regenerated and neutral situations can coexist. Developing his case study, Barley (1986) explained that: "As role reversals, clandestine teaching, and incidents of blaming the technologist gradually defined a new interaction order, the radiologists' moral authority tarnished and the technologists began to regard the inexperienced radiologists with disdain (…) Unaccustomed to having their knowledge perceived as inadequate, anxious that they might make a serious mistake and baffled by the computer technology, they began to express hostility toward the technologists." (Barley, 1986: pp. 93-94).

An interesting point can be raised at this stage: these three socio-technical archetypes can be interpreted either from Archer's (1995) or from Giddens' (1979, 1984) perspective. On the one hand, from the latter, socio-technical archetypes are specific psycho-sociological situations where structural properties are instanciated in a particular way. Technology does not exist away from its use and agents willingness is central in every social move. Ontological security [Ontological security is the feeling of continuity actors have as regards their actions and social context. When it is questioned, strong anxieties arise in their mind.] is either maintained or broken by actors' actions. On the other hand, from the former's perspective, socio-technical archetypes have a more concrete and objective dimension. Socio-political struggles, material conditions, agents' various creative capacities weigh on the potential evolution of the social system.

The chart on the newt page describes the archetypes by means of Structuration Theory and the Morphogenetic Approach :

Table 2: Structurational sub-streams and their interpretation of each archetype

	General Description	**Structuration's Theory Interpretation**	**Morphogenetic's Interpretation**
Neutral Archetype	Uses reproduce some pre-existing social structures. They dissolve into individual, groupal, or organizational routines, which are reinforced by them.	Structural properties are reproduced by means of an instantiation linked to IT uses. Ontological security is maintained.	Social structures are reproduced through actions. Structures condition actions, and up to a certain extent, S>A.
Disrupted Archetype	Uses (and sometimes new social structures emerging at the same time) come into conflict with other social structures.	Instantiation mechanism implies some tension, which may be expressed individually. Ontological security is broken.	There are logical or practical incompatibilities between actions and structures, e.g. those reproduced or transformed by the group under study : S #A

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	General Description	Structuration's Theory Interpretation	Morphogenetic's Interpretation
Regenerated Archetype	Uses produces new social structures or transforms old social structures.	*Instantiation is innovative. New structural properties are produced. If it has been broken, ontological security is on the verge of being rebuilt.*	There is a transformation of social structures. Action is stronger than structures, more powerful or innovative than some conditioning element (S<A). In Archer's perspective, this can have a social cost for actors.

2.3 Two general sequences of archetypes: the balancing-point and the improvisational dynamics.

Using the three socio-technical archetypes previously worked out, it is now possible to describe some general trajectories linked to IT implementation. An appropriative trajectory can be defined as "a general and regular sequence of socio-technical archetypes, a structurational dynamic". From our point of view, the theoretical and empirical literature suggests two trajectories: the balancing point dynamic and the improvisational dynamic.

2.3.1 The balancing-point dynamic.

From this first perspective, routine is the most common state of a social system. IT uses can thus have two sub-trajectories, each leading to the same final state. One the one hand, the new technology can first involve analogical uses, then local or global disruptions concomitant with local changes, before a global move to the regenerated socio-technical archetype and later, to a new routine **(sequence N-D-R-N)**. We go through two symbolic gates: G1 (the move from routine to change) and G2 (the move from disruption to a new social order). This first sequence corresponds to the situation described by Barley (1986, 1990). The general idea is summed up this way by the author: "(…) to occasion the structuring of organizations, technologies first disturb or confirm ingrained patterns of action to reformulate or ratify scripts, which, in turn, delimit the organization's institutional structure" (Barley, 1986 : p 84). On the other hand, the new technology can also directly induce a regeneration of the social system **(sequence N-R-N)**. The case study developed by Orlikowski (2000) epitomises this second situation. A new software results in new social configurations, without major tensions for the role system. Anyway, whatever sub-trajectory is taken into account, the gist of the matter lies in going through the first symbolic gate (G1), which embodies the move from the neutral archetype to another different archetype. The cases developed by Walsham (1993), Grote and Baitch or Muhlman (2001) illuminate these two points: the existence of a (strong) gate G1, and the inertia of socio-technical systems. Activities then always come back to a routinised state ("With time, recurrent behaviour leads to the formation of an interaction order and a set of shared typifications that generally acquire the moral status of taken-for-granted facts" Barley, 1990; p 67).

As in the case of archetypes themselves, the balancing point dynamic can be understood from Structuration Theory or the morphogenetic approach points of view. As regards Giddens, the overall process is in the mind of actors. The gate G1 is the point where the "ontological security" feeling is broken (for the first sub-trajectory). Anxiety resurfaces. And all social activities sooner or later become routine. That is why, if the dynamic ends with the regenerated archetype, the system always comes back to a long-lasting neutral archetype. How can one (a researcher, a project manager, a user…) judge if the organization comes back to the neutral archetype? From Giddens perspective (rather interpretative) it all depends on the actor's point of view. When what was a" social innovation in use" becomes routine from the agents' point of view, the system is back to the neutral archetype. From Archer's point of view, things are more concrete. The tension is in the "conditioning context", through logical or practical incompatibilities. Agents have various interests, capabilities and comprehension of the social contexts. Structures have, up to a certain extent, heterogeneous "causal efficacy". And the regenerated, neutral or disrupted nature of the social system can be determined "objectively"[9].

[9] For the empirical study, we will adopt a critical realist perspective.

2.3.2 The improvisational dynamic.

A second appropriative dynamic is put forward more and more in the structurationnist literature. It is what is called the improvisational dynamic. Orlikowski (2000) recently promoted this idea, which had been already presented in a non-structurationnist article (cf. Orlikowski and Hoffman, 1997). From this point of view, structurational processes linked to IT use are much more ongoing and intertwined than the work of Desanctis and Poole (1994) or even than a part of Orlikowski and Robey's (1992) work may suggest. Archetypes arise continuously in organisations. For the same part of the social system, uses can be at the same time regenerating, disrupting, and neutral. Technology is constantly "re-enacted" globally (its general sense) or locally (the sense of a given functionality). The consistence and stability of the first dynamic is questioned. It is also likely that the sensemaking process is a bit different from an improvisational point of view, with more retrospective creation of forms[10].

2.3.3 Comparison of the two trajectories

It is possible to sum up differences between the balancing point dynamic and the improvisational trajectory by means of the following table:

Table 3: Comparison between the balancing-point and the improvisational dynamic

	Balancing point dynamic	Improvisational dynamic
Archetypal sequence	N-D-R-N	R1-R2-R3-R4
Rhythm of the sequence	Low	High
Archetypal purity	High	Low

Is balancing-point trajectory totally inconsistent with the improvisational dynamic[11]? We do not agree on this point. Everything depends on the level of observation, the time scope studied, and the conditioning power of the socio-technical context. In practice, it is also clear that most organisational members behave simultaneously in improvisational and balancing terms. IT users are thus different from jazz musician[12] and from the forces of law and order…But the forthcoming case studies will now be helpful in precising this interesting point.

3. Illustration and adaptations of the structurational approach : four case-studies.

In this second part, the theoretical framework previously developed will be applied to four case studies: A, B, C and D. For each case, the "premodel" will enter into an assimilation-accommodation process. On some occasions, the data collected could be assimilated by the premodel. Other times, it was not possible, and it was necessary to accommodate it. This is what happened with the appropriative trajectories.

The methodology followed conforms to the case study methodology as proposed by Yin (1994). Semi-structured interviews[13] were carried out with end-users and IS managers met several times. A questionnaire was submitted as regards to their instrumental uses of the technology. We also did direct observations of steering committee meetings and read various internal and external documents.

The tool under study (Intranets) has been divided into three sub-technologies:

1. Electronic mail
2. Newsgroups
3. Data bases and tools in an HTML format

The interview structure scrupulously respected these categories, with a part for each tool.

The four sites have the following characteristics:

Table 4: Presentation of sites A, B, C and D.

Site	Main activities	Technology implemented	Nature of the study	Direct obser-vations
A	Tele-communication	Intranet, with a browser interface	Longitudinal 39 interviews	Yes
B	Cleanliness, energy, water, communication	Intranet, with both a Lotus notes and a browser interface	Longitudinal 37 interviews	Yes
C	Chemistry	Intranet with a navigator interface	Transversal 5 interviews	No
D	Quality certification	Lotus Notes	Transversal 5 interviews	No

[10] Making an analogy with jazz, Weick (1998, p 547) asserts that "in jazz improvisation, people act in order to think, which imparts a flavour of retrospective sensemaking to improvisation".

[11] As Ciborra (1999) or Orlikowski (2000) suggest.

[12] "The intention of a jazz musician is to produce something that comes out differently than it did before, whereas organisations typically pride themselves on the opposite, namely reliable performance that produces something that is standardised and comes out the same way it did before." (Weick, 1998; p 552).

[13] 86 on the four sites.

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The four sites were not studied in the same way. A and B were analysed longitudinally, i.e. by means of repeated interviews, and continuous observations (one and a half years for A, one year for B). C and D have been studied transversally. People were asked to retrospectively reconstitute their appropriative dynamic. A single set of interviews was used. Besides, study of sites A and B was more global than C and D. For A and B, we tried to study the appropriative dynamic from a corporate point of view, taking into account the company as a whole (B) or looking at some regional areas (A). As regards C and D, the research has been focused on very local dynamics: the security service of a big R&D centre for C and headquarters for D.

3.1 Case A

For the first site, the socio-technical context was classic. A was a big company with a divisional structure, partly state-owned, and had been engaged in telecommunication activities for more than 50 years. The group changed significantly during the study: (end of 98-beginning of 1999): more decentralisation, redeployment of administrative agents, new product orientation (towards new technologies)… The Intranet was rather a meta-Intranet, i.e. a technical structure destined to support functional, divisional, regional or operational web sites.

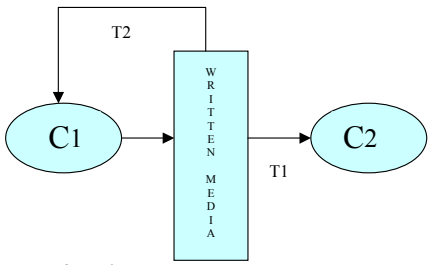
The socio-technical configuration clearly corresponded to the neutral archetype and illustrated the difficulties to go through gate 1.

The overall Intranet (launched two years before our research) was studied, along with a regional sub-Intranet put at the users' disposal one week before the first interview. At all levels, the technology was used in a way that strongly reproduced (and reinforced) organisational compartments and the role system. Users from a given branch only visited the part of the network dedicated to them. Newsgroups were used in a rather conservative manner, in spite of their openness. As soon as some deviant behaviours arose (for instance, criticism of management) auto-regulatory mechanisms emerged. Contrary to the goal assigned by IS managers to technology; Intranet was not at all a way to develop more transversality within the organisation. Moreover, the various control systems deployed by IS managers in order to channel, limit or facilitate the use of IT were also strongly reproductive of pre-existing social structures. For the regional Intranet, IS managers were all located in the headquarters' office, and no real transversal webs were set up. Nonetheless, for a small part of our sample, technology supported a decompartmentalisation of the organisation through a **catalysis phenomenon**, i.e., "the willing transformation, by means of a factor, in the context of this transformation, the catalyst" (Avenier, 1999). Technologies were used in order to develop transversal communications and cooperation. Users got in touch with new people through the mail directory or Intranet bases. New social structures come into being through other media such as telephone or direct meetings. Intranet had only had a leverage effect on this phenomenon.

However, a very interesting pattern was also noticed. It was specific to the mail system, and to the people of our panel located within the regional head office[14]: the active traceability pattern, and the passive traceability pattern.

The active traceability pattern had the following characteristics: every time an employee took an initiative, he informed his superior by means of a direct mail or copies (cc :) sometimes coupled with acknowledgement of reception. The mail was then stocked by the user. We actually met someone who kept three copies of their mails: on the person's hard-disk, on the mail server, and on printed paper! This type of appropriation was rather specific to the regional headquarters, where the atmosphere at work was deteriorating during the period of the research. The reason for this was that several people were redeployed from administrative functions to operational units. Therefore, people did not want to give reasons to their hierarchy to redeploy them. All this resulted in "unexpected consequences": a break in confidence, and paradoxically, a worse social climate.

The interactional script can be described in the following manner:



C1: Correspondent 1.

C2: Correspondent 2

Figure 1: The active traceability pattern.

[14] Particularly subject to social tensions at the time of the study because of the forthcoming redeployment.

C1 represents a correspondent looking for active traceability. He or she communicates with another actor, C2, in a hierarchical position (T1), using the mail as some kind of informational shield. The actor then loses a part of his or her autonomy, and at the same time gains more "ontological security". In the case of a conflict, he or she can defend him or herself (T2) by means of the stored mail.

Sometimes, the reverse situation could also be found: the passive traceability pattern. Some people, often in hierarchical positions, avoided committing themselves officially, by means of mail, which "leaves traces" (*"In order to get precise information that looks like official information, I use the phone. The mail leaves traces"*). Users in this case prefer media without memory. Several people in charge of human resource management thus avoided leaving traces that could make concerned employees think they could be redeployed. This second dynamic can be illustrated in the following manner:

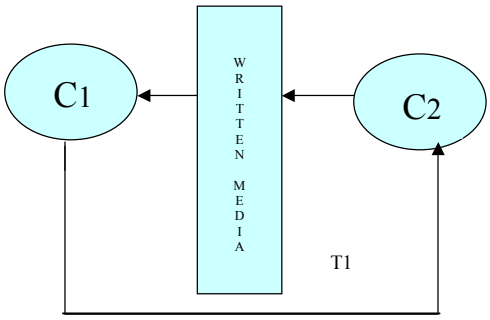


Figure 2: The passive traceability pattern.

A user (C1), in a hierarchical position, communicates with another agent (C2) using technologies without memory (T1). The agent C2 then tries to initiate a written communication by means of e-mails (T2), and to commit C1.

3.2 Case B

In this second case study, the global conditioning context was very different from the previous one. B was also a large company, but with a relatively new identity. This was a form of a financial structure, whose corporate agents had decided three years ago to give a more industrial objective. What was important was the development of an integrated supply towards customers as regards to the optimisation of industrial processes. The group thus consisted of many more heterogeneous entities with different categories of corporate agents, and big "necessary incompatibilities". Contrary to A, no real cultural structures existed. The Intranet structure was also specific. It consisted mainly of different Intranets (subsidiaries technologies), and federative projects launched by central corporate agents. From a purely technical point of view, things were also very contrasted, as some companies used Lotus Notes, others a classic Intranet (with browser), and others simply an e-mail system. The research concentrated on the federative project.

As in the case of A, IT implementation conformed to the neutral archetypes or more rarely, to the disruptive archetype. IT uses strongly reproduced organisational boundaries. The central databases structure and content reproduced and reinforced social structures, and more precisely, the role system. A few local morphogeneses were all the same noticed. This was the case of the "alternative users" category. The starting point is the following: a user who is both in administrative functions and an intense e-mail user, suffers from the disruptive nature of his e-mail system: "*The mail's problem is the interruption it can entail in work. Every time one receives a message… between the phone and the average 30 e-mails received in a 10 hours' working day, it makes 2-4 mails an hour, and I am interrupted every 20 minutes at least!".* This situation is illustrated by the example of an auditor communicating with a set of correspondents (C1), themselves corresponding with another set of correspondents. In view of the disruptions resulting from its reporting activities, the auditor decided to develop a new appropriation pattern: "*Every morning, I switch on the mail system, and then switch it off until 2 pm, time at which I consult it again. I also read my mails for the third time just before going home. I realise that by opening the mail system every morning, I could be kept abreast of an emergency, and could treat it more effectively than if I left my mail switched on all day long with new messages coming every five minutes.*" But this new appropriative pattern was not always accepted by the communication network. People from the first circle of correspondents (C1) gave phone calls, asking why the no one had answered the mail sent 20 minutes before. This could then lead to two kinds of "structural elaboration": morphostasy or morphogenesis. In the first situation, the socio-technical system comes back to the original state. In the second situation, a new local structure emerged, more alternative than reactive.

Finally, it was also surprising to notice a progressive local morphogenesis linked to the central IS service. At the beginning of the

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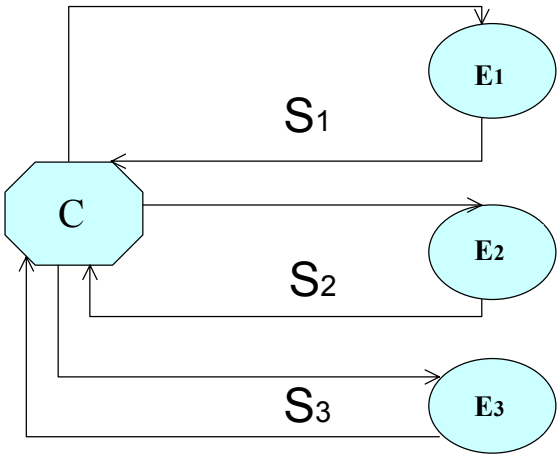
Intranet project, IS subsidiaries were rather reluctant to cooperate with central managers. But the group developed a new tool: “Teamrooms”. This was a sort of private news group targeting very specific communities, with discretionary access, and a documentary database. The success of this technology was much more important than the one of classic newsgroups. Many IS agents in subsidiaries decided to ask central agents for the "model" in order to develop their own "teamrooms". The competence of IS headquarters was thus more recognised, along with its legitimacy.

3.3 Case C

This third organisation was in the chemical industry. It was on the verge of a huge merger with a former competitor, which raised a lot of fears about the future. The study focused on the security department of a European Research Centre of the company. Some members were rather reluctant to actual or potential effects of Intranets. More precisely, with the implementation of a security newsgroup, experts dreaded the emergence of a disrupted situation, an endangered “cohesion of the service”. Normally, engineers had a very informal way of counselling technicians and researchers by walking around on the site or exchanging ideas on the phone. Researchers used to ask the same question to the different engineers[15]. They then chose the less constraining answer which was often formalised by an e-mail (cf. figure).



C: Customer (researcher or technician)

E: Security engineers.

Figure 3: The current role system between customer and security engineers.

With the new system, customers (C) could ask advice directly on the forum. And if an expert (E2) gives an answer directly, it is automatically formalised at the same time it is given. Other experts (E1 and E3) cannot say anything to E2, or they may make him or her lose face. And if E2 does not consult his or her colleagues before answering, this can have damaging consequences… It can also be supposed that if C does not get a satisfying answer on the forum, he will go back to the previous system.

Newsgroup

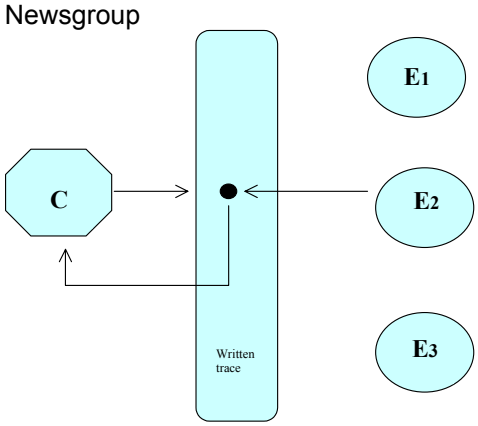


Figure 4: The disrupted situation expected by engineers.

3.4 Case D

The last organisation, D, was pretty much the same as A. It was a company with a long history, strong social structures, and a precise role system. The study was focused on a part of the regional headquarters, and the director-secretary relationship, along with engineer - customer interactions. Employees had Lotus Notes at their disposal. Contrary to the preceding sites, the overall network was managed at a national level. Contents, IT strategies and control systems were worked out by central corporate agents. Local technical problems, such as software maintenance, were managed by local computer delegates.

Again, the socio-technical context corresponded to the neutral archetype. IT uses strongly reproduced the role system. Secretaries managed the e-mail flow like paper-mail, archiving a pre-selection in the name of the director, who also sometimes dealt with electronic information himself. Technology thus dissolved into pre-existing social routines. It was the same with Lotus documentary databases, which were seldom used by secretaries and directors. They were mainly consulted for problems relating to archives previously read in a paper form (technical or quality reports), and recently moved to the server. Nor was the engineer-customer relationship altered by the technology. Few commercial interactions were

[15] Who were aware of this.

managed by mail (anyway, customers were under-equipped). Paper along with oral discussion were still the main media of customer-engineer exchange.

4. Discussion

The four cases developed were partly consistent with two appropriative trajectories previously introduced. IT use strongly reproduced and reinforced organisational frontiers and socio-technical systems displayed a real inertia. Gates 1 and 2 were sometimes gone through, but rather on the micro-social level. The balancing point dynamic is thus relevant to understanding the social dynamic of IT use, but at a very local and limited level. Moreover, the dimension of role system modified by the technology was often linked to "non-relational aspects". Inspired by Nadel's research (1957), Barley (1990) thus explains that there are relational and non-relational roles. Relational roles demand an "alter ego", another person who fills a "complementary position in the social order": mother and son, debtor and creditor, professor and student… Intranet modified the rhythm of task achievement, the surrounding social climate of social systems functioning or the general efficiency of some organisational processes, without changing anything as regards to the systemic arrangement of professional relations. This is fully consistent with Barley's observations: "When introduced into a work-setting, new technologies initially modify tasks, skills, and other non-relational aspects of roles" (Barley, 1990; p 70). Besides, it was also remarked that IT routines can be broken long after IT implementation, as suggested by the alternative use of e-mail on site B. On the whole, it is then clear that both balancing and improvisational dynamic have their relevance.

After all, the production-reproduction of social structures underlined by structurational approaches is not always appropriate. Sometimes, IT uses only accelerate or inhibit tendencies initiated under non-technological environments. That is why a third appropriative dynamic is introduced, particularly important to understand Intranet's uses: the catalytic trajectory. This is a middle-range situation in comparison to the other two appropriative trajectories. In this configuration, IT use becomes an action among others. There is no "social innovation in use" *per se.* Traceability patterns along with transversal uses of Intranets illustrate these situations where IT uses only accelerate evolutions of the role system.

As regards to the potential limits of this work, there are three points we would like to discuss: the first is linked to our methodology, the second, to the contextualisation of the trajectories, and the third, to some epistemological aspects of the model.

One can suggest that the emergence of one of the three trajectories can be related to the time scope of the study. A global balancing point dynamic could eventually arise on a site two years after the implantation of a new system. In the meantime, micro-improvisational or local balancing-point dynamics may have occurred. The trajectory delimitated will then be related to the time of the researcher's arrival and departure. There are nonetheless two counter-arguments to this critic. First, it is not consistent with the actual rhythm of technological change. Technological networks content and frontiers are modified at such a speed that it is often unrealistic to deal with a unique trajectory in the long run, unless the use of a "ceteris paribus" principle as regards the "new" system implementation. Second, most interviews achieved during our study integrated retrospective elements aimed at enlarging the scope. That is why the empirical time scope is not completely the one of the observation.

The second limit is more a theoretical one, because contextualisation (from a critical realistic perspective) raises another problem. Which conditioning elements may favour each trajectory? According to Collins and Kush (1998), technology can be classified into three general categories:

- Tools: which are machines that "can amplify our ability to do what we can already do"
- Proxies: that is to say "machines [that] can replace us by doing what we already do (perhaps better that we can do it)"
- Novelties: i.e. "machines [that] can do types of things that we could never do without them" (Collins and Kush, 1998 ; p119).

An interesting proposition we would like to put forward is the following: Intranets (for the cases studied) were "tools" rather than "proxies" or "novelties". In the case of other kinds of collective technologies (ERP[16] for instance), would the dynamic linked to this other kind of technological and societal context be the same? It might be expected that

[16] Entreprise Ressource Planning.

changes (if they arise[17]) are achieved quicker and in a purer fashion in the case of "proxies", automating and restrictive[18] technologies, than in the case of more flexible technologies[19]. This could thus be an interesting research agenda to pursue: Are there different kinds of appropriative trajectories according to the technology under study? One may argue that this can result in a new kind of technological determinism. But this does not seem to be the case at all. The link of a given trajectory to a specific technology remains open. No content is given for the final outcome. The latter proposition only indicates that the opportunity scope concerning "Tools" is probably wider than the one concerning "Proxies" or "Novelties".

Another potential limit of the study is an epistemological one. What is the validity of the appropriative trajectory described? Often, the move from one archetype to another implies subjective elements. For instance, the routinisation of an activity integrates the user's point of view more than the researcher's perspective. This is an important gap between Archer's and Gidden's theories. According to the latter, appropriative trajectories have a strong interpretive nature; according to the former, the social dynamic of IT use has objective features. Tensions are inherent parts of the social system. In their fieldwork, researchers often navigate between these two extremes. Here, we have chosen to interpret the data from a critical realist perspective.

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[17] I.e. if the condition for the production of new social structures is stronger than the one promoting the statuo quo.

[18] From a technical as well as from a social perspective. A strong coalition of corporate agents may thus promote a very precise goal and general intent for IT use (what Desanctis and Poole (1994) name a "spirit").

[19] Of course, this idea linked to the conditioning context is only relevant from a critical realist perspective.

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