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Organizational Appropriation of Technological Change

Conceptual Basis and Analytical Tools

François Lapointe

Egalement disponible en français sous le titre :
Appropriation organisationnelle du changement technologique

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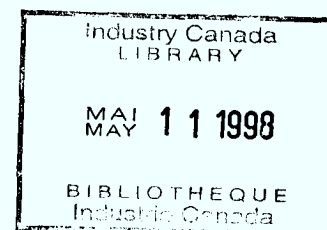
Centre for Information Technologies Innovation

**Technological Innovation and
New Forms of Work Organization**

**Organizational Appropriation of
Technological Change**

Conceptual Basis and Analytical Tools

François Lapointe



Laval
August 1993

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Bases conceptuelles et outils d'analyse

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INTRODUCTION

Since the beginning of the 1990s, numerous analyses¹ have remarked on the difficulties faced by organizations in all the industrialized countries in adjusting management and work organization techniques to the increasingly rapid pace of technological change. Faced with this situation, analysts are unanimous in concluding that organizations must develop a management approach that integrates the planning and application of technological change with the design and development of their organizational structures. Unfortunately, research in this direction remains abstract, characterized by the formulation of strictly theoretical assertions.

Starting from this observation, we have attempted to lay the groundwork for an approach to applied research into the **appropriation of technological change** in organizations. By the "appropriation of technological change," we mean that process whereby actors integrate such changes into their practices, and into their representation of reality and their methods of operating within it, such that they can act and make choices within the process. Applied to organizations, this notion involves integrating change into methods of management and operation, but also into the cultural dynamics and social relations that exist within the organization. It is in this sense, therefore, that we speak of an **organizational appropriation of technological change**. This notion encompasses all issues related to the introduction of new technologies in the workplace, at the same time as it makes it possible to identify and gauge the specific effects of these changes on work. More concretely, this implies two levels of activity. To start with, our aim is to develop a "methodological toolbox" that will allow us to intervene on these different issues with a view to facilitating technological change in various types of organization. At the same time, however, it is important that these methods and analytical concepts be firmly based on a clear theoretical understanding of the question of "technological change and forms of workplace organization."

The aim of the present document is to lay the groundwork for this undertaking by considering the current state of thinking and analysis on the question, as well as early experimentation. Together these will allow us to situate and commence our task of methodological construction. Without claiming to provide an exhaustive examination of the

¹ For example, Alsène, Légaré, Vendittoli, 1991; Alsène, Légaré, Éthier, 1990; Eason, 1991; Hendrick, 1991, Saint-Pierre and Cambrosio, 1990.

question and the numerous issues surrounding it, we nonetheless intend to produce a reference work that will serve as a guide for our research into the appropriation of technological change. After establishing where we stand on the question of appropriation of technologies, we shall set out guidelines for the organizational appropriation of technological change and define the conceptual tools supporting it. It is these tools that will allow us to situate our objective from the point of view of applied research. We shall then describe the methodology by which we have undertaken our research and, finally, its application to various field studies.

1. THE NOTION OF APPROPRIATION: GENERAL DEFINITION AND SITUATION

The notion of appropriation as an instrument for analysis and observation of the social, cultural and political effects of computerization emerged in the context of sociological research into technological change and the spread of technologies among the general public. Serge Proulx, for example (1987; 1988; Proulx and Bordeleau, 1988; Proulx and Tahon, 1989) has considered the appropriation of a computer culture by its users as the basis for an attitude of "critical openness" to what he calls "new technical objects." In this context, the question of appropriation is considered an aspect of the study of the computerization of daily life, with the penetration of microprocessor-equipped equipment and accessories in the domestic arena, in the operation of the state apparatus (public administration), and in the work world. The empirical research referred to here considers more particularly the development of domestic uses of microcomputers (specifically for recreational purposes) and applications used by professionals working at home (Proulx and Tahon, 1989).

Proulx adds that an effective appropriation of a computer culture presupposes that the individual or group has the ability, first, "...to use the technical object for purposes other than the specific technical function for which it was designed by its manufacturer," and, second, "...to define what might be, as far as the user is concerned, the 'appropriate use' for the technical object in the context of his social activity" (1987).

Overall, the appropriation of a new technical object or new technical knowledge is defined as:

"...a complex process which develops through a subtle web of interactions between the development of specific social uses for the technical object or knowledge, the social representations and mental image of the technical object or knowledge, the constraints and necessities posed by the individual and social activities of the users (actors)... the socially established "methods of operation" for the technical object or knowledge, that is, the directions and instructions proposed by the manufacturers, which are affected by the prevailing social norms and from which the users (actors) "distance themselves" to one degree or another..." (Proulx, 1987, pp. 47-48)

The notion of appropriation must be distinguished from the idea of **adoption of a technological innovation**, which is particularly common in the literature on technology management².

"The phenomenon of **adoption** of technological innovations offered to the public concerns a particular aspect of the process of appropriation, that related to the social conditions that make technical objects and a computer culture **accessible**. Accessibility is a necessary prerequisite for achieving the goal of appropriation." (Proulx, 1988, p. 159)

In defining appropriation, Proulx (1987) distinguishes between two levels: 1) the acquisition of **individual** knowledge, effective insofar as the learning process "permits the individual to integrate the technical object or knowledge into his or her daily life in a creative and significant way"; and 2) the sociopolitical enhancement of the power of a particular group or social category relative to the other components of society. In this case we speak of **social appropriation**, which occurs "when the use of new tools or new knowledge contributes to strengthening the social influence of the group that appropriates the tool" (1987, p. 47)³ These two dimensions follow from the fact that individual experiences of learning microcomputer technology can be interpreted in a larger social context (for example, the individual knowledge thus acquired can be of use on the labour market).

Note, however, that much research into individual appropriation (Douzou, 1986; Proulx and Bordeleau, 1988; Tahon, 1988; Jouët, 1989; Proulx and Tahon, 1989) has shown that differences emerge between the domestic uses foreseen by users upon purchase of a microcomputer and the real uses which later develop. Thus individual approaches to appropriation are marked by a gradual change in the perception of the domestic microcomputer from an object to be used for recreational or home purposes (home management, games, children's education, etc.) to a tool to be used for working at home.

2 In the sociology of innovation, Everett Rodgers has explored in depth the question of adoption by individuals.

3 This definition, which is based solely on the acquisition of power, seems to us too narrow. For example, in the context of the civil service, one can see that the appropriation of technological change can be an integral part of an organizational strategy intended to maintain spheres of activity in a context of shrinking resources. Here appropriation may respond to two levels of motivation, which can be called the level of legitimization and the level of politics. On the first level, the organization's internal social representation presents appropriation as a question of "survival" for the collective unit. The second level, often hidden just beneath the surface of the first, shows appropriation to be an element of individual or collective strategies for professional advancement on the part of the promoters of the change, of the users of the new technologies, etc. (For a concrete illustration of this example, see Lavoie and Lapointe, 1991.)

One can see, therefore, that the existence of microcomputers has resulted in the invasion of the private, domestic sphere by the world of work. (Proulx and Bordeleau, 1988; Proulx, 1988). Nonetheless, the recreational aspect of the machine remains a primordial part of individual appropriation, insofar as "...it is because the use of the microcomputer is in itself enjoyable that so many people are prepared to use it for work." (Proulx and Bordeleau, 1988)⁴

Alongside the massive expansion of microcomputer use that marked the 1980s emerged various interpretations and approaches to information technology. Some presented it as a threat to the quality of life, because of job losses, deskilling, and threats to the confidentiality of personal information, while others saw it as a source of "electronic miracles" that would increase productivity, replace routine tasks with stimulating, creative work, and provide new means of artistic expression and creation. The symbolic production that resulted from this clash of ideas made it possible to identify new social, economic and political issues in the work world. Thus the "technological conversion" of the 1980s was studied as a social phenomenon which takes form on the basis of collective representations, representations that, in turn, it encourages, modifies and reconstructs. It is in this context that Proulx and Bordeleau (1988) point out the importance, as a social and political issue, of the **social appropriation** of scientific and technical knowledge linked to computerization by various professional and social groups.

Cazabon (1988) also starts from this view of appropriation as a sociopolitical issue to propose a definition: appropriation is "that which permits one to affirm and strengthen one's

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In reality, it is probably not the domestic microcomputer as such that has provoked the breaking down of the frontier between the home and the workplace. If microcomputer use is interpreted in a global context of increasing demands for productivity, increasing competition on the labour market, and urban sprawl (increasing distance between home and work), one can see the domestic microcomputer as a tool that can facilitate and accentuate this process, without in fact being the fundamental cause of it. Rather we are faced with a **sociotechnical** phenomenon, around which develop **social representations** of work and the tools that permit it to be carried out (see Saint-Pierre and Cambrosio, 1990). Later we shall see that these social representations are constructed by actors on the basis of local conditions and a context that is as much social as technical.

It is interesting to note that the same sociotechnical phenomenon resulting from the introduction of the computer in the domestic sphere has different consequences when introduced in an agricultural context. A recent examination of the computerization of Quebec dairy farms (see Lavoie and Murray, 1992) in fact tends to show that, in this context, the microcomputer has made it possible to use time previously required by farm work for other purposes. As well, the microcomputer is just one part of a process whereby dairy farmers are reconstructing their conception of their work, changing their view of agriculture from that of a way of life to that of a profession. As in the example of telework, here the computer is simply a tool that is facilitating and accentuating a wider social phenomenon, i.e., the "professionalization" of agricultural work, which is in turn part of an "urbanization" of rural life.

social position seen as part of a struggle for the development of society." Here the notion of appropriation is considered as a blueprint for society from the perspective of increasing autonomy and liberation. The author recognizes that such a conception turns appropriation into a relatively utopian idea when applied to the general public, to users who are not technical experts. Starting from a similar analytical framework, Alsène (1988) also reaches the conclusion that such a view of the appropriation of microcomputer technology is a utopia. The author states that "technology is not neutral," but is "the sphere of experts"; it "encompasses a logic of society that makes impossible, if not difficult, its adaptation by counter-experts. It is a Trojan Horse." (p. 307).

2. ORGANIZATIONAL APPROPRIATION OF TECHNOLOGICAL CHANGE : DEFINITION AND FRAMEWORK FOR ANALYSIS

The question that interests us concerns the development of means by which the real issues involved in the process of technological change can be integrated into strategies for management and organizational change. From this perspective, we present the hypothesis that appropriation can be seen not as a process of taking control of a technology, conceived of in isolation, but as the ability to recognize the constraints and opportunities posed by a technology and to act on them. Technology is constructed both socially and technically; the process of computerization is as much a function of the organizational context in which it takes place as it is of the intrinsic characteristics of the technologies in question (Saint-Pierre and Cambrosio, 1990). In this sense we can speak of the **organizational appropriation of technological change**, based on the ability of groups and organizations to integrate their operating logic with the content and orientation of technological changes.

By considering that the appropriation of technological change in the workplace emerges from an organizational context and dynamic, we avoid the utopian vision of the appropriation of the *technology in itself*. We are, therefore, able to understand that such a phenomenon requires many types of knowledge, competence, and professional culture. Appropriation thus appears as a collective issue, whose primary basis is the ability of the group to share various areas of control through **adherence** to a common goal and common identity. At issue in organizational appropriation, therefore, is the **relative degree of control** of technological change by an organization, i.e., its capacity to express its perspective on such a change. Furthermore, such an analysis can serve to describe the necessary conditions for a **participatory approach** to the design and implementation of technology (Bjorn-Anderson, 1988).

2.1. The Sociotechnical Character of Technological Change

Many authors consider that issues in the sociology of science and technology are necessarily both social and technical. This approach follows from a **strategic analysis of innovation**, according to which innovation is constructed on the basis of symmetry between social and technical aspects (see, in particular, Akrich, 1989; Akrich *et al*, 1988a, 1988b; Bijker, 1987; Callon and Latour, 1986). The process of innovation is thus defined as

dependent on negotiation between various actors whose capacity to intervene depends equally on technology and technical knowledge, on the one hand, and social relations, on the other. Put another way, so-called technical choices may be made that imply strategic choices or decisions affecting social relations while, conversely, "... there is no way to have a social group known as cyclists if they do not have bicycles." (Doray and Lapointe, 1990)

Such an approach is, therefore, oriented towards examining the relations between actors that are manifested in the process of innovation. Technology appears as both consisting of and creating constraints, opportunities and relationships that may be scientific, technical, social, cultural, economic, political, cognitive; and so on. The actors may be individuals, groups, elements of understanding or structures (the designers, users, standards and constraints present in an organization or environment, etc.) that carry out and direct this process. In short, this approach defines itself as follows:

"Rather than speak of the logic inherent in objects, we shall, more modestly, content ourselves with noting a firm consensus on their description. Rather than catalog logical connections and on that basis deduce the nature of the observable world, we shall attempt to record, retrieve and analyze those linkages that display some stability, those irreversibilities — always provisional — that develop and, finally, come to resemble logical connections, but new and transitory connections, of which we may say such irreversibilities are constructed, associating human beings and things according to rules that remain to be discovered." (Akrich, Callon, Latour, in Benghozi, Akrich, Callon, Latour, 1988)

Given such an approach to innovation, it seems difficult, if not contradictory, to separate even conceptually the various aspects involved in the process of constructing technology, since the various elements are interrelated and indissociable. Considering the notion of technological **change** in organizations from this perspective may allow us to understand the developing process, the interactions surrounding the change and the process of innovation of which the change is a part. This is, therefore, an extremely useful conceptual framework that can help us decode and grasp technological change for the purposes of analysis. However, this approach takes a historiographic perspective on change, one that proposes an *a posteriori* understanding of the sum of phenomena observed. Hence it can be only partially of use when organizing a process of applied research whose goal is to **intervene** in the process itself in order to enhance organizational and technical choices.

To accept that there is movement, relationship and overlap between the various dimensions of a technology and the context within which it develops does not necessarily mean, however, that it is totally impossible to distinguish the various components. Common

sense alone allows us to distinguish between an organizational intervention (the establishment of an administrative procedure, for example) and a technical one (such as installing a video card in a microcomputer), even if the two are in some ways related, having perhaps, a common origin or mutual repercussions⁵. While recognizing the sociotechnical nature of the process of constructing technologies, it is, therefore, conceptually possible to distinguish areas of inquiry in the social and technical reality within which the phenomenon of appropriation occurs. Such an exercise proves particularly necessary from the point of view of applied research, with its aim of producing proposals for intervention. If they are to be made operational, any recommendations made must be based on an analysis that can define specific goals, as well as the specific methods required to reach them (Lapointe, 1992).

From this perspective, the issue is to discover the "constructs" underlying common sense, and their relationship to the circumstances and context that make "sense" of the actions of the participants. By comprehending the way in which the actors collectively understand the technological change, we can reach a definition of the issue of appropriation within an organization, and on that basis recommend means to facilitate such change. This is the viewpoint from which we shall present the conceptual tools that will form the basis for our methodological development.

2.2. Conceptual Tools

2.2.1. "Situated Actions" and the Sociotechnical Context

Anthropology offers interesting avenues for the study of technologies as indicators of the knowledge, values or operating rules of societies. Lucy Suchman (1987) takes this approach when she applies the analysis of the production of the (symbolic) **meaning** of human behaviour to human-machine interaction. The author thus introduces the notion of **shared understanding** to illustrate the production and appropriation of what other authors have called social representations (notably Jodelet, 1988, 1989). It is this shared understanding that renders actions intelligible, establishing itself in reference to **plans**, which are representations on the basis of which one can explain the actions taken to respond to

⁵ Among other examples, Kidd (1988) has shown how social considerations (concerning the qualification and dequalification, or deskilling, of operators of digitally controlled lathes) can be identified and circumscribed in order to be integrated among software design principles.

particular situations. This analysis leads Suchman to propose that actions are first and foremost "situated" and to posit these **situated actions** as *ad hoc*.

To speak of situated actions, linked to a particular function, clearly implies the existence of the actor's environment, the context within which the person defines the criteria that make his or her actions intelligible. As concerns the appropriation of a technology or a process of technological change, this analytical framework shows the importance of consistency between the environment as represented by the user and the real physical environment. Suchman deduces that the computer's environment is not just physical, but social. This requires an interpretation of the users' actions and an evaluation of their understanding of their situation. The organization of situated actions emerges from the interactions between actors, as well as between actors and the environment surrounding their action. Insofar as actions are always situated relative to social and physical circumstances, context, says Suchman, is determinant in interpreting actions.

The basis of actions, Suchman concludes, resides in the **local interactions** of actors with their environment. Such an analysis implies the recognition of a certain level of autonomy on the part of social actors relative to technological change, hence the possibility of an appropriation of the process, founded on its interpretation and its application in a local context.

In order to situate these local interactions and their position in the process of technological change, we propose to speak of the **sociotechnical context**. We thus aim to grasp, starting from "situated actions," the relations between actors and change. In particular, this idea is intended to permit a clearer definition of the specific situations of organizations that are the subjects of our research. In this sense, reference to the sociotechnical context can serve as one element for the interpretation and understanding of the contextual dimensions guiding the conduct of actors relative to change. The specific sociotechnical context of an organization is constituted in terms of various dimensions. On the basis of our empirical observations to date, we have identified five such dimensions:

- the **general context** of the organization (characteristics of the area of activity, the market conditions, the financing of operations...);
- the **existing technological basis** of the organization (the role of technologies in the work and production process; acquired experience in the implementation and use of

technologies; existing mechanisms for change management; available expertise, human and technical resources...);

- the **characteristics of the actors** in the organization (their social position in the organization, the networks of cooperation and exchange to which they have access, their perceptions of their role and that of the organization...);
- the **discourse** of the actors (the formal and informal discourse within the subdivisions of the organization, the ways in which the actors describe their work, their perceptions of the organization, of change...);
- the **practices** of the actors (their assigned tasks, the work process, the needs these practices are intended to meet, specific modes of intervention, specific attitudes regarding these practices...).

On the basis of this information, we should be able to reach a better understanding of the "behaviour" of various types of organization faced with diverse situations of technological change, in order to establish the conditions required for the appropriation of such changes.

2.2.2. Social Representations

Like Suchman, Denise Jodelet (1988, 1989) puts forward analytical tools that allow one to transcend a purely cognitive interpretation of human-machine interaction. Jodelet has developed the concept of social representation, which illustrates a "version of socially shared reality." The concept is intended to reunite the psychological and social dimensions, providing an "interface" between the individual and the group. Social representations concern the way in which the individual — in this case the user — reacts to a question or situation in his or her environment, hence to the common meanings developed in a given situation and context, as well as to socially shared attitudes. Jodelet considers representations in the analysis of new technologies to be linked to work, to the individual's reaction to the task.

Referring to the question of technology transfer, the author also proposes that representations are built on the basis on a number of relations: relations with the environment, relations with the types of pre-existing knowledge (traditional, technological,

scientific...), relations with an operating logic (an economic logic, for example), as well as relations with the characteristics ascribed to the technologies. Thus, people who share the same activity (or the same group of activities) in the same environment participate in their own universe of representation, on the basis of which the group creates a particular universe of standards and knowledge.

Social representations can therefore provide an excellent reflection of the way in which users collectively conceive of the constituent parts and mechanisms of their environment, in other words, the technology, their work, and the methods of operation of the organization to which they belong. The study of these representations therefore makes it possible to illustrate the conditions for the emergence and construction of an appropriation of technological change within and by organizations. The notions of plans and situated actions put forward by Suchman can strengthen this approach to understanding relations to change in an organizational context.

2.2.3. Implicit Organizational Design and Organizational Logic

The organizational context is the frame of reference within which actors construct their perceptions of the final results of change, of the manner in which it will be integrated into the work process. It includes, in particular, rules of operation, social groups, and their strategies and interrelations. In a discussion of the integration of new technologies in organizations, Éric Alsène (1990) takes the results of several empirical studies⁶ to develop the idea of the non-neutrality of technology. He argues that technology does, in fact, carry with it an organizational logic insofar as it "...incorporates' the technical and social viewpoint of its designers and producers who, it should be remembered, work within the context of the power relations and organizational cultures that characterize the domains of research and development and innovation" (p. 327). The author calls this concrete and specific application of a technology's built-in organizational logic its "implicit organizational design." He remarks, however, that this implicit organizational design is made up of "organizational constraints and opportunities" concerning the different possible ways of using the technology. He adds that **we are not dealing with a rigid, frozen reality**. The organizational context (such things as existing structures, earlier technologies, management styles, etc.) will determine the way in which a technology's built-in organizational logic will

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These include a study of the introduction of a computerized process-control system in a process industry, as well as a study of the introduction of two automatic component-insertion machines et a MRP II production planning and control system in an assembly plant.

be applied in a given organization. The way in which an organization "plays" on these constraints and opportunities depends on the **correspondences** that exist between the technological and organizational spheres. This interaction helps define the specific effects of the latter on the organization, defining the limits of action in the management of technological change.

From this perspective, the process of appropriation of a technology by an organization seems to be determined by the way in which that organization manifests its capacity to balance the organizational constraints and opportunities inherent in the technology. In this sense, the appropriation of technological **change** refers to a wider issue, one that depends on organizational strategies, actions taken by actors, and collective representations of the transformations involved. Technology is therefore dealt with as one element in a process of change in the methods of organizing and carrying out work, including, of course, the social relations linked to it.

The idea that an organization has a logic of its own implicitly refers to a specific **context** and **circumstances**, as described by Suchman (1987). These circumstances and context form the frame of reference within which the actors construct their **social representations** (Jodelet, 1988, 1989), which in turn are the basis of what can be called the logic, or identity, of the organization, which we have defined as the organization's **sociotechnical context**.

One of the major aspects of our work, as we attempt to define and operationalize the notion of the organizational appropriation of technological change, will be to develop analytical tools that will enable us to grasp these social representations. Next, we must verify that these representations fall within in a frame of reference that is shared by all actors in the organization. We shall also attempt to grasp the extent to which the motivations forming the basis of this frame of reference can be understood, allowing us to intervene in its formulation in order to define the conditions and facilitate the process of appropriation.

2.2.4. Investment in Forms

The integration of a technological change within the "logic" of an organization may presuppose the establishment (or re-establishment) of a general framework that can channel, organize and direct the necessary resources. Here we refer to an effort to conceive of and establish organizational and normative structures which aim to situate, adapt and

operationalize a set of practices and activities. This work of structuring, once explicitly recognized and formalized within a management and operational framework, can be called an **investment in forms**.

The idea of investment in forms was initially developed by Laurent Thévenot in order to extend the range of concepts that could be used to describe the ways in which a professional identity is codified (Thévenot, 1983). The author's intention was to develop a methodology to understand the process of codification of laws, rules, instructions and standards that can contribute to defining an area of activity as belonging to a particular profession or trade. Thévenot later went on to extend the area of application of his concept to cover all forms of co-ordination of action and their relations with systems of production, as the basis for a "theory of economic resources" (Thévenot, 1984; 1985; 1987).

Put more precisely, a form is an instrument, such as a norm, standard, custom, contract, law or convention (or a set of norms, standards, etc.). In each case we are dealing with a structure that creates or regulates relations or equivalencies between various elements relating to an organization. Such forms have a number of characteristics:

- stability over time, which ensures their continuation into the future;
- an area of validity illustrating their effective scope;
- a degree of objectivation, which allows these forms to recreate a situation, to have an intrinsic effect that distinguishes them one from another.

The notion of investment should be linked to the idea of work or expenditure, whether material or symbolic. This expenditure is made in order to define a framework regulating relations, made automatic through the establishment of "equivalencies" (for example, between a norm and the practices to which it applies) that permit the forms produced to be compatible with one another⁷. Investment in forms therefore represents the act of creating, through inclusion and exclusion, an arrangement that will link *a priori* heterogeneous elements into a stable and predictable relationship.

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When speaking more specifically of technological change, a parallel should be drawn between the notion of equivalence and that, in the same order of ideas but on a wider scale, of correspondence between the technological and organizational spheres that we borrowed from Alsène (1990) in the previous section.

Planning and managing a large organization, that is, preparing and monitoring procedures, regulations, programs, and so on, is intended to construct a general operating framework that can orchestrate the use of resources. It is based on the establishment of equivalencies by which management unites these resources in a given order. Investment in forms attributes certain specific areas of power, resources and goals to specific actors or areas of activity. The intent is to permit the effective use of resources that are intended to contribute to the achievement of objectives, such as the implementation of technological change. In short, the idea is to orchestrate and consolidate a certain arrangement of resources, practices, knowledge and representations, linked to the application of technology.

The results of our field work⁸ permit us to add that investment in forms cannot be carried out by an organization's "decision makers" alone. A multiplicity of actors can also contribute to its definition, according to their representations of technological change, of their role, of what the change will allow them to gain or lose, etc. Aside from their participation in change as such, they affect investment in forms by the ways they apply it in their daily activity and the ways they interpret its objectives and operation. Investment in forms can be a mechanism facilitating the organizational appropriation of technological change. On the other hand, investment in forms can also result from the appropriation of technological change by an organization, insofar as it includes the relations among actors and the social representations that are at the base of the appropriation.

We should also point out that it seems evident that a technological change in an organizational context does not automatically lead to a corresponding investment in forms. The effects of a change and the conditions under which it is appropriated by the organization may be so negligible that such an investment is not required. On the other hand, management may not take into account the organizational requirements of the change, either because of constraints that are too great to be overcome, because of a wish not to upset existing orientations, or simply because of a lack of vision and dynamism.

As a conceptual tool, investment in forms can therefore enable us both to identify management interventions, for purposes of analysis, or to propose interventions in an applied research situation.

⁸ See in particular Lavoie and Lapointe (1991), Doray and Lapointe (1992) and Lapointe and Lavoie (1993).

2.3. Articulation of the Notion of the Organizational Appropriation of Technological Change

The preceding analyses have essentially taught us four things. First, technological change occurs in a specific context (Suchman, 1987), from which emerges a **sociotechnical context**. The latter can enable us to distinguish and connect, on the basis of the specific characteristics of the technological change, elements that are perceived, *a priori*, as being in the organizational sphere. Fundamentally, the sociotechnical context can be represented on the basis of five dimensions: the general context of the organization, the existing technological basis of the organization, the characteristics of the actors, the discourse of the actors in and about the organization, and the practices of the actors in the organization.

Second, we have seen that an organization is a combination of elements in constant motion, whose positions concerning change may grow out of multiple sources and where **social representations** play a significant role in the development of such positions (Doray and Lapointe, 1992; Lapointe, 1989). Hence, to grasp the process of technological change with the aim of comprehending and, finally, guiding the process of appropriation, we must be able to identify these social representations and to understand the sociotechnical context that characterizes the organizational sphere.

Third, we have seen that **technology is not neutral**, i.e., it carries an implicit social vision that includes a preconception of its eventual use (Alsène, 1990, Akrich, 1989; Kling and Iacono, 1989, 1988; Callon and Latour, 1986). The social content of technology contributes to defining the conditions of its appropriation, to limiting the space available within in which it can be adapted and integrated into an existing work process. As well, we put forward the hypothesis that understanding the **implicit organizational design** (Alsène, 1990), which reflects the organizational constraints and opportunities offered by the technology, can guide us towards the technological choices most likely to favour the appropriation of change within and by the organization. Thus, implementing technological change in a work context essentially means establishing a **correspondence** between the "sphere" of technology and the "sphere" of organization (Lapointe, 1992; Alsène, 1990; Noulon, 1990; Kidd, 1988; Suchman, 1987, 1988). We refer here to the relation of actors to a given technological space. The aim of this interaction is to create a socially and technically integrated construction, adapted as much as is possible to the organization's specific context.

Lastly, we defined the notion of **investment in forms** as a possible reference point, either to circumscribe the actions taken by an organization to absorb change, or to allow development of recommendations for action to support the organizational appropriation of change.

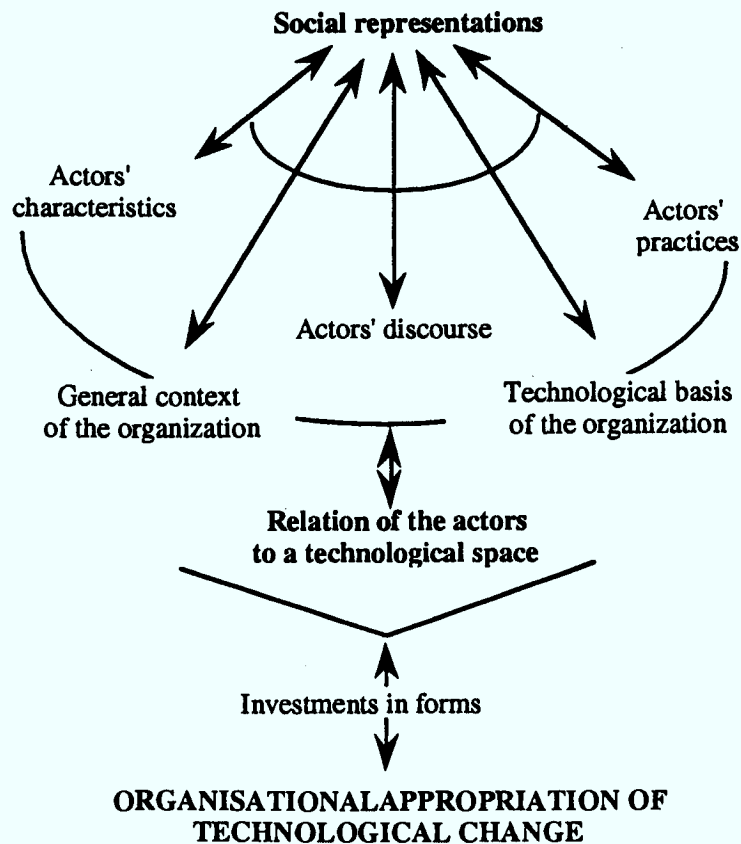


Figure 1 - ORGANIZATION ET REPRESENTATIONS

Under these circumstances we can affirm that a technology, through its implicit organizational design, creates limits on the ways it can be used, but also offers a certain flexibility. This flexibility, which, one may presume, can be of greater or lesser extent, also implies that the same technology may bring forth or be subject to differing social representations, depending on the context of its implementation. In the same way, social representations and the organizational context with which they are dialectically linked are, for the users, the crucible in which are forged perceptions of the advantages and disadvantages of the technologies with which they have to work.

The organizational constraints and opportunities implicit in a technology affect the ways it can be used, thus contributing to the development of the social representations and organizational choices that underlie the notion of the appropriation of change as we have defined it. Thus, the relation of actors to change is built, on the one hand, in reference to the constraints and opportunities implicit in the technology (which constitute its implicit organizational design) and, on the other hand, to their organizational context (as illustrated through the organization's sociotechnical context). The notion of organizational appropriation of technological change should, therefore, enable us to represent and describe the process of realization (or non-realization) of such a construction. The object of this understanding is to comprehend and provide the information needed to develop recommendations for action that can orient and facilitate the process of change.

In order to develop, verify, and operationalize the conceptual tools that follow from these hypotheses, we must adopt broad and flexible methods and criteria that can be used in various contexts. This is stressed by Suchman (1987), who considers the question from the point of view of ethnomethodology. Rather than extract an action from its context, representing it as a model or a rational plan, such an approach consists in studying the manner in which people use their context to carry out an intelligible action. The question, therefore, is to direct our analysis at the ways in which people produce and identify "the obvious" with the aim of taking "situated actions." The representations that are the basis of actors' actions, relative to their context, make up the main indicators for such an approach. The relative character of these aspects requires an approach based on consulting the actors in the workplace and founded more specifically on the collection and evaluation of qualitative information.

3. APPLIED METHODOLOGY

3.1. General Approach

Applied research, as we understand it here, is situated at the frontier between basic, or academic, research — which is intended to develop new knowledge — and interventions in management and organizational development — which apply already existing knowledge, models and techniques. From this perspective, applied research consists essentially of two complementary levels of activity. The first involves proposing interventions. Do this we must develop and operationalize the means required by such interventions, including methods, analytical criteria and approaches, and change-management strategies. To ensure that these means of intervention are sufficiently "robust" and pertinent, and with a broad enough area of validity (i.e., they are generalizable), they should be developed on the basis of rigorous theoretical conceptions and detailed analyses of the proposed areas of intervention. Hence the second level of activity, which consists in bringing together and developing knowledge that will allow a global understanding of the issues studied, in order to define exhaustive strategies for acting on change-related issues. In this way, we aim to develop means that will allow us to consider our objective of research and intervention with a certain detachment, in order to fully comprehend the project as a whole. In this way we can ensure that the suggestions made at the first level are firmly anchored in a global perspective, fitting into strategies for intervention that are coherent with the organizational realities we encounter.

As for the development of our "methodological toolbox" as such, it involves a process of research and methodological testing in three stages. First, one must undertake to define and articulate the conceptual bases on which can be founded an approach to intervention in a real situation. Such an approach is built on the basis of existing knowledge and methods of investigation, and on theoretically developed means of intervention. Next, the application of this approach to applied research projects enables us to develop, test and verify in practice our concepts, methods and means of intervention and, if necessary, make adjustments based on our empirical results. Finally, on the basis of these "pilot projects," and the results and experiences that they provide, we shall be able to put forward generalizable methods and approaches that can be applied to other contexts of change and other types of organizations.

Through this process, the elaboration and application of the notion of the organizational appropriation of technological change will generate **instruments to support the planning and management of technological change** that are founded on an overall understanding of the questions at issue. Essentially, such an approach aims to bring to the management of companies and organizations a framework for analysis and intervention that will permit them to construct **long-term global strategies**. These strategies will integrate organizational management and the management of technological change.

3.2. Methodological Approach

Our starting hypothesis is that **qualitative evaluation methods** are principle means by which we can take into account all the complexities of the organizational appropriation of technological change and define pertinent methods of intervention. This hypothesis is based on the following idea. The approach and methods to be developed should provide an overall vision of the question of technological change in an organizational context, thus enabling us to understand all the various components of the notion of appropriation. These components make up the relation actors-technology-work-organization. Such an approach implies that we must develop methods that will permit us to construct our method of intervention in a way that takes into account the specificities of the sites where it will be put into practice and according to the point of view of the actors present. This understanding of the context, and its "reason for existing," requires an approach that can collect detailed and subtle information, one that does not risk distorting the meaning of the actors' discourse through the bias of predetermined questions. We consider that the best way to reach this goal is to let the actors speak for themselves, constructing our analysis and our recommendations on the basis of what they have to say, rather than according to predefined analytical categories.

On this basis, we have chosen to orient our activity towards the construction of methodological tools of an **inductive** nature. Our inspiration here comes from the methods of inquiry developed by ethnomethodology, more specifically what one current in the American literature on program evaluation calls **naturalistic inquiry**⁹. This approach attempts to produce results based on information gathered in the field rather than by starting

⁹ See, in particular, Fetterman (1986); Guba (1987); Lincoln and Guba (1985); Patton (1980).

from predetermined causal hypotheses. In this sense, an approach can also be considered **interpretative** if it is primarily oriented towards understanding the **process** of appropriation and use of computer technology, rather than simply attempting to identify its impacts. From this perspective, the "subjective" opinions of the actors are considered important sources of data. On the one hand, they help us construct a picture of the context in which the technology is being used. On the other hand, they are one of the factors on the basis of which intervention may be required in order to optimize the effects of change. Finally, such an approach is essentially **formative** in nature, in that it is designed to provide a constant flow of information and to favour the use of evaluation results as they become available in the process of change management.

3.3. Application

3.3.1. General Approach: an Iterative Process

The development of our methodological toolbox is based on a dynamic, back and forth process between theoretical research and field work. We intend to carry out this process by undertaking seven stages :

Exploratory study - The starting point of our research project, the exploratory study is a brief review of the literature and case studies with the goal of amassing elements needed to consider the notion of appropriation. It has already enabled us to draw a general portrait of the subject, to determine possible avenues of investigation, and to form conceptual and methodological tools that can help us better understand the appropriation of technological change by organizations.

Definition of a methodological approach - On the basis of the exploratory study, we were able to develop a preliminary, working version of the methodology (concepts, methods, analytical tools) to be used for the purposes of validation.

Validation of the method's basic precepts (methods and conceptual tools) - This first stage of validation was carried out by applying the methods and conceptual tools developed on a theoretical basis to a real working context, one where we already had a good understanding of the particular questions at issue. By comparing data gathered concerning our various

analytical categories (social representations, sociotechnical context, implicit organizational design, investments in form,...) with information previously collected about the observed context, we were able to verify the pertinence and level of precision of our methodological tools.

Application - The collection of data and subsequent analysis of it according to an inductive and interpretive approach, i.e., one developed on the basis of the points of view and the perceptions of the actors in place.

Validation of results (internal consistency and coherency) - Within the framework of a field study, and, as before, taking an inductive approach, the interpretation, the analysis of the data, and the resulting conclusions are submitted to the various actors concerned. The aim here is to validate the results of the investigation to ensure that they do in fact correspond well to the points of view and representations of the actors involved.

Adjustment and fine-tuning - The methods and analytical tools used are subject to adjustment and fine-tuning throughout the various field studies, on the basis of the experiences, constraints and opportunities that emerge from the projects. The fact that corrections can be made as projects continue, in an iterative fashion, means that their pertinence can be verified immediately, without putting in danger the contribution of the research to the projects' operational results.

Validation of method (external consistency and coherency) - At stake here is the necessity to ensure that the method and analytical tools used do not "distort" the results, that they have validity beyond the production of information that is coherent and plausible from the point of view of the actors involved. The comparison and contrasting of various field studies, of analyses and their resulting conclusions, and of epistemological problems and their resolutions will be the basis for this process of verification.

The methods of data collection and analytical tools thus developed will constitute the foundation of our "methodological toolbox." From this perspective we can suggest, through the prism provided by the notion of organizational appropriation, certain specific avenues of research. Here we are thinking in particular of:

- the management of technological change in specific contexts, such as the implementation of a translator's workstation (TWS) at the Secretary of State.;

- issues linked to teleworking, such as management , supervision and organizational communications in the context of teleworking.

3.3.2. The Example of the Evaluation of the TWS Trial, Version 2.0

In the case of the TWS (version 2.0), our task was to test, within the framework of an evaluation of an operational trial, certain conceptual elements of our approach to organizational appropriation in a real situation. The notions of **implicit organizational design**, the associated **organizational constraints and opportunities**, the **social representations** of the context by the actors, and the **correspondence** between the forms of work organization and the characteristics of the new technology were all used to analyze the context and its relation to the change.

The use of these conceptual tools as analytical categories enabled us to make various observations¹⁰. First, that the capacities of the workstation, but, even more, the "logical" implicit use, corresponded to the evolution of the real tasks of the translators and of the division of the work of translation at the Secretary of State. The TWS was implemented in a context of reduced resources, because of which translators were, in any case, obliged to integrate a number of "peripheral" tasks into their work alongside translation as such. Traditionally these tasks had been the responsibility of support staff and revisers. Thus, translators developed **social representations** of their role and their work according to which they defined themselves as autonomous, fully responsible for both the production (typing, layout, publishing) and quality (revision) of the translated texts, rather than as agents responsible for just a part of the production process. The TWS, by providing tools that support publishing functions and, above all, terminological and linguistic research, integrated support to the user for these two levels of responsibility. This **implicit organizational design**, with the opportunities which follow from its capacities, has led to a significant appropriation of the TWS by its users.

At the same time, we noted that this appropriation is not yet integrated at the organizational level. As yet there has been no specific investment in the "forms"¹¹ linked to production management, productivity, and the resources required to support the process of

¹⁰ For a description of the TWS 2.0 trial, see Lapointe and Lavoie, 1993.

¹¹ Here we speak of the notion of form as defined by Thévenot and presented earlier in Section 2.4.

change (such as training, technical support, network management). An effort is still required to **establish correspondence** between real practices, methods of management, and the distribution of resources allocated to the support and management of change. It is in this sense that our analysis enabled us to formulate recommendations for a strategy for change management by the organization (Lapointe and Lavoie, 1993)

3.3.3. Further Applications

The notion of appropriation is in the process of being put into operation in various research projects. We can already establish general avenues for research and intervention. Into the context of a telework project, for example, the notion of **social representations** of the context is particularly important, concerning a universe of reference much broader than in the example of the TWS, where the issue was the transformation of work practices within the framework of a pre-existing organization. In the case of telework, we are dealing rather with an evolution of the spatial organization of work (i.e., at a distance), a transformation of methods of management and the control of work and working time. Wider aspects of the relation actors-work-organisation-technology, such as the perception of the boundary between home and work, may also be at issue as dimensions of appropriation. The notion of **constraints and opportunities** here concerns issues such as transport, supervision, the exchange of information at a distance, in short, a reconceptualization of the organization via the potentialities of changes that are, *a priori*., technological. As a result, the definition of an **investment in forms** adapted to telework is at the centre of the issues raised. Whether or not such investment will be carried out is a direct function of the level of appropriation of the change by the organizations concerned. This organizational appropriation depends in part on what the various actors (for example, the prospective teleworkers themselves, the supervisors and their immediate superiors, the organisation's clients, and the unions) think they have to gain or lose by the project. The identification of such perceptions may make it possible to define forms and methods of implementation that are the best adapted to the various contexts in which telework is to be established.

The Employment and Immigration's Work-at-Home project (WAH) shows an example of changes that imply an necessary readjustment of rules and modes of operation of the organizations concerned. These include, for example, the management of work processes, procedures for organizational communications, human resources management, methods of control and supervision, materials management, and so on. At the outset, at least, it seems to us that the question of the appropriation of telework by these organizations

is closely linked to the constraints and opportunities that follow from these various questions and the way they are dealt with. Note, too, that the experience of TWS 2.0 showed us the importance of the perceptions of gains and losses resulting from change held by the various groups concerned. Thus, the points of view and opinions of the actors, particularly the teleworkers themselves and the managers to whom they are responsible, will be prime sources of information.

The WAH project is not only concerned with the implementation of a technological innovation. Rather, it is on the organizational level that we can first speak of innovation and significant change, change made possible through the use of relatively conventional computer technology. Here the sociotechnical character of the change is apparent. We note that the project is part and parcel of the overall logic of the organization's management orientation, including such measures as the replacement of direct supervision by a quality-control approach and an emphasis on the individual responsibility of the clerks. There is, therefore, a correspondence between the spirit of the proposed change and the broad outlines of the organization's **sociotechnical context**.

We observe that, to the present, the participants support the idea of working at home. They do not wish solely to take part in an experiment, however, but hope that it will have concrete results in the long term. Here again, there is a **correspondence** between various characteristics of telework as a concept (increased autonomy, flexible working hours, increased control of each employee over the organization of the working environment) and the criteria on the basis of which participants see themselves as valued and motivated. We also observe, however, that a fundamental question in the appropriation of change concerns the evolution of the participants' **social representations** of telework in general and of their participation in the project in particular. The relationship with technology, the coexistence of the work world and the home environment, and the transformation of work-related social relations are all factors that are likely to affect the way in which participants perceive the implementation of the change relative to their expectations. This is also a determining question for the success of the experiment and for the feasibility of telework in general. Thus the study of social representations and the conditions of their development make up a central aspect of the research to be carried out in the WAH project.

Otherwise, we are working to adapt our approach to support for the development of technological prototypes, within a prototyping project, using an iterative process of experimentation in a real context. What we must determine are the characteristics that the

technical tools developed must have in order to correspond to the constraints and opportunities that emerge from the sociotechnical contexts of the projects in question. These characteristics will then be translated into specifications for the development of the capacities and the human-machine interface of the instruments in question, as well as in methods of managing implementation of these tools. The objective therefore, is to exercise a certain level of control, or at least impart some orientations identified as desirable, over the **implicit organizational design** of the technologies developed by the project.

A such exercise probably make it advisable that we should treat a part of it as a preliminary investigation. This could be based on the evaluation of various technological design and implementation scenarios that would be proposed to groups of target users for group discussion. The comments, reactions and suggestions received could serve as raw material for developing specifications for the design of a prototype (or various different prototypes) to be tested as part of a pilot project. Such a pilot project would provide the opportunity to carry out a more in-depth, evaluative field study, along the lines of what was done in the TWS project and what is proposed for the EIC Work-at-Home project. The data gathered in this second phase would be used to define generalizable methods applicable to project implementation management.

In all of these researches, we aim to collect data on the **social representations** of the actors (users, managers, union representatives...) relative to issues around technological change, as well as to identify related **constraints and opportunities**. Here we are referring in particular to:

- the nature of the work (objectives, the tasks as such, questions at issue, "professional culture"...);
- the work process (division of tasks, division of responsibilities, stages, means of control, constraints and limits of action...);
- the communications and exchanges related to the organization and execution of the work;
- the way in which the various actors see themselves as a group (their abilities, interests, relations with the organization...);
- the nature of change as such (organizational and logistical issues, advantages and disadvantages for the individuals and the organization...);

Such an approach aims to lead the various actors to compare their respective representations of the organizational reality and to draw out new ideas. As was the case with

the TWS 2.0 project, the results of analysis and the resulting recommendations should be presented to the various groups of users consulted for purposes of verification. This information should lead to a proposed investment in forms that will favour the organizational appropriation of technological change.

4. CONCLUSION

We have seen that the organizational appropriation of technological change is a form of social, or collective appropriation. It concerns the emergence of the social representations and collective practices (norms, procedures, operating methods, interactions between participants, etc.) that develop around a technological change in an organization. Such a change occurs concurrently with new forms of work organization, new social dynamics, and new characteristics of organizational culture. It is, therefore, as much social as technical, and greatly concerns the perceptions, points of view and behaviour of the actors involved. Therefore, understanding our object of study is largely dependent on our interpretation of the opinions of the actors. Here we are speaking not of an appropriation of the technology as such, but rather of a certain "interpretive flexibility" vis-à-vis technological change on the part of the actors affected by it.

Ultimately, study of the organizational appropriation of technological change is intended to develop management strategies that can facilitate the implementation of such changes in organizations. The goal of the present document was more limited. Our aim was to lay the groundwork for the development of analytical tools that would enable us to understand the conditions needed for such a form of appropriation. On that basis, we believe that we are able to develop a set of methodologies that can improve the overall management of technological change. Various analytical tools have already been developed with a view to grasping the issues involved in the organizational appropriation of technological change in order to produce operational recommendations in real situations. Recall that this involves the sociotechnical context and existing practices (situated actions), social representations, implicit organizational design and the internal logic of the organization, and investment in forms.

The application of these analytical tools in various research/intervention projects should allow us to validate their applicability and refine their content, in order to arrive at a methodology that can be generalized for any number of situations. We are not, however, interested solely in transmitting procedures for intervention. Rather, we aim to propagate knowledge that is based on an overall comprehension of the phenomena studied. In this way we can speak of a process of adaptation and transfer of knowledge between the academic and practical planes.

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