Preface

The Crisis of the Fordist Paradigm and the Emergence of Cognitive Work

In 1885, Frederick W. Taylor presented a paper to the *Society of Mechanical Engineers* in which s/he proposed a method for analyzing the timing and movements of work. In 1913, Henry Ford and his partners perfected an assembly line in the Highland Park factory adopting Taylor's principles. In Taylor's framework and Ford's factory, the timing and movements of work were determined by an objective technical system rather than an arbitrary factory hierarchy. In the spring of 1914, the technological and organizational model now known as the Fordist paradigm was a reality.

Perhaps the most relevant aspect of the Fordist factory is that the work is organized, evaluated and regulated on the basis of *standards* that prescribe both the results and the timing of the work, as well as the ways it is carried out. The process of defining standards proceeds from the formal planning of the work, it is further developed through the definition of procedures and is sustained by an intense activity of measuring each operation.

Once the standards have been constructed, human needs can also be taken into account, but always with the awareness that every mediation means moving further away from the ideal, causing a weakening of "rational" action. *The recurrent problem in managing the work in a Fordist factory is how to impose the "rationality" of the standards and how to defuse the threats to order arising from the individual's subjectivity and initiatives.* Historically, this problem was resolved in different ways within the diverse ideologies and power relationships operating outside and inside the factory, but always with respect to the Fordist paradigm, that sees in the standard a point of reference which cannot be renounced.

Even the toughest paradigms are not eternal. Around the middle of the 1960s, the Fordist paradigm began to wear thin due to a series of social, economic, technical and cultural reasons. Surely one of the most relevant changes came in the technological center of gravity of the companies, following the spread of automation, information

and communication technologies. One of the main innovations introduced by the technologies is linked to the availability of infrastructures for multimedia communication, which is thorough and global at the same time, opening up possibilities for opportunities and types of business that were not feasible in the past.

By removing individuals from the simple execution of manual tasks and routines, which was more and more the prerogative of "intelligent" machines, the new communicative infrastructure profoundly transformed work and its organization, anchoring work activities to knowledge sharing and transformation, instead of to the standardization and division of labor. The new processes of transformation are now based more and more on the widespread cognitive capacity of the subjects called to integrate modules of specialist knowledge. Knowledge that, as Rullani (2002, p. 34) affirms, in post-Fordism produces value "because it generates sense and therefore opens new horizons for possible production, giving meaning to objects, behaviors, situations that were previously without value."

In new organizations, the worker, independently from the role that s/he occupies and the function that s/he has, becomes a *cognitive worker*[1], called to *gather and interpret data and information, to understand the world in which s/he operates, to make sense of her/his own actions, to explain and infer her/his own evaluations and her/his own decisions, and to construct, with other individuals, common courses of action.* The cognitive worker does not only work on the explicit knowledge contained in documents and tables, but also on personal experiences, discourses, relationships, evidence, and emotions. The task that s/he is asked to carry out is to make sense of the events that fall into her/his own area of responsibility, directing and widening the range of opportunities for her/his own organization.

Cognitive work is work invested with reflexivity (Cillario, 1990): The worker generates events, observes them, reflects upon them, and possibly modifies the ways of generating future events. The cognitive worker is perpetually involved in redesigning her/his own actions, and s/he develops a continuous activity of construction and reconstruction of sense, partly tacit and partly explicit, in messages that s/he exchanges with her/his interlocutors. The activities carried out by the cognitive worker are defined in the proposals by Choo (1998) for the *knowing organization*:

1. The activity of *sense-making,* necessary for reducing the ambiguity and equivocation of events

2. The activity of *decision making*, necessary for making choices and allocating resources

3. The activity of *knowledge creation*, necessary for enriching the organization with new frames of reference to be used in the future

The cognitive worker[2] contributes to the processes of creating values through activities that allow him/her to direct her/his actions, overcoming obstacles coming from

paralyzing dilemmas in the form of paradoxes (Cameron & Whetten, 1983). The paradoxes are presented as intrinsic contradictions between elements that cannot be traced to a coherent unicum in the area of an existing conceptual system. The objective of the cognitive worker is to resolve the paradoxes by questioning the dominant point of view, the routine, the beliefs and the values system that is taken for granted. Only by overcoming the dominant rationality and creating a new system of reference can the paradoxes that block the action be resolved.

For cognitive work, what has been written by Pinchot and Pinchot is quite true: "*The nature of knowledge work, which requires gathering information, imagination, experimentation, the discovery, and the integration of new knowledge in a wider array of systems has as a consequence that the bosses cannot control the knowledge workers as if they were ditch diggers or workers on an assembly line. If knowledge workers do not know how to do their work, they can learn what to do before their bosses. Knowledge work has a strong component of self-management and group work, and is blocked by the long-distance control of a boss. [...] When a team of doctors administer a life-saving therapy, the members of the group must apply hundreds of instruments, medicines, and procedures to a variety of patients, each of which is unique, and they learn continuously, also because knowledge and technogies are improved continuously. This is true both for technicians and doctors. A society of knowledge workers will be completely different than what it was before*" (Pinchot & Pinchot, 1993, p. 47).

The centrality of the cognitive aspects in the creation of values radically modifies the rules of the organizational game. Most of the work done by cognitive workers consists in the emission and reception of messages through rituals of interaction with the social and organizational network. *Meanings, decisions, and shared knowledge are constructed with these messages.*

Organizational charts, procedures, planning and control systems, informative systems are not very effective in defining and organizing *a priori* the activities of the cognitive worker. The first and most stringent conflict is the asynchronism between the time needed for cognitive work, which is the time for creativity, research, innovation, and the time, methods and standards imposed by the productive machine.

Although most managers are aware of this challenge, in practice there is a strident contrast between the rhetorical exaltation of the centrality of knowledge, creativity and the managerial apparauts still strongly inspired by the Tayloristic approach.

Managing Knowledge: From Individual Sense-Making to Organizational Learning

Most managers illude themselves that knowledge resources and the creative and learning processes can be governed with the old logic of observation, measurement, and control. The failure of this approach, arising from the crisis of the Taylorist

model, has caused many organizational and management researchers to look for new forms of organizations and to study some possible alternatives in the governance of learning and knowledge management.

Some scholars have analyzed the concept of organizational cognition. Lant and Shapira (2001) classify approaches to organizational cognition within a dichotomy between the hard, objective, and quantitative information processing approach (March & Simon, 1958) and the soft, subjective, and qualitative sense-making approaches (Daft & Weick, 1984). In particular, following the latter, fruitful research efforts have been directed toward the representation of organizational cognition and information flow in groups and organizations, such as cognitive mapping (Eden & Ackermann, 1992; Huff, 1990), and qualitative methodologies such as ethnography and discourse analysis (Heracleous & Barrett, 2001).

Despite the development of many methodological approaches, there is scarce integration between qualitative approaches, mainly oriented to consulting applications, and quantitative approaches, usually developed at the academic level for research purposes.

Second, on the theoretical side the different perspectives developed in literature and managerial practice have focused on different aspects and have used different level of analysis and background without providing a holistic theory of organizational learning and knowledge creation.

Third, there is a lack of literature addressing the issue of organizational learning from the practitioners' perspectives, and providing feasible methodologies and tools for organizational learning management able to merge the in depth level of analysis usually achieved by qualitative inquiry and the rigor and analytic power of quantitative modeling techniques.

In order to try to fill this gap, this book is based on a multidisciplinary approach to organizational cognition and learning and, in a broader sense, to knowledge management. Such an approach can be positioned at the intersection between sociology, cognitive psychology and "hard sciences" such as computer science and advanced computation. It proposes in integration of qualitative methodologies (discourse analysis and mapping) and quantitative methodologies (fuzzy logic and soft computing) to model cognitive processes starting from the analysis of discourses through which people *make sense* of their own and others actions in organizations.

In the sense-making perspective (Weick, 1979), understanding is a matter of choice. Choice is only the final act of an ongoing process in which individuals make sense of the uncertain external environment drawing on previous knowledge accumulated through action in terms of past experience and interaction with other people.

In the sense-making perspective, individuals create knowledge in a three stage process made up of enactment, selection, retention. In the enactment stage, individuals, on the basis of their preexisting knowledge, select clues and signals belonging to the ongoing and uninterrupted data flow from the environment. Through enactment, people try to reduce ambiguity of incoming information. In the selection stage,

people draw from their memory models of actions (e.g., recipes, scripts, theories, etc.) constructed through experience and learning that proved to be useful in the past. In the retention phase successful models of action are stored for possible future reuse.

Being influenced by and strictly interrelated with action, *cognition is necessarily situated*, and, as such, influenced by the particular organizational context in which it develops (Blackler, 2002). Actually this means that enactment, selection and retention may be strongly conditioned by the presence of shared values, traditions, procedures, socially accepted behaviors, rules, culture, etc.

By adopting a sense-making perspective to investigate organizational learning and knowledge creation with respect to a specific context of action, one needs to analyze how individual cognition takes place concretely in organizations in terms, for instance, of how people frame problems, which values and beliefs influence or draw their actions, how existing models of action influence current and future choices, how people make and justify their choices and perform their action through the use of organizational artifacts. This understanding is essential for managing change in organizations, in order to grasp resistance and obstacles to change as well as to bring to the surface tacit knowledge, local learning, and emerging competencies.

According to this approach, a new event is interpreted when an individual is able to link it to an existing previous body of individual and collective knowledge. Natural language is the most immediate tool to express such knowledge, because it allows individuals to represent nuances, ambiguities, uncertainties, and conflicts usually neglected by formal methods in order to achieve coherence, simplicity and certainty. *Furthermore discourses can be used to communicate and share knowledge by convincing other organizational members through reasonable arguments. In order to convince other people one needs to share with others, at least to a certain extent, a common body of knowledge and a same language.*

It is possible to have an idea of the complex contextual knowledge used by an individual when s/he explains the motivations of his/her judgment to other people. Actually, through an explanatory discourse, people introduce hypotheses on the base of their own background knowledge to explain some evidence by relating new facts to known ones. More precisely with explanatory discourse we mean any spoken or written discourse through which an individual try to make explicit the reasons justifying a choice.

Starting from this theoretical background the main ideas proposed in this book are summarized as follows:

1. Individual knowledge is incorporated into mental schemata and organizational procedure. Patterns of action, scripts, models of behavior, facts, shared values, and stereotypes resulting from an ongoing sense-making activity are stored in both individual and collective/organizational memory.

2. Organizational as well as individual memory are socially constructed thanks to an ongoing activity of individual interpretation and collective interaction (Berger & Luckmann, 1966; Nicolini & Meznar, 1995).

3. Ambiguity related to input coming from the surrounding environment is resolved through explanation (Schanck, 1986; Thagard, 1994). Through explanatory discourses, people relate new facts to known ones by introducing or implicitly assuming hypotheses to explain (enacted) "evidence" on the base of their own background knowledge.

4. Natural language is the most direct tool to express such knowledge, because it allows the representation of nuances, ambiguities, uncertainties and paradoxical assertions (Quinn & Cameron, 1983).

5. By combining qualitative and quantitative methodologies we can define a methodological approach to build management systems for the learning organization by representing individual and collective knowledge through "verbal models."

6. Verbal models can be used to elaborate knowledge for different aims, e.g., for simulation of organizational members reasoning and decision processes, for decision making support, to perform organizational analysis, to map and store useful and reusable knowledge, to support knowledge exchange and creation, to help groups in the problem setting phase.

How the Book is Organized

Learning and creativity are the fundamental dimensions of cognitive work. The objective of this volume is not to analyze cognitive work at the individual level, but to see how it unfolds in organizations. This means investigating the processes of learning and creating new knowledge at the collective level.

The learning organization is the organizational paradigm for the exercise and development of cognitive work and is the primary object being studied in this text. A learning organization is not only an organization that favors and provides incentives for learning and creativity among its own members, but in some way supports it, amplifies it, appropriates it and makes it available to the other members of the organization and its stakeholders.

Consequently, organizations wanting to transform themselves into *learning organizations* need to understand, model, and in some way, govern collective learning and manage cognitive work. They also need new and concrete ways and tools for analyzing and managing organizational processes. In order to provide some possible answer to these needs, this text deals with the following questions:

1.   What are the building blocks of organizational learning?

2.   How does the organization build learning by itself?

3.   Which methods and systems can facilitate learning?

4.   How should a learning organization be governed?

The text is divided into four parts followed by two appendixes:

a.   In the first section (Chapters I-V), the principle object of study, organizational learning, and its main components (organizational change and collective memory) are defined;

b.   In the second section (Chapters VI-IX), the processes through which organizational learning is developed are taken into consideration, in particular the role that language and discourses have in generating, making explicit and utilizing organizational knowledge.

c.   In the third section (Chapters X-XV), the concept of verbal model is introduced, and is used to identify, codify and model the organizational knowledge contained in discourses. Moreover, we demonstrate how verbal models can be used to build systems and tools for managing knowledge and supporting decisions. Finally we present a case study aimed at illustrating a practical application of the proposed methodological approach.

d.   In the fourth section (Chapters XVI-XVIII), the managerial implications for governing cognitive work more effectively are highlighted, and a research agenda for the development of methodologies within the paradigm of the learning organization is outlined.

e.   In the appendixes we provide two further examples related to the application of some of the methodological tools proposed in this book (fuzzy verbal models, agent-based simulation).

Section I: Organizational Learning

The first section of the volume (Chapters I-V) aims at answering the question "What is organizational learning?"

In Chapter I we show how digital technologies have contributed to the need of managing a critical new resource: knowledge. After giving a brief history of the birth and evolution of knowledge management (KM), we will show how the paradigm of the learning organization is able to answer to some of the main criticism moved to the modern approaches to KM.

Our analysis of organizational learning assume as starting point that organizations emerge when there is a need to impose an "artificial" order on the spontaneous

and chaotic flow of social action. This order guarantees the regularity and rhythm of collective actions and such regularity is generally recognized from the outside. Each of us identifies an organization based on the objectives that it pursues and on what it really "does" or "produces" *regularly*. The same regularity, together with the output that the organization produces, is one of the most evident products of organized collective action (Chapter III).

The regularity of collective action is usually achieved through standardization, controlling behaviors, and sacrificing subjectivity in the pursuit of collective aims "at a higher level." In order to guarantee this regularity, organizations develop the tools and shared values through which they condition, more or less openly, the behavior of individuals. Conditioning is therefore, instrumental and psychological at the same time. Rules, procedures, division of labor, formal systems, but also missions, and slogans, are practical examples of how organizations attempt to assure *their own persistence*.

In their pursuit of regularity and the rational use of resources, organizations are often compared (and sometimes confused) with machines (Morgan, 1997). However, in addition to being the result of an organizational and efficiency-oriented rationality, organizational action is the product of the social game and individual intiative within a group (Crozier & Friedberg, 1977). It is the result of two essential cycles: The cycle of persistence, that is manifested through the attempt to reduce the entropy of social action within recognizable and stable forms, and the cycle of change, through which the individuals create space for action in order to attain individual advantages within the limits imposed by the dominant rationality (Chapter IV). Every organizational action is developed within this continuous tension between persistence and change.

The regularity of functioning in an organization is always potentially up for discussion. This is usually pursed is three ways: (1) *at the political level*, through the management of power and of the social game, (2) *at the technical level*, through the maintenance of the formal apparatus (control and technology systems), (3) *at the cultural level,* through the construction of shared values. If organizations are systems that impose and maintain order to guarantee continuity and an identity that is recognizable to collective action, then they are systems that are *intrinsically predisposed to avoid change*, because every deviation from the constituted order is seen as a dysfunction, disturbance, or anomaly. *Collective learning, then, is always manifested as an anomaly and only as an attempt of questioning the status quo, within and through the social game and individual initiative.*

There is no change if there is no memory. Change, in fact, is not a blind leap into the future but the regeneration of memory beginning with the possiblity of action that memory itself allows. In Chapter IV, the concept of collective memory is analyzed and a model is proposed. Organizational memory is seen as a system of shared values and artifacts that guide the action. Artifacts are products of human thought that at the same time guide ad condition action. In the organization the artifacts are

usually explicit rules and tools necessary for the coordination of collective action. The following examples represent typical organizational artifacts: utensils, projects, marketing plans, reports, manuals, procedures, signals, regulations, labels, glossaries, images, equipment, software programs, missions, declarations, Web sites, uniforms and clothing, training material, contracts, sales orders, etc.

In Chapter V the relationship between organizational change and memory is analyzed. It is this relationship that in this text is considered organizational learning. In particular, the intrinsically paradoxical nature of collective learning is highlighted. Learning occurs when an organization is capable of modifying its memory, and therefore its value system and artifacts. Memory is not so much the goal of learning as much as it is its starting point.

The content of organizational memory can be distinguished by the amount of *sharing* among its members, the degree of *prescriptiveness* in directing action, the degree of *specificity* with respect to specific courses of action. When these contents are widely shared, prescriptive and specific, then the organization exercises a high level of control on organizational actions, with the unpleasant consequence that the higher the control exerted on the actions, the less likely it is that an individual can create variety.

In reality, organizational memory is characterized by a graduality of sharing, of prescriptiveness, and specificity that is inevitably translated into *ambiguity*. It is this graduality that allows the cognitive worker to express variety; and it is the ambiguity that allows the organization to modify its own memory and to transform itself, into a learning organization.

On the other hand, an excessively weak and ambiguous collective memory can turn out to be too fragile to generate and sustain change inasmuch as it does not in itself contain sufficient history and cohesion.

The paradox of learning is the paradox of experience: Memory is a prison and a space to explore, a restriction and an opportunity, an obstacle and a resource for change, all at once. The future is, more often than not, the projection of the image that we have of our past.

Section II: The Emergence of Organizational Learning

The second section of the volume (Chapters VI-IX) is dedicated to answering the following questions: How does the learning organization learn and through what processes? How much and in what way is it possible to model and govern the processes of learning in an organization?

If learning is the offspring of memory, then it can be stated that learning only takes place *within a tradition* (Polanyi, 1967). Whether learning is a continuation or a break with the past of a group, it can be verified only from within a social world that shares values, rules, systems, tools, and knowledge. This social world is the

shared representation that is constructed and settled over time from within a group that has a history and that is what sociologists call constructed reality (Berger & Luckmann, 1966). Collective memory is therefore the result of a process of social construction (Chapter VI).

In organizations, social reality is constructed less spontaneously and more quickly than in an unstructured group, through the identification of a set of shared meanings and language that facilitates the coordination of collective actions and the persistence of the organization. The process of learning in organizations is above all learning about how the organization "works." Individuals are constantly engaged in the construction of a sense to give to their own actions and those of others within the social reality of an organization.

To make the world more predictable, individual cognition does not hesitate to use the interpretive schemes and proconstituted models; learning in a social reality is above all learning these schemes, that is the way things should be "seen' (Chapter VII). Once these schemes have been learned, it is enough to put each event in its place within a well-known world (Nisbett & Ross, 1980). Paradoxically, learning by schema becomes a formidable obstacle to deeper learning, that is to say at the second level, relative to the capacity to question the schema or to create new ones (Argyris & Schön, 1978).

Whether at the first or the second level, collective learning is tied to a problem of consensus: I cannot learn without a language, a tradition, a set of explanations of events and situations, and if I want to transfer the results of my learning to the group, I have to use the rules and the language of the group—either that or I have to modify them so that I can be understood.

How can this world of shared, often implicit and fleeting meaning be identified? A central role in the process of construction of sense and consensus is played by language and by discourses (Daft & Wintington, 1979). Individuals communicate their realities through discourses and they share it and attempt to explain it to themselves and their interlocutors. Explanatory discourses represent a very direct way to use the constructs of collective memory. It is through explanatory discourses that organizational members offer and ask for reasons. It is through discourse that events, behaviors and choices acquire meaning and are legitimized (Chapter VIII).

The explanations provided by members of an organization describe the "theories" that guide the action. At the first level, they can be analyzed to understand how to organization works, how their members interpret the events, which schema they use and how these schema are made.

At a more sophisticated level, explanations are not the simple activation of schema, but the creative construction of hypotheses, conjectures and mechanisms that better explain the existing schema, or ambiguous and unusual events.

Through *confermative* explanations, organizational memory is activated and consolidated, while through *creative* explanations, the organizational knowledge present in its memory is declined and regenerated in order to be adapted to new

contexts of action. The vagueness and blurriness of memory play a decisive role in the effectiveness of the adaptation from old to new situations. Only through language is it possible to realize the complex process of transfer and generalization of knowledge from past experiences to new experiences. As a matter of fact, the ambiguity of verbal language allows evaluations and explanations to be maintained even though they are not necessarily coherent with each other (Chapter VIII). The logic of explanatory discourses is not the rational pursuit of truth, but the production of consensus. It is the logic of conviction, of rhetoric, of communication. The rationality of social action is not to demonstrate the truth, but the convince and build sense and consensus.

On the basis of the theoretical elements described in the first and second part of the book, in Chapter IX a model of organizational learning is presented: The MEP model (memory, experience, plan). It represents the starting point for the construction of the methodologies and tools proposed in the third part of the volume.

In the MEP model, the logic of learning and of cognitive work is realized with regard to three fundamental coordinates: The coordinate of accumulated knowledge that is consolidated through learning (memory), the coordinate of the intentions and anticipatory vision (the plan), the coordinate of interaction and comparison with the world (experience). The logic of learning is a logic of action. An action is self-made through a continuous comparison between the schema of sense contained in memory, the flow of raw data coming from the outside world and the intended plan.

According to the rational approach of the theory of decision, the action is a final product of the sequential process that originates from deliberate intentions and requires the elaboration of objective data.

In Figure 1, the rational character of the action is shown instead through its cyclical development between the coordinates of memory, planning and experience, and its continuous returns and revisions: the schema of sense contained in the memory influence the way in which the reality is tested, the result of the perceptions force the schema to be modified, and the intentions guide the activation of the schemes and the search for information, but it can be modified and adapted to the available data and unconfirmed expectations.

Through action, the logic of explanation begins to take shape: The cognitive worker constructs hypotheses, conjectures, inferences, suspicions, images, representations through a continuous comparison between memory, intention and concrete experience. Finally, s/he is able to build convincing explanations in the attempt to transfer or simply communicate the results of one's own learning to the community.

The action of the cognitive worker requires a balanced mix of the use of memory, experience and planning ability. Upsetting the balance of the action toward just one of the dimensions creates pathologies that are then transmitted into the organizational networks.

The action that is carried out above all along the lines of memory is typical of a *self-referential organization*, which reinterprets the world exclusively in the light

Figure 1. The coordinates of action
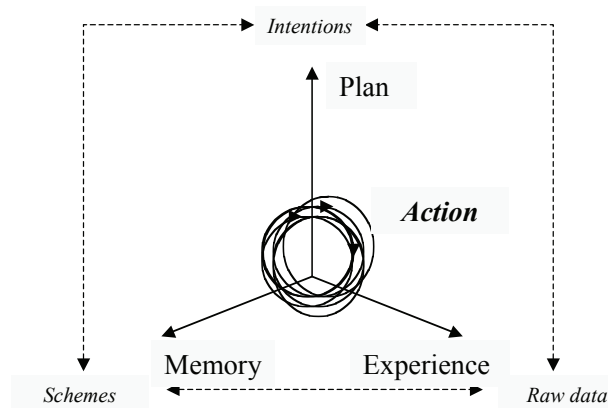
Rational action is developed within three temporal coordinates. The first coordinate specifies the action as determined by "intentionally disposed needs" (Bonfantini, 1987). It is the coordinate of intentions, objectives, desire, goals, planning, willingness, and the imagined future being sought. The second coordinate specifies the action in terms of experience, means and resources that are offered for the action, the opportunities to be taken advantage of, and problems to resolve. It is the *present* that is continuously regenerated during the course of the action as a set of events to interpret and to put back together in the flow of action. The third coordinate specifies the action in terms of the accumulated knowledge of the actor, as a possible result within the framework of the rules, the values and the knowledge that the actor has at his disposition. It is the *past* that allows the actor to acquire awareness of the action.

of the past; the action is cemented into its memory. The weight of the past blocks the capacity to construct the future. Bureaucracies are typical examples of self-referential organizations.

The action that is carried out mostly along the planning axis is typical of *utopic organizations*, with their elevated capacity for planning that is not founded upon history and its capacity to deal with the outside world. This is what often happens in small, innovative companies that often are not able to survive their own birth or disappear when the creative impulse of the founder-entrepreneur is exhausted.

The action that is usually carried out along the axis of experience is typical of *empirical organizations*, which rely upon experience, empiricism and contingency. Small companies are often examples of empirical organizationas, centered around the figure of the entrepreneur and her/his action, inspired by the myth of artisanship that is often organizational craftsmanship, and because of structural, cultural or contextual limitations, have a hard time developing a proactive type of action and a vision relating to the project.

Section III: Methods and Tools for the Learning Organization

Which methodological tools can be used for analyzing the organizational learning process and to build systems for the management of knowledge and the support for decisions in the learning organization? In the third part of the volume, a methodological approach is presented for the identification, mapping and modeling of explanatory discourses for the construction of tools:

- In support of organizational analysis
- For modeling and management of the knowledge contained in discourses
- For the development of tools for the support of decisions

In Chapter X, the methodology is described at the overall level and suggestions are made for the identification of explanatory discourses. In this phase, the methodological approach is qualitative, but structured. A protocol is illustrated for the identification of discourses through interviews and examples from research in the field.

In Chapter XI, the problem of codifying discourses is explored. The codification comes through "mapping" the contents of the discourse, typically classified in terms of concepts and relationships between concepts. A mapping technique is presented in detail and reference is made to a larger portfolio of methodologies that allow for the creation of cognitive maps, meaning representations of belief systems in the light of which individual or groups interpret a situation or a problem.

The discourse mapping approach derives in part from the field of cognitive psychology and operations management and in part from the typical approaches of the so-called knowledge engineering, which is the branch of computer science specializing in building systems for managing information and knowledge in support of decisions. Among the latter, those most closely resembling the approach presented in this volume are the so-called expert systems, computer systems that, by modeling the knowledge of an expert in a certain field of application (domain), reproduces the reasoning of a human expert in the resolution of localized problems such as in the elaboration of a diagnosis beginning with the symptoms and experimental measurements.

In Chapter XII and XIII, through the introduction of the concepts of verbal models and linguistic variables (Wenstøp, 1975b; Zadeh, 1973), some basic elements are provided for modeling discourses and linguistic variables by using some mathematical techniques, fuzzy logic in particular.

A verbal model is a mathematic representation of the variables (concepts) contained in a discourse and of the relationships between these variables. A linguistic variable is a variable that assumes linguistic values for example, the variable "performance" can assume the values of disappointing, poor, satisfactory, above average, excellent, and so on.

A verbal model can be implemented through the use of appropriate algorithms on a computer: The model accepts both quantitative data and qualitative evaluations as input, in the form of verbal judgments, and fuzzy algorithms allow for the rigorous and reproducible simulation of the effects of the reasoning contained in the discourses. This way, the logic of explanation can be seen in action.

In Chapter XIV, some examples of verbal models are developed in reference to applications in the organizational and managerial fields. Verbal models can contribute to the construction of a wide knowledge base and an analysis of the results of the simulations can be used for various purposes, which can be classified into two main typologies:

a.   **Analysis and description:** The representations can be used to analyze and describe the cognitive schemes through which members of an organization classify or interpret a problem: How can a collaborator be evalutated? What is a good supplier? How should I act in a given work situation? How can I resolve that type of problem? These analyses can be used for training purposes, to plan some improvements, or to understand the causes of resistance to change, etc.

b.   **Decision support and synthesis:** The models can be used for resolving complex prolems and for building systems to support decisions. The approach is similar to the one used for creating expert systems. The hypothesis is that organizational memory contains the answers to a new problem. Or one supposes that the members of a work group can use these representations as a support for reflecting upon a problem, comparing alternative points of view, arriving at more elaborate representations following the aphorism proposed by Weick (1979): How can I say what I think until I see what I say? The models are, in effect, visual representations of mini-theories.

Finally, in Chapter XV, we illustrate the application of the proposed methodological approach to a real world case study. In the case study we use causal maps to elicit and represent the grey knowledge used by software developer's involved in a project of development of a new software.

Section IV: Implications and Perspectives

In the fourth section (Chapters XVI, XVII, and XVIII), the managerial implications for the effective management of cognitive work are underlined and a research agenda is proposed for the development of methodologies regarding the learning organization paradigm.

In Chapter XVI, some criticalities and methodological implications for organizational analysts who intend to adopt the approach and the tools proposed in this book

are discussed. Our approach assumes discourses as data. And yet, this is problematic data, with quite different characteristics from those of the quantitative data of traditional empirical research.

The fundamental difference between the numerical data and qualitative verbal data lies in the fact that while objective meaning can be associated to the first, sense can be made of the second only after a process of subjective intepretation of the data. For example, to say that "Today, the outside temperature is 30°C" is not the same as saying "It's hot today."

In particular, in this chapter, the question of the reliability of data is discussed, and an answer is given to questions like: How can we be relatively sure that the content of the discourses are interpreted correctly by the analysts? When is an intepretation acceptable? Is more than one intepretation admissible? Is it possible to identify and evaluate errors of interpretation?

Chapter XVII is dedicated to managerial implications. We highlight that one crucial aspect of the processes found in a learning organization is not so much in its capacity for achieving certain results, but in the process itself. The results of learning are difficult to predict and even more difficult to plan. The process of learning is destructured and uncontrollable. It can go in unexpected directions and give unhoped for results. Serendipity, or the luck of finding something new and interesting while intending to search for something else, is a recognized characteristic of the learning process (Merton & Barber, 2004). Individuals must be given a certain degree of freedom and room to maneuver. All of this requires a new cultural and managerial attitude with respect to time and space management, as well as work relationships. Times, places, and relationships marked by creativity and innovation, before production, hierarchy and efficiency.

Some suggestions are proposed in this chapter for managers who intend to supervise learning and cognitive work in this perpective.

Chapter XVIII is dedicated to identifying possible future research perspectives and development for the methodological approach presented in this text. The methodological argument is taken up again from a wider perspective in order to propose a truly innovative approach. For each of the salient moments of the proposed approach, that is, the identification, mapping and modeling of discourses, the available or potential alternative methodologies are mentioned briefly and possible developments are outlined.

The two final appendixes are aimed at providing the readers with further detailed examples of application of the methodological approach proposed in our book. The first example presents the step-by-step construction of a verbal model to represent and evaluate the voice of the customer in new product development, the second appendix describes an agent based model to simulate collective learning processes in competencies development.

How to Read This Book

Given the objectives of this work, the text was conceived as a sequence of short Chapters that attempt to give complete descriptions of the specific concepts within them. Nevertheless, there are some alternative ways to read this book, for people who are less interested in the methodological aspects or would like to read about them later.

For these readers, we advise reading all of the chapters in the first two parts, the first chapter of the third section (Chapter X) and to skip directly to the final chapters (Chapters XV, XVI, XVII, XVIII). For readers who are interested in the methodological aspects, but less interested in the quantative aspects, we suggest following the same procedure with the addition of Chapter XI.

Reading Chapters XII, XIII, and XIV does not require special mathematical knowledge. We have preferred to give the minumum amount of detail and mathematic formalism, saving it for the appendix or other readings, perhaps to the detriment of the rigor of the presentation, but with the advantage of a higher degree of legibility of chapters even by an audience that does not have a background in quantitative studies. Nevertheless, the methodological approach presented in Chapter X can be applied as a first step, without necessarily moving on to a "hard" modeling of discourse, limiting it to the phases of identification and mapping.

The text can be used with a specialized course of business organization at the graduate level, for masters and for PhD courses, training courses for organizational analysts, personnel managers, and personnel trainers. Most chapters have been designed so that the material can be covered easily and completely in a single two hour lesson.

The text can also be used as a "secondary" source for in-depth study and reflection. Many summary boxes and detailed descriptions of the illustrations have been provided for this reason. Some boxes are extra information for "detailed study," and contain brief reviews of specific topics and essential bibliographical references. Other boxes contain examples, metaphors, digressions and suggestions, often taken from narrative literature or the figurative arts, whose function is to give readers interpretative keys and explanations of some concepts in nontraditional and, we hope, more meaningful and interesting ways. The citations at the beginning of every chapter have also been chosen in order to represent as closely as possible the content and what is to us the deeper sense of the chapter.

To avoid interrupting the flow of the chapter we have limited the footnotes and end notes to those that are strictly indispensable. At times the notes contain information that would have been more appropriately shown in boxes, but we decided to limit the use of this tool to avoid overusing it. Instead we have highlighted or illustrated just those concepts that we believe are most important to the objectives of the text.

For Whom This Work was Written and What You will not Find in it

The text was written for everyone who believes that the future of organizations lies in learning and those who would like to know how to build and manage a learning organization. To those readers we offer a theory of organizational learning in which the central concepts are those of memory, experience and planning. A methodological approach is presented along with some tools that can be used to analyze explanatory discourse, which are the starting point of every attempt at organizational learning.

An example of an information box: Organizations as cognitive systems

The origins of the cognitive approach to the sudy of organizations goes back to the contributions made by March and Simon (1958) in which organizations are essentially considered as systems for the elaboration of information (*information processing*). Organizations allow us for the partial obviation of the limits of the rationality of individuals, inasmuch as they are able to process a larger quantity of information collectively. It was from these approaches that the metaphor of the organization as a computer or a brain was born (Morgan, 1997).

A second line of thought that put the cognitive process at the center of the analysis comes from the analysis of the decision-making process in March (1988), Mintzberg et al. (1976), and Quinn (1988). Unlike the *information processing* approach, the experts of organizational *decision-making* place the emphasis on the chaotic, destructured, political, and apperently irrational character of the decision-making process. In particular, March analyzes the role of ambiguity as an intrinsic characteristic of organizational decision-making processes (March, 1988).

A third line of study is tied to organizational *sense-making*. Followers of this approach (Weick, 1979; Daft & Weick, 1978; Choo, 1998) consider organizations as intepretative systems that elaborate and create meanings instead of as complex processors of information from the objective, or at least non-problematic meaning. In the sense-making approach, the interpretation is not antecedent to the action but is the result of the action and the interactions in organizations; moreover, organizational processes are conditioned by the presence of preexisting intepretative schema created by individuals through the accumulation of experience and the construction of collective beliefs. The sense-making approach had remarkable methodological effects in the field of *cognitive mapping* (Huff, 1990; Eden & Ackermann, 1992); the methodologies of mapping aim at identifyig and representing the interpretative schema that guide the actions of members of an organization.

Lant and Shapira (2001), editor of a volume that contains many contributions on the recent developments of *organizational cognition*, highlight a growing contrast in the literature between the supporters of *information processing* and *organizational sense-making*. The works contained in the volume nevertheless show that organizational cognition can gain remarkable advantages from the integration rather than the contrast of these two approaches.

The emerging paradigm of *social cognition* (Conte, 2002) promotes the integration between the cognitive and sociological approaches, and recent advances in the field of artificial intelligence in virtue of the recognition of the reciprocal influence between individual cognition and social interaction. The chosen methodological tool for the analysis of this complex problem is *simulation based on agents* through the creation of virtual organizational scenarios implemented through algorithms in which various typologies of independent agents interact with their peers and with their surroundings causing the emergence of aggregate phenomena and mass tendencies that can be explained starting from individual behaviors and ways of interaction.

Quite little attention is paid to the pyschological aspects tied to individual learning. Instead, proper consideration is given to the political and relational aspect of learning. The use and application of methodological tools presented in this volume assume that the learning organization has adequate conditions (psychological, relational and political) to carry them out.

The text is aimed at people studying organizations, consultants, managers and anyone who is interested in actually building a learning organization. In the entire universe of books and articles on the theme of "learning organizations" the present text has a very specific, and in some ways original place among them.

Specific, because it casts its attention on a specific tool of organizational learning, which is explanatory discourse. It firmly sustains that explanatory discourse triggers organizational learning, summarizing in a rational construct of memory, experience and planning.

Original, because it provides a bridge between the theory and the practice of organizational learning by proposing an innovative methodological approach. This connection allows us to lay down the base for the construction of new organizational systems that can envelop and circulate knowledge and "soft" information usually ignored by traditional systems.

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Endnotes

[1] The term "cognitive work" has been used in Italy within the Marxist contrast between work and capital (Bifo, 2003). The use of the expression in our treatment is instead to be considered without political connotations, even though some political fallout may originate from our conceptualization. This debate naturally goes beyond the limits and the objectives of this volume.

[2] The term "knowledge worker" is often use to mean cognitive worker (Blackler, 2002; Reich, 1991). This concept recall the definition proposed by the National Labor Relation Board negli USA (1996), the professional is "a worker that executes intellectual job activities, with high discretionality, that produces non standard outputs, and that possesses specialistic knowlegde acquired through superior training or the exercise of the professional activity." As Cillario observes (1990), nevertheless we should not mistake cognitive work with intellectual work. What distinguishes cognitive work from noncognitive is in the end traceable to the capacity for observation, reflection on one's own work, and autoomous reorganization.