

Dynamics of Organizations: Individuals, Network, Global behaviour

DOING

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B.0 Proposal summary page

Proposal full title: **Dynamic of Organization: Individuals, Network, Global behaviour**

Proposal acronym: **DOING**

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B.0.1 Proposal abstract

The goal of this project is to develop new techniques for measuring unaccessible aspects of the structure of public organizations, such as hospitals and universities, by means of a tuned computer modelling of the dynamics of the organization itself. The computer model is based on a multi-dimensional characterization of the individuals which includes psychological and qualitative aspects and on the structure of the networks of interactions among individuals. The model includes also the temporal dimension through the simulation of the dynamics of the organization. The synchronization between the model and the reality is performed through automatic, indirect monitoring of inter-individual interaction events. This is performed by semantic and time-series analysis of “focus group” discussions, such as chat sessions, forums, blogs, wiki pages, e-mail contacts. The main idea of this approach is that aspects which are difficult to measure directly, such as satisfaction, robustness, happiness, self-organization and other emergent features may be more easily obtained from a suitable computer model, once it is tuned to reality.

B.0.2 Proposal body

Public organizations such as hospitals and universities, plays a fundamental role in society. Their functioning is based on a *double level* organization: the official one, based on the planned structure, and an effective one in which all involved persons (physicians, nurseries, personnels and patients for hospitals, teachers, secretaries, technicians and students for universities) interact and self-organize. The technical aspects of the main process (curing and teaching) are regulated by a long history of peer-review and self-evaluation. One can consider that this process has reached an optimized level. However, this mechanism is apparently not well suited for optimizing and improving other aspects of the organizations, related to “marginal” points like self-esteem, satisfaction, perception, wellness, efficacy and robustness (resilience from errors) in communication. As a simple example, many “alternative” treatments in medicine deserve their success not to their therapeutic success, but to the “aridity” of traditional treatments. On the other hand, many therapeutic treatments of chronic or slow-progression diseases may profit from patient cooperation and feedback. Another example may concern the teaching process: it is not uncommon that a good scientific background may coexists with irrational assumptions about events occurring in everyday life, or with a poor attitude to collaboration. These “marginal” points affect the global behaviour of the organization, and also the role of the organization in the society.

The main drawback that prevents the application of the self-evaluation process to these aspects of the organization is the lack of tools able to measure and quantify “unmeasurable” quantities, either of psychological/perceptive origin or having a cooperative nature, such as the level of self-organization, the effective network of interactions, the degrees of separation among participants.

Indeed, the measurement of emotional, perceptive and psychological components, or of collective ones is an hard task. The most used tool is the battery test, which is however expensive and lengthy to set-up and analyse, and can only sample a very restricted set of aspects. Another drawback of explicit tests is that they are very sensible to the cultural differences among participants. Moreover,

with this kind of tools it is almost impossible to capture the temporal dimension, i.e., to monitor the dynamics of organizations.

In recent years, theoretical and experimental researches by physicists have focussed on the characterization of the emergent properties of complex systems, for which self-organization plays a fundamental role. The main tool for this kind of investigation is computer modelling. While the very first studies have taken into consideration strongly simplified models of individuals interacting in a schematic ways, present investigations concerns sophisticated (i.e., multi-dimensional) models of individuals, non-trivial interaction networks and complex global behaviour. Another current investigation theme concerns synchronization of complex, multi-dimensional systems.

The introduction of computer models has been successful in engineering, material science, drug design and molecular biology, since in this way the measurement of quantities that are unaccessible to experiments become possible.

At variance with the case of “hard sciences”, in a social context it is not possible to develop a model starting from “first principles”, and one has to resort to phenomenological assumptions. One of the crucial points of this project is thus that of validating models on test cases.

The tuning mechanism is also a crucial point of the project: in order to measure sensible quantities on the model, it has to stay “synchronized” with the reality. In order to minimize desynchronizing effects, the tuning phase should be as much automatized as possible. Therefore, we plan to adapt and develop semantic analysers of the information flow among individuals, and of informations generated during special “cooperative” events such as focus group and problem solving sessions. In particular, we want to specialize such tools for the study of the distance and clustering among individuals based on the informations that can be obtained from targeted and consensual discussions in electronic form, e.g. forums, chat, blog, wiki pages, e-mail/SMS communications.

Since this part essentially concerns personal data handling (although not the kind of data involved in the ethic issues of the EU), particular relevance will be given to the issues of privacy and protection.

From the technical point of view, we shall profit from the experience of one of subcontractors (Bassnet), which is an enterprise specialized in web portals, content management and data management.

The main goal of the project is therefore to set up an interdisciplinary working group, made up of physicists, work psychologists and computer scientists, able to deal with psycho-socio-organization problems from multiple points of view in a real collaborative way. We believe that real improvements in measuring psycho-socio-organization quantities can only arise through the combined use of psychological approaches, theoretical physics dynamical modelling and computer-aided analysis. The innovative points of the proposed projects are the cross-cultural approach, the contemporary observation of individual emotions and skills, the multilevel (individual/network/dynamic) approach and the use of computer models as measuring tools.

This new multidisciplinary approach will be applied to two case studies. The first case study will concern hospital organizations, with particular attention to robustness and resilience with respect to error self-correction and propagation, especially in non-technical contexts. We will perform a parallel investigation on individual (emotions and skills) and organisation (e.g. the network of interactions) aspects. The target is to focus the main criticalities of the system, having the possibility of acting on both the human and structural level, in order to minimize the error formation and spreading.

The second case study will concern the evaluation of the processes that undergo university teaching programs. While the evaluation of learning is a well-established technique (course marks), all other aspects concerning students and teachers communication and self-organization, influence of cultural gaps, birth and propagation of extra-curricular knowledge, clustering and distances among individuals, are traditionally ignored. However, it is an everybody's experience that these aspects play a major role in the learning process, and are also very important for customers' wellness and satisfaction.

The sampling technique that we will adopt is based on the analyses of the patterns of communications, in electronic form. In order to favor data collection, we plan to promote web-based discussion tools among participants (hospital personnels and patients; teachers, secretaries, technicians and students). These tools will also provide a democratic instrument for the governance of such institutions.

B.1 Scientific and technological objectives of the project and state of the art

B.1.1 Objectives

The main scientific objectives of the project is to develop reliable models of interacting individuals in public organizations in which communication and self-organization are fundamental components. The models of individuals and the character of interactions are fundamentally multi-dimensional and include hard-to-measure aspects such as emotions, skills, perceptions, cultural differences. The model of the organization includes non-trivial networks of interactions, and the temporal dimension. The goal will be not only to understand "how" people work together but also "why" they sometimes co-operate, and why not.

If the resulting models are able to reproduce and forecast the behaviour of the modelled organization and of the participating individuals, this can be used as a powerful measuring tool for investigating "unaccessible" quantities, either of psychological/emotional or cooperative/emerging character.

The resulting models need to stay "synchronized" to reality. In order to do this, we plan to adapt and develop automatic data-mining processes for analysing the semantic and temporal content of electronic communications. The main idea is that communication contents and temporal coincidence can be correlated to "distances" in some multi-dimensional space. Once these distances are "normalized" to the organizational expected flow of informations, they can provide important informations on the "connections" among individuals inside the organization. It is expected that each "dimension" is related to a different "distance". Finally, the model will compute the evolution of individuals behaviour over the network of connections. By comparing and synchronizing this behaviour with that of the actual organization, we finally obtain a way of sampling individual and collective "hard-to-measure" quantities by actually measuring much more accessible aspects. By "electronic communications" we mean a broad range of different informations, that can be gathered by electronic means mainly using web tools. These informations include both the temporal dimension and the semantic contents. As examples, one can consider access and contents of visited web pages, timing and contents of chat sessions, forums, etc.

We plan to automatize this sampling process as much as possible, producing a data-mining and data-collection tool that constitute, together with the produced models, one of the technological objectives.

While distance measurements may be performed on occasional data, we plan to "stimulate" interactive sessions based on the concept of focus group or problem solving meeting. In order to

introduce these instruments in our test cases, we plan to adapt and develop web-based collaborative software, which is another technological objective.

Moreover, we think that these tools may promote the participation of subjects to the governance of the public organizations, thus promoting cooperation, peer-reviewing, and democratic participation. Since the informational contents of this study concerns the privacy of individuals, particular attention will be devoted to the transparency of the process, to give accurate and easy-to-understand informations to participants, and to the protection of the collected data.

We will achieve this aim by bringing together communities that are currently focusing on different aspects of this problem, to create a common language and to exploit synergies. The working teams will include sociologists, psychologists, physicists and computer scientists, all engaged in the modelling of the individual, organizational, and network behaviour. Indeed, we believe that a real improvement in measuring psycho-socio-organizational quantities can only arise by the combined use of psychological approaches, theoretical-physics dynamical modelling and computer-aided analysis. We want to create an interdisciplinary consortium bringing together scientists with very different backgrounds, trying to build a common language and layout for tackling, in an innovative way, the problems under study.

On the other hand, no “universal model” can be used to characterize in a quantitative way different organizations. Hence, we will focus on a few test cases. We believe that the modelling tools developed in this project will be useful also for other fields of application. Furthermore, the methods that will be developed to address our specific tasks are expected to have enough generality to allow future investigations in other fields, not addressed in this proposal

The first test field will be hospital organization, and in particular its robustness with respect to error self correction and propagation in non-technical issues. This topic is of extreme relevance, for both its economic and its human consequences. It is also a perfect test case for the integration of the individual, network and dynamical aspect of the analysis. Errors arise almost always at the individual level, but the responsibility for their spreading (or insufficient repression) are the network structure and the set of working rules (the dynamics). The operational protocols have been designed (end evolved) in order to reduce the spreading of technical errors and promote corrections. However, usual methods are quite resource-consuming and ineffective outside technical contexts, especially when patients are asked to participate or when informations has to be exchanged with them. The parallel investigation on the individuals and on the networks (represented for instance by the organization chart) can give us the chance of decomposing the errors at different levels. On one hand, we can measure some variables, like the stress, the sense of responsibility, the ability of working in a team, which can give us a first prediction on the possibility of making a mistake. On the other hand, we can consider the role of different kinds of networks in preventing the formation of errors or in limiting their spreading. The innovation lies in the fact that we will try to analyse both aspects using a panel of experts with different backgrounds, from physicists to psychologists of work, from computer scientists to businessmen.

Another interesting field of application, that also has an important territorial impact, is the modelling of the aspects of all the processes that takes place in a University, beyond learning. In particular, we shall examine communications among teachers and students in order to investigate the self-organization and cooperation processes. As a by-product, we shall produce indicators of clustering, satisfaction, well-being and cooperation of students and teachers. These indicators can be useful for the evaluation of the quality of the university.

Since we want to understand organizations starting from the individual level, one of the main

aspects of our project is that of modelling the individuals. A major difficulty of this task is that individuals are “multi-dimensional”, and that we only have access to a few “projections” of the individual complexity over the aspects that are under investigation (e.g., by questionnaires). On the other hand, individuals may interact along other “directions”, inducing the idea of “irrational” behaviour of individuals. We would like to validate our modelling of individuals through comparisons between computer-aided modelling and both traditional and innovative measurements. It is a hard try-and-compare task but it has the advantage of converting the model into a measurement tool, allowing the measure of hidden quantities.

If we want to summarize, the three main innovative aspects of this projects are:

- The cross-cultural (measure/modelling) approach
- The simultaneous observation of individual emotions and skills in organizations
- The multilevel (individual/network/dynamics) approach

The purpose of this project is then not only the one of building models able to reproduce the observed data, but also to create the premises and the seeds of a true “theory” of psycho-socio-organization. The models that we will develop will create a “communication tool”, which should mediate the action of the two disciplinary groups: the psycho-socio-organization on one hand and the hard sciences on the other hand. This tool will not only be the model of the case-study, but a true language translation machine, able to accept and transmit solicitations and demands from both the social scientists and the modellers.

B.1.2 State of the art

This project represents an innovation since to our knowledge similar activities are only being planned in the US and for military applications¹ but not focusing on public organization.

There are many investigations about social organizations, and the style of approach is quite different, depending on the disciplinary field of the authors. Psychologists pay much attention to individual characters, how an individual feels the environment and how individuals interact among themselves. This approach is also motivated by the fact that most of the traditional data-collection is done by means of questionnaires, filled-in by the individuals. These data are often difficult to be inserted into a mathematical model.

Many psychological tests have arbitrary metrics but are appropriate for testing psychological dimensions. Metric arbitrariness is a concern, however, when researchers wish to draw inferences about the true, absolute standing of a group or individual on the latent psychological dimension being measured. This is the case of context of most case studies in which psychologists need to develop inventories with non-arbitrary metrics. One example comes from social psychology, where researchers have begun using the Implicit Association Test to provide the lay public with feedback about their “hidden biases” via popular Internet Web pages.

The most important task confronting the field of personality is that of capturing the dynamical, process-oriented nature of personality in a parsimonious fashion. Trait theorists have addressed some of the more static, descriptive aspects of personality—how people may be concisely described in terms of a set of global characteristics. However, we have not yet arrived at the point where we can succinctly express the more process-driven, context-sensitive patterns of personality.

This may best be accomplished by understanding people’s predominant goals and their strategies for pursuing those goals. Such a motivational analysis allows us to express coherent cognition-

¹ See the project of the National Academy of Sciences “Organization Models From Individuals to Societies”, project identification number: CSBD-I-04-03-A

affect-behaviour patterns that distinguish individuals from each other. Moreover it also illuminates the underpinnings of important psychological phenomena in all individuals (e.g., helplessness, aggression). It's possible to illustrate these points by identifying major classes of goals and the cognition-affect-behaviour patterns that are associated with them, goals can provide a common language for those who take a process-oriented approach to personality, as well as common ground between personality and other fields of psychology.

An interesting propose in this way [Dweck1996] best be done by understanding people's predominant goals, along with their beliefs about whether and how these goals can be realized.

Traditional quantitative analyses of organizations are based on aggregated economic data (annual sales, market sectors, number of employees, etc.), collected from the chambers of commerce or similar institutions. This approach does not take into much consideration the interconnections among the involved persons.

In the context of the study of organizations, much effort has been dedicated to the characterization and improvement of the operation of organizations from the business management point of view.

Modelling has been also used, in particular to study the effects of information and knowledge flow in the organization network context, considering descriptions that include individual functions.

Different approaches have investigated the syntax and semantics of persons' communication languages, using approaches that have mainly focused on the structure of dialogues

Some authors proposes pragmatics theories which extends and adapts the cognitive dissonance theory, unifying it with the theory of coherence in thought and action that issues from computational philosophy of mind, in order to study this aspect.

This new motivational models are formulated in terms of constraints and elements of cognition and allows us to define cognitive incoherences and dialogue utility measures.

In communication theory, one generally distinguishes between cognitive theories and interactional theories [Littlejohn1992].

Interactional theories articulate around the notion of structural coherence (often called conversational coherence; [Craig1983]) and deal with the shape of communication, answering questions such as:

- what are the dialogue units,
- what are the structural regularities of conversations
- what are the conventional constraints of the dialogue shape/structure.

In contrast, cognitive theories deal with message production as well as message perception and reception.

Central questions are then:

What to communicate, when to communicate it and to whom, how to understand and interpret incoming messages and how to react.

These theories articulate around the notion of cognitive coherence and address the functional aspect of communication at both the internal and external level.

The results of such an analysis have brought more efficiency in engineering working processes [Nissen2002] by identifying criticalities and solving them even before the working process begins.

Note that the individuals have been considered as functions in the organization, not as personalities. This simplification can be a good one for an engineering kind of work organization but not necessarily for other types of work organizations or of work purposes. It is expected that including the psychological aspects of the person in a proper organization model will bring improved working quality (or efficiency) but little or no research at all has been done so far that integrates the knowledge developed by the psychologist with the models developed to study complex systems.

There has been also interest in the application of complex systems models to psychology.

It's possible to conceptualize personality and individual variation from the perspective of dynamical systems. People's thoughts, feelings, and predispositions for action are inherently dynamic, displaying constant change due to internal mechanisms and external forces, but over time the flow of thought and action converges on a narrow range of states—a fixed-point attractor—that provides cognitive, affective, and behavioural stability. An attractor for personal dynamics develops through two mechanisms: the synchronization of individuals' internal states in social interaction, and the self-organization of thoughts and feelings with respect to a higher-order property (e.g., goal, self-concept).

These studies have also proven challenging to organizational psychology and the modelling has been used to show that there is in fact the possibility to describe them collectively (e.g. social relation stability), with the use of modelling tools like the ones provided by catastrophe theory, cellular automata, non-linear dynamics, logistic maps and game theory [Guastello2000]. These studies address in part the issue of this proposal but do not have the integrated approach here sought, are of mainly qualitative nature and are limited to the description of the observed phenomena. Research is still needed to uncover the underlying mechanisms that act in a complex way within an organization and are partly generated by the features of the personality of individuals.

The complexity of social systems arises at different levels. Individuals are indeed complex entities, whose interactions depends not only on measurable quantities, but also on past history, non-verbal communications and personal differences. Connections among individuals are of different kinds, and different networks exists for different purposes. It is sufficient to consider for instance the differences between the network of personal contacts and that of organization of work in a generic enterprise².

Much simpler complex systems have been studied by scientists using a combination of statistical and dynamical tools, combined with computer simulations of simplified models. After a first phase of almost purely-theoretic work, these techniques have started to be applied to the interpretation of real systems, starting, as usual, with the simplest ones [MULTIAGENT]. What is emerging is the fundamental role of modelling. When a system is really complex, the "black box" analysis of data cannot shed much light in the details, while the comparison of a model simulation with experimental data may be very fruitful.

For what concerns the "technical" problems of simulating human organizations with sufficient details able to be compared with experimental data, it can be said that it is an interesting task even from a theoretical point of view. The theoretical approach of physicists, mathematicians and

² The literature recognizes that the interplay between individual and organization features has a critical role in the understanding of economic phenomena. See for example "Group formation in economics: networks, clubs and coalitions", G. Demange and M. Wooders, Cambridge University Press (2004).

computer scientists (hard-scientists for short in the following) in modelling social structure can also focus either on individual (agent-based modelling) or aggregate quantities, population-level modelling using Markov techniques.

Simulations at population level using Markov models are almost traditional, and have been used to assist in the development of medical care guidelines at a policy level [MARKOV] These techniques are of valuable interest in evaluating the outcome or the cost of a protocol.

Social sciences seek to understand not only how individuals behave but also how the interaction of many individuals leads to large-scale outcomes. Understanding a cultural or economic system requires more than an understanding of the individuals that comprise the system. It also requires understanding how the individuals interact with each other, and how the results can be more than the sum of the parts.

How does the heterogeneous micro-world of individual behaviours generate the global macroscopic regularities of the society? It is standard practice in the social sciences to suppress real-world agent heterogeneity in model-building. This is done either explicitly, as in representative agent models in macroeconomics [Kirman1992], or implicitly, as when highly aggregate models are used to represent social processes.

While such models can offer powerful insights, they "filter out" all consequences of heterogeneity. Few social scientists would deny that these consequences can be crucially important, but there has been no natural methodology for systematically studying highly heterogeneous populations. Finally, it is fair to say that, by and large, theoretical social sciences, especially game theory and general equilibrium theory, has been preoccupied with static equilibria, and has essentially ignored time dynamics. Again, while granting the point, many social scientists would claim that there has been no natural methodology for studying non-equilibrium dynamics in social systems.

One of the possible approaches to this kind of problems are social simulations using Agent Based Models (ABM) [MULTIAGENT]. ABM begins with assumptions about agents and their interactions and then uses computer simulation to generate "histories" that can reveal the dynamic consequences of these assumptions. Agent-based approaches have started to be used also in medical contexts [Fridsma1998].

Actually, ABM simulations has been largely applied nowadays to explore economic systems, thus giving life to the so-called Agent-based Computational Economics (ACE) i.e. the computational study of economies modelled as dynamical systems of interacting agents. ACE has been around since at least 1989 when Kim and Markowitz (who got the Nobel prize for his portfolio theory) simulated the 1987 Wall Street crash by two different types of traders. Since many years the economists organize WEHIA meetings were the last three letters stand for Heterogeneous Independent Agents.

In recent years, hard-scientists have also realized that social networks [NETWORK] are quite different from that of physical networks. Therefore, many efforts have been devoted to the investigation of the mathematical properties of networks, and to the measurements of the structure of social networks.

One of the objectives of this project is to create and validate a new provisional model on psychosocio-organization phenomena which are not yet understood by standard methodologies.

When we consider an organization we means measuring the feelings, perceptions, expectations, attitudes, hopes and fears of the persons making up the organization. So it is possible to view the

diagnosis of organizations as an attempt to study psychologically collective behaviour.

In particular, the personal relations can be explained as levels of separation or clustering. Using this behavioural map we shall move on to identify those behavioural interactions that modify themselves and that the plural psychological relation determining the dynamics of the organization. We shall use the assumption that a mutual influence between opinion leader groups determines the course of a collective system.

To create the instrument we believe that a continuous comparison between working groups is really necessary, in order to develop a new common *forma mentis* in the various fields.

One of the goals of our interdisciplinary approach is also to provide metaphors for future investigations.

Our proposal would be an attempt to improve the ACE approach by a mutation/selection phase, much in the spirit of biological systems. In order to do this we will take into account the memetic approach, originally proposed by Richard Dawkins [Dawkins1982]. The latter consider the "meme" as the basic unit of cultural transmission³. We extend such a definition by considering a meme as the basic unit in the production of cultural objects.

The distance between the problems that arise and our ability to solve them is termed "the ingenuity gap" (as it has been called by T.Homer-Dixon [Homer2002]). How can we measure ingenuity and how can we distinguish different types and qualities of ingenuity? One possibility is to approach these issues in terms of 'cultural epidemic': in fact all the kinds of memes (ideas, products, messages, behaviours, fashions, advertisements, policies, etc.) spread in a cultural system (social network) in a way similar to epidemics do and give rise to radical changes when a given critical threshold - the "tipping point" - is overcome [Gladwell2000].

Our goal would be to provide a new computational methodology, through an ABM approach based on the concept of meme and cultural epidemics, in order to measure the goodness and the efficiency of a strategic project as a function of the cultural context in which it will be implemented and as a function of the ingenuity it will supply compared with the external requirements.

B.1.3 Approach/methodology

Our research will be conducted along three interconnecting lines of investigation:

- the individuals;
- the networks of interactions among individuals;
- the dynamics of individuals over the network.

More specifically in order to validate the models with real world data, we will use an approach which consists of three ingredients that will be applied to two case studies.

The individuals.

The really innovative ingredient of our approach is the attention devoted to individuals, and especially to develop some arbitrary metrics able to describe that aspects of individuals, so important for human relationships, that are hard to be characterized by numbers: values, sense of community, goals, strategies, personality structure, state and trait anxiety, stress, self-esteem, self-efficacy, self-consciousness, culture, affordability, perspectives, competitiveness, leadership, cognitive functions and social skills.

³ see for example <http://jom-emit.cfpm.org/overview.html>

The very first goal of our investigation is to develop models of individuals [Bagnoli2004] including such features, that have in general a dynamical character (i.e., their "value" depends on the context). Such a model has to be built by means of a strict collaboration between psychologists and scientists. Since the features considered are quite hard to be measured directly, we have to compare them indirectly with existing and custom-collected data. None of the traditional analyses of interpersonal interactions takes into account the "personal factors", i.e. the importance of education and formation of employees, the "social climate", the importance of having well formed persons at certain levels, the heuristic which subject employ and so on.

All these "objective" (social system, social structure) and "subjective" (social climate) factors are very important in determining the success or failure of an organization, but are never considered because they are difficult to be quantified.

The networks.

The second ingredient of our approach are the networks of communications. Many efforts have been devoted in recent years in the characterization of non-physical (i.e. human) networks. We now start to have a more precise knowledge of how the network structure affects the dynamics. One aspect of our modelling is to measure the structure of various networks in the organization of work. We think that there are several interconnecting and maybe competing networks, and people appear as nodes in many of them. One example is the network of personal contacts, another that of the information flux, and a final one that of material flux. We propose to measure the structure of these networks and the different role of persons in them. One of the points that may have a fundamental importance in the social organization of work is the coherence among different networks. We expect that a strong discrepancy in the structure of some of the most important networks will be reflected in the psychological variables of the involved persons.

Moreover, the structure of the network has a deep influence in the spreading (percolation) of errors [SPREADING], and thus on its robustness.

The dynamics.

Finally, the world is dynamical, and so is the organization of work. Especially in recent years, globalization exerts a strong pressure on existing structures, both of private and public character. Very few organizations have survived without adaptation, so we think that an adequate metaphor for a healthy organization is that of the "red queen" (Alice in Wonderland) hypothesis of competing population: evolution (say, innovation) is needed just to survive, in a way similar to Alice in Lewis Carroll's tale, who had to run as fast as possible just to stay in the same position [EVOLUTION]. One of the most important goals that we could achieve is the elaboration of a robustness indicator for the organization under examination.

It is well known that different network structures imply a different degree of robustness of the dynamics. For this goal we want to apply the techniques used in evolving population dynamics: mutation and selection, which is just another way of calling a stochastic optimization process.

The search plan comprises the construction and validation of a new-generation of psychological measuring instrument, able to detects and integrates behavioural and cognitive performance dimensions.

Agent-based modelling

One of the objectives of this project is to create and validate a new provisional model on psychosocio-organization phenomena which are not yet understood by standard methodologies.

When we consider an organization we means measuring the feelings, perceptions, expectations, attitudes, hopes and fears of the persons making up the organization. So it is possible to view the

diagnosis of organizations as an attempt to study psychologically collective behaviour.

In particular, the personal relations can be explained as levels of separation or clustering. Using this behavioural map we shall move on to identify those behavioural interactions that modify themselves and that the plural psychological relation determining the dynamics of the organization. We shall use the assumption that a mutual influence between opinion leader groups determines the course of a collective system.

To create the instrument we believe that a continuous comparison between working groups is really necessary, in order to develop a new common *forma mentis* in the various fields.

The search plan comprises the construction of one measuring instrument based on a multimethod/multitrait approach based on a standardized ensemble of structured questionnaire, projective test and interviews, giving origin to a matrix in which more psychological characteristics of organizational dynamics are collected.

One of the goals of our interdisciplinary approach is also to provide metaphors for future investigations. Our proposal would be an attempt to improve the ACE approach by a mutation/selection phase, much in the spirit of biological systems. In order to do this we will take into account the memetic approach, originally proposed by Richard Dawkins [Dawkins1982]. The latter consider the "meme" as the basic unit of cultural transmission⁴. We extend such a definition by considering a meme as the basic unit in the production of cultural objects.

The distance between the problems that arise and our ability to solve them is termed "the ingenuity gap" (as it has been called by T.Homer-Dixon [Homer2002]). How can we measure ingenuity and how can we distinguish different types and qualities of ingenuity? One possibility is to approach these issues in terms of 'cultural epidemic': in fact all the kinds of memes (ideas, products, messages, behaviours, fashions, advertisements, policies, etc.) spread in a cultural system (social network) in a way similar to epidemics do and give rise to radical changes when a given critical threshold - the "tipping point" - is overcome [Gladwell2000].

Our goal would be to provide a new computational methodology, through an ABM approach based on the concept of meme and cultural epidemics, in order to measure the goodness and the efficiency of a strategic project as a function of the cultural context in which it will be implemented and as a function of the ingenuity it will supply compared with the external requirements.

B.1.4 Case studies

Case 1: Hospitals

Error propagation and persistence in hospital organizations is a very expensive phenomenon, both in economic and human terms. Any measure designed to reduce it has to deal with robustness of the network, costs of communication and control, psychological acceptance of individuals and compatibility with the hierarchical organization. In the spirit of these considerations we plan to develop an integrated inter-disciplinary group composed of psychologists of the organization of work, theoretical physicists specialized in the dynamical modelling of large number of interacting agents with experience in sociophysics, econophysics and networks and computer scientists. We want to develop a model of the organization, from individuals to the collective dynamics over the measured network structure, merging together the different point of views present in our interdisciplinary consortium.

The approach of the CACT group [CACT] will be the simulation of self-organized hierarchical levels in hospital management. Here one has to optimize a compromise between efficiency of information flow and efficiency of patient care. Assuming that the head of the hospital gets new

⁴ see for example <http://jom-emit.cfpm.org/overview.html>

information with a high degree of reliability and understanding, e.g. on new medication, will this information reach the single patient correctly? At each level of the information hierarchy, there is the danger of misunderstanding and loss of information. The safest way to treat patients in this model would be to have the hospital head to treat everyone directly. But then the hospital could only help a handful of patients. With a high tree of hierarchical levels, like a Bethe lattice where each person on one level supervises n neighbours on the lower level, a much larger number of patients can be treated in one hospital but the errors in information will be higher. Random fluctuations may make this model unsolvable analytically and thus require computer simulation. Similar types of simulations were already successful for ecosystems. Here one has to optimize the compromise between the amount of species and individuals on the one hand, and the limited resources on the other. Self-organisation into typically five food levels was seen. In a similar way, we have to optimize the health and number of the patients under the constraint of a fixed number of health workers.

The SYM group will give a different contribute to this case study [SYM]. Along with the main goal of reducing organizational errors in hospitals, the proposed study relies upon the features inherent to Operational Experience Feedback (OEF): organizational actors participate actively in the OEF program, integration to global quality, standardisation of methods to allow knowledge transfer from one hospital to another.

They propose to consider two categories of hospital errors: errors leading to incidents/failures in a perspective of improving health performance, and accidents/crisis in the perspective of improving safety.

To that effect, they propose to study an adaptation of OEF methods not so much applied to the gravity of damage, but to the **learning potential** stemming from the management of each incident, accident or crisis.

They propose as well to study as a *continuum* the various subsystems which compose the hospital, from those under tight control (access restricted to medical professions) to the open subsystems (which include actors from outside the hospital) which are characterised by the frequency of micro-incidents which lead hospital management to continuously use recovery strategies and to manage change dynamics.

To valid the results of the study, they will study the definition of success factors for OEF methods: transfer to hospital actors, knowledge production and improvement of safety processes.

This part of the study includes the development and test of a set of analytical tools (including a questionnaire on individual and organizational values) that can be transferred to participating organizations. Data treatment is possible on large numbers of participants and aims at providing feed back on information otherwise difficult to model. Possible generalization to other organizations in Europe in the same field of activity (e.g. hospitals) will be considered as well in this part of the study.

Case 2: Universities

The second case study will address the issue of those aspects of the teaching/learning process beyond concept learning.

The interactions among teachers and students are an important aspect of the learning process, even before students enter the university. However, there is no standard technique to measure and monitor this aspect, especially for what concerns the psychological components and the emergence of cooperation and self-organizations.

We plan to apply a strategy similar to that used for hospitals to university, based on modeling and on the analysis of information flow. The introduction of web-based discussion tools, focus group and problem-solving sessions will be done in cooperation with the structures that participate to the self-evaluation process.

In our team there is a good expertise in web-based services for distance learning and cooperation [WEBTEACH], and we may profit of

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B.2 Relevance to the objectives of the NEST

We think that computer-based modelling will become the main measure technique for complex systems, and in particular for issues concerning social systems and the interpretation of their behaviour.

We also think that the techniques and the methods developed by physicists that investigate complex systems may be very useful to the investigations concerning individuals. In particular, the emerging properties of cooperative systems constitute a metaphor of the possible collective behaviours of persons. Indeed, interacting individuals constitute a paradigmatic example of a complex, multi-dimensional system that can only be dealt with a multi-disciplinar and "holistic" approach.

Another relevant point of this project is the contribution to the mathematization of psychology and work organization, and the introduction of dynamical modelling in these fields. Our case studies are relevant for physics and for social sciences and our approach tries to bridge the gap between the physical sciences and those of other disciplines in an effective manner. This interaction may easily promote cross-fertilization on both sides.

The essential point of the project is to make possible, through the use of a model, to measure quantities that pertain to psychology through measurements of informational or temporal character. We believe that this project will constitute a strong impulse to this kind of approach, thus fostering similar investigations and creating new research fields able to attract intellectual efforts in the future.

A properly designed model can also give as a response the ability of the represented organization to achieve goals or specific working targets, for example the minimization (or elimination) of error propagation in health data of the patients in a health care organization. The project will produce models that will be tested against real world specific cases. It is expected that there will be a model (or a set or category of models) that can be validated as a good representation of the organization characteristics, response and dynamics with respect to a specific organization goal.

It is one of the goals of the present project to represent in the model also the aspects of the personality of an individual within the organization and creativity is a characteristics that can be identified and placed in the representation of the individual in the models that simulates the organization.

The project vision of the organization environment is individual-centric. In fact one of the goals of the project is to have as input the characteristic psychological aspects of the person in the organization. To achieve this goal there are the specific professionals and competent participants

directly involved (psychologists, business consultants specialized in work organization and dynamics) and, as many times stated, the models to be developed will include, as parts of their properties definition, the personal characteristics of the individuals.

The project method, organization and work plan and the multidisciplinary character of the project team is designed to study the relations and dynamics that occur in public organizations, taking into account the complexity of the interrelations and the conditions imposed from outside.

Another expectation of the project is to find within the model(s) analysis the appearance of structural relations between the actors. In particular the identification of the relationships (maybe hidden) between groups in the organizations that can promote enhanced collaborative environments. The models in fact can, within their dynamics, enhance the appearance of stronger interaction (as measured for example with the information flow) within certain individuals, which at the end can be identified as groups. Furthermore, the group formation process can be “imposed” in the model, for example as a network correlation constraint, and the effect of such condition (or alternative ones) studied. This can bring decisions within the organization that will help support of augmented group presence and visualisation.

B.3 Potential impact

The success of this project will give a new tool to support decision processes and to promote cooperation and diffused governance.

The case studies were chosen so to have an impact in social sectors, like the education and health, where the interest of the EU community is high. The realization of verifiable models where the psychological characteristics of the individual and their mutual interactions are explicitly considered can give a better comprehension of public organizations, of the consequences of strategic choices, and thus can lead to benefits for the whole society.

The multidisciplinary research approach brought in by this proposal will contribute to the cross fertilization between traditional research fields, which can favour the innovation through the exploitation of synergies and the better comprehension of the specific language of another field of knowledge.

We also expect that the knowledge generated within the project could bring benefits for the European Community opening also new challenges for further research in areas that are already at the frontier in their disciplines of participants (psychology, physics, economy) thus attracting young researchers to operate in this new sector.

The project will make a strong advance in the crucial fields of collective phenomena resulting from the interaction of a large numbers of heterogeneous agents using the cross-cultural approach and the computer model as a simulation and forecasting tool..

Better understanding and forecasting allows a better decision process, one that reduces the risks always present when decisions have to be taken with incomplete information (as usually occurs in the social sciences, business and economic sectors). The method and approach proposed in this project can bring significant innovation from a methodological point of view with an impact on the decision processes for activities where planning has been seen to be a valid method to proceed. The availability of a validated model of a working environment phenomena will reduce cost of trials and reduce the risk related to the changes in public organizations by allowing the analysis of several alternatives.

The realization of this project would be very difficult if not supported by the European Union since it is not simple to aggregate at European level so many groups at high level in so many different and somehow not yet fully communicating disciplines which are not necessarily available in a single country.

B.3.1 Contributions to standards

There are no expected contributions to standards.

B.4 The consortium and project resources

The **Center for the Study of Complex Dynamics of the University of Florence (CSDC)** has been founded in January 2002. Several topic areas are involved: Scientific (Biology Department, Organic Chemistry Department, Physics Department, Statistics Department), Technological (Energy Department, Civil Engineering Department, Computer Science Department), Medical (Psychology Department) and Social Sciences (Mathematics for Decisions Department). Besides the researchers belonging to these departments, external members from industry and society are admitted on the basis of their competences in the field. The CSDC is located in the new science campus of Sesto Fiorentino, near Florence Airport (see the web page www.csdc.unifi.it). The primary objective of CSDC is to promote the study of complex systems in several domains of natural sciences and applications. It is involved in teaching activities at PhD level. It promotes transfer of knowledge to companies. Interdisciplinary collaborations are fostered on several scientific areas: biophysics, neural sciences, social and economic sciences, medical sciences.

The **Console srl (CCC)** is a consulting society specialized in psychology of work and has interdisciplinary competence in the field. See the web page <http://ccc.console.it>. It is distinguished in the use of diagnostic tools in the socio-organization area. The reference model is multi-cultural. Console is part of an international network of scientific research.

The **Cactus group at the Department of Physics and Astronomy of the University of Catania (CACT)** active since 2001 has an intense interdisciplinary research activity in Complex Systems. The main goals of the Cactus Group are: Investigation and development of models which describe the general properties of a Complex System; study of consensus model formation; Analysis of real data and networks of various kind, as for example intermittent turbulent phenomena, systems with long range interactions, correlation in DNA sequences, clustering and fractal properties of seismicity data, study of connectivity, diffusion, efficiency and optimization in social, neural and computers networks. Web site: <http://www.ct.infn.it/~cactus/>.

The **Aristotle University of Thessaloniki group (AUTH)** has an extended presence in the field of simulating complex systems, and in particular networks, neural networks, diffusion models, fractals, etc. with applications to various diverse fields. Expertise: Large-scale simulations, algorithm parallelizations, grid computing.

Institut Symlog de France (SYM) is a small private structure listed in the CNRS guide to independent research laboratories in the social sciences. Founded in 1982, Symlog has since 1984 conducted research and intervention in the area of technological and natural risks, with special emphasis on public perception and participation, providing counsel on institutional and organizational decision making.

Symlog has performed qualitative studies for large French and international public and private institutions (French Ministry of Environment, ADEME, IRSN, EdF, ANDRA, EC-DG12, OECD-NEA, US NAS-NRC, Sloane Foundation, Center of Technology Assessment in Baden-Württemberg...). Interventions include analysis of public communication in risk management, study of public risk perceptions, evaluation of institutional risk regulation systems. Methods applied include interviews (individual or focus groups), content analysis, large surveys, and social value inventories. Symlog personnel have participated in many ministerial or international expert groups. Relevant experience in the field of *risk perception and communication* includes partnership in EC DG 12 contracts: NoMiracle, Novel Methods for Integrated Assessment of Chemical Risks in Europe (Environment Agency Denmark, 2004-2009), COWAM 2, Communities and Waste Management (MUTADIS, 2004-2006); SPARPA, Social Psychological Aspects of Radiation Protection after Accidents (U. Surrey, 1997-1999); RISKPERCOM, a 5-country study on public risk perceptions (Stockholm School of Economics, 1995-1998); "A Public Information Campaign for a Proposed Underground Repository for Intermediate and Low Level Radioactive Waste"; (BNFL, 1991-1993). *Public participation and social policy making* were addressed in EC DG 12 contract PENREF: Citizens and Pension Reform (ICCR, Vienna; 2000-2002). *Policy response to risk* is addressed in EC DG 12 contract ATLANTIS: Atlantic Sea Level Rise (U. Hamburg, 2002-2004).

The Department of Informatics at Geneve University (UNIGE) is one of the five entities of the InterFaculty Center of Computer Science. The problems treated are: Reaction-diffusion systems, [Road traffic simulations](#) ,Models of flowing granular materials ,Cellular automata simulation of a large moving object,Fracture ,[Genetic programming](#) ,[Financial market simulations](#) ,Dynamic load balancing.

The Centre de Recherche en Épistémologie Appliquée (CREA) École Polytechnique / CNRS (UMR 7656), founded by Jean-Pierre Dupuy et Jean-Marie Domenach, is the research center on cognitive sciences and epistemology of the Ecole Polytechnique, Paris. Since the beginning its activities have been twofold: modelization in human sciences (models of auto-organization of complex systems in cognition, economy and sociology); philosophy of science and in particular epistemology of cognitive sciences. Recently the center has been reorganized around the idea of interdisciplinarity involving both “hard” (physics, mathematics, ect.) and “soft” (sociology, epistemology) sciences.

B.4.1 Cvs of the Group Leaders

Franco Bagnoli

Born in 1961, got his master degree (Laurea) in Physics from Florence University (Italy) in 1989 and his PhD in Theoretical Physics of the University Pierre et Marie Curie (Paris 6) in 2001. From 1991 to 2001 has held a technical position in the Department of Applied Mathematics, University of Florence. Since 2001 he is assistant professor (ricercatore) in the Department of Energy, University of Florence. Investigation themes: discrete systems (cellular automata, agent modelling), studied from a theoretical point of view, characterizing several aspects of nonequilibrium phase transitions (wetting, damage spreading, chaos in discrete systems, synchronization). Applications to biological modelling, especially evolutionary population models, focussing on the role of competition in the speciation phenomena of both asexual and recombinant populations. At present, he is studying the dynamics of HIV infection using these models. He also applied discrete system modelling to

sociologic models, studying opinion formation and forecasting of personal preferences.

Enzo Spaltro

ACADEMIC EXPERIENCES: starting in University of Milano, continuing at Catholic Milano University, Department of Psychology, and after at Pavia University, Trento and Bologna University. he was also teaching as visiting professor at the following universities: Université de Montréal, Canada, at Laval University, Canada, at Asunción University, Paraguay, Tucuman University, Argentina, at Fortaleza, University of Ceará, University of San Paulo, and Santa Catarina, Brazil, at Mariland University, USA, at Valencia University Spain, at Complutense Madrid University, Spain, Nijmegen University, Netherlands, Tilburg University, Netherlands, Gent University Belgium, Berlin University, Germany, etc.

PROFESSIONAL EXPERIENCES: President APIL Associazione per la Psicologia Italiana del lavoro, President AIPG Associazione Italiana Psicoterapia di gruppo, President IRIPS, Istituto di Ricerche ed Interventi Psico-sociali, President SIPs, Società Italiana di Psicologia, President TTG, Associazione per le Teorie e Tecniche di gruppo, Director of Psicologia del lavoro, Psicologia Italiana, Teorema, (Journals of psychology and Management), Author of a lot of national books and international publications.

The main stream of his research activities were groups and group phenomena and dynamics. The problem of measurement of group dynamics were explored mainly in the field of social and organizational climates and cultures. Other fields explored were economic psychology and ergonomics, that is human engineering. Special attention was also given to psychological test building and implementation.

Andrea Rapisarda

Born in 1960, is Associate Professor in Theoretical Physics and Mathematical models and methods at the Department of Physics and Astronomy of the University of Catania (<http://www.ct.infn.it/~rapis/>). He is also responsible for the teaching activity of the Physics Department being President of the Struttura Didattica Aggregata di Fisica, since November 2004. He is member of the Italian Physical Society (SIF) and member of the Editorial board of Physica A. He has organized several international conference on complex systems and in particular the International Workshop "Complexity, Metastability and Nonextensivity" held at the Centre E. Majorana, Erice, Italy, 20-26 July 2004 (www.ct.infn.it/~rapis/ERICE-COMPLEX04)

. He is co-author of more than 80 papers published in international journals with referee and international conference proceedings with reading committee. He is also referee of several international journals, including among others: Physical Review Letters, Physical Review E, Chaos, International Journal of Modern Physics, Physica A, Physica D, Europhysics Letters, Journal of Statistical Physics. His main research interests are: Complex systems, Statistical Mechanics, Systems with long-range interactions, Phase transitions and critical phenomena, Nuclear multi-fragmentation, SOC theory, Glassy systems, Chaos and non-linear dynamics, Fractals, Turbulence, Synchronization, Networks, Data series analysis in geophysics and biology, Numerical simulations and modellization of social systems.

Panos Argyrakis

Panos Argyrakis (b. 1950), Professor at the Department of Physics, University of Thessaloniki, 54124 Thessaloniki, Greece. E-mail: panos@physics.auth.gr, URL: <http://kelifos.physics.auth.gr>. Degrees from Augustana College, (BA, 1971), University of Illinois, (MS, 1974), University of Michigan (PhD, 1979). Teaching positions at Department of Physics, University of Crete (1980-1985), Department of Physics, University of Thessaloniki (1985-now). Research Interests/Specializations: Dynamics and statistical mechanics of complex systems, fractals,

disordered structures. Networks of systems. Neural networks. Random walks in complex physical and biological systems. Diffusion controlled kinetics. Large-scale computer simulation techniques, Monte-Carlo and Molecular Dynamics. Publications: Author of over 200 published works in international journals, books, conference proceedings, etc. with about 60 citations/year.

Marc Poumadère

Marc Poumadère is an Associate professor at l'Ecole Normale Supérieure, Cachan, France and has been responsible for the doctoral level course on Management of Societal and Technological Risk since 1993. His teaching and research bear upon both organizational issues of risk management and public risk communication. He serves on the scientific committee of the Risk Evaluation and Response (EPR) programme of France's Ministry of Ecology and Sustainable Development. As Programme Director of Institut Symlog, he consults to a range of private and public institutions. Poumadère's interests include situations where cooperation between the involved stakeholders leads to mutual risk definition and effective resolution of risk issues on a policy or community level. He is currently engaged in social values analysis of local stakeholder and policy response to catastrophic global warming effects in EC-DG12 contract ATLANTIS. Poumadère was named Fellow of the Society for Risk Analysis in 2002.

Bastien Chopard

Associate Professeur at University of Geneva Computer Science Department

<http://cui.unige.ch/~chopard/> -1988: PhD in Theoretical Physics, University of Geneva, Profs. C.P. Enz and M. Droz, advisors. -1982 Master in Theoretical Physics, Prof P. Bouvier (Astrophysics), advisor. Professional Experience (in the Computer Science Dept. Unige): 2001- Associate Professeur, 1992--2000 Maître d'enseignement et de recherche, 1991--92 Maître assistant. The position of Associate Professeur comprises around 6 hours per week of teaching, the supervision of Master and Bachelor students and the direction of a research group, namely the "Scientific and Parallel Computing (SPC) group" which includes about 6-8 scientists (Phd students and postdoc). Major research themes are modeling and simulation of complex systems (using cellular automata, lattice Boltzmann models, multi-agents systems,..), parallel computing, bioinformatics, genetic programming. Other professional positions

He has published One textbook about the modeling of physical system with cellular automata, co-authored with M. Droz. Cambridge University Press, 1998. Translated in Chinese and published by Tsinghua University Press, 2003, more than 50 articles in International Journals and more than 50 articles in the proceedings of International Conferences with reading committee, about 30 "technical reports" and papers without reading committee. He is editor of conferences proceedings and special journal issues. Additional academic activities are member of the steering committee of ACRI (Cellular Automata for Research and Industry) and DSFD (Discrete Simulation of Fluid Dynamics), member of the Scientific Committee of ICCS, (Int. Conf. in Computational Sciences) and workshop organizer, reviewer for many international journals in computer sciences and physics, member of the editorial board of IJUC (Int. J. of Unconventional Computing), OCP Science journals, president of "Commission Informatique de la Faculté des Sciences", member of the committee of the "3e Cycle Romand d'Informatique".

Serge Galam

Current position: Director of Research at CNRS (Centre National de la Recherche Scientifique), member of Centre de Recherche en Epistémologie Appliquée (CREA) at Ecole Polytechnique (UMR 7656), 1, rue Descartes, 75005 Paris

Past positions: Teaching Assistant at Tel-Aviv University (Department of Physics and Astronomy), Research Associate at City College of City University of New York (Department of Physics),

Visiting Assistant Professor at New York University (Department of Physics), Member of Laboratoire des Milieux Désordonnés et Hétérogènes at University Pierre et Marie Curie
 Invited talks and conferences: 50 Invited talks at International Conferences, 60 Contributed talks at International Conferences, 90 Seminars at universities all over the world.

Publications: Papers in International Scientific Journals with referees, media coverage: Le Monde, Libération, France Soir, Le Figaro, La Recherche, Pour la Science, Science et Vie, Le Minotaure, referee activity: International journals: Physical Review, Physical Review Letters, European Physics letters ; Physica A, Europhysics Journal B, Research foundations: INF (Israel), FNRS (Belgium), NSF (USA).

B.4.2 Human and material resources

In addition to the principal investigators, a certain number of other researchers will be involved in the project. Several researchers at all levels are required in order to successfully carry out the objectives of the project. We estimate that during the course of the project about 20 people will be employed, with a diverse range of experience (Professors, Post-docs, PhD candidates). Special attention will be given to young researchers who will be introduced in this multidisciplinary field. A key component of the project will be the mutual exchange of knowledge among the groups. This will be achieved by short-term (few days) and long-term (few weeks) stays of people at the participants laboratories. Video conference meetings among the group will be held very often, in order to keep strong the cooperation level during all the phases of the project. Participation in related conferences will be strongly pursued for all groups, in order to be up to date with the world-wide developments. A sizable part of the budget is, thus, devoted to travel and conference expenses, while a part of the budget will be devoted to the equipment.

B.4.3 Budget breakdown

Category	Budget Percentage
Personnel	52.00%
Travel	12.00%
Equipment	10.00%
Consumables	3.00%
Overhead	20.00%
Management	3.00%
Total	100.00%

B.4.4 Sub-contracting

Panos: Margarita Ifti

Professor Dietrich Stauffer, from University of Cologne is an expert in agent modeling. Born in 1943, masters degree in Physics in 1967, PhD in 1970. Since 1977 he is Associate Professor at Cologne University. 1985 Humboldt Prize for French-German Scientific Cooperation; spent half a year in Paris and Marseille 1986. 1999 French-German Kastler-Genter physics prize, 1999 Foreign member of Brazilian Academy of Sciences 1999 Prize of Polish Education Minister

2004/6 Honorary doctorate, Université de Liège, Belgium 1990-2002 Member of Senate teaching committee, Cologne University; coordinated 13 curricula in the sciences in 1994/96. 1990-96 Member of Computational Physics Board, European Physical Society
1992 Successful grant application (first spokesperson) for graduate college of Scientific Computing at Cologne University. Presently coordinator of interdisciplinary Scientific Computing seminar at Cologne University. Edited Annual Reviews of Computational Physics, World Scientific, Singapore. Past or present member of editorial board for : J. Aerosol Sci., J. Stat. Phys., J. Phys. A., J. Physique, Physica A, Physics World, Computers in Physics, Annual Reviews Comput. Phys., Int. J. Mod. Phys. C (managing editor), Theory in Biosciences, European Physical Journal B, Quantitative Finance, Computing in Science and Engineering, Blickpunkt: Der Mann, Complex Systems and Inter-disciplinary science. Three books in 1980's (all translated into at least one other language, all in at least second edition), fourth book 1999, fifth book 2000. 570 papers. Included in list of 1000 most-cited physicists 1981-1997, Institute of Scientific Information (above 8700 citations since 1993).

He is a former participant of the project, but since he is retiring in 2008, he will participate only for the first year, as a sub-contractor of the Paris (CREA) node.

Bassnet srl is an enterprise specialized in human interfaces, accessibility and e-government. <http://www.bassnet.it/>. The project will profit of their experience and of their CMOS portal/content management system for the final implementation of the developed instruments on a web portal. Mauro Felici is the Project Manager in the Web Content & Document Management Area of Bassnet company. Bassnet makes available to the project an open source platform named CMOS devoted to the implementation of a web portal to be devoted to cooperative web work with extensions to multi-channels.

Since this contribution will be integrated only in the dissemination and exploitation plan, we choose to include Bassnet as a sub-contractor of the CCC group.

B.4.5 Other countries

B.4.4 STREP Project effort form

Full duration of project

Project acronym: DOLFIN

	DE	CSDC	CCC	CACT	AUTH	UOC	SYM	UNIGE	CREA	Total
Research/innovation activities										
Definition of the Multidimensional Battery approach about Psycho-Economic- Socio-Organization factors through interdisciplinary focus groups	2	2	2	2	2	2	4	2	2	20
Design of the data collection process, data collection and analysis	6	48	24	-	6	3	36	-	-	123
Design and building of a WIKI-type cooperative working space among the project partners	12	2	2	2	2	2	2	18	2	44
Theoretical premises to modelling psycho-socio-organizational systems	8	8	6	14	8	8	8	8	8	76
Construction and validation of specific models using collected data	12	12	6	12	12	6	6	6	16	88
Dissemination and exploitation	4	4	4	4	8	4	4	4	4	40
Re-analysis of the field data, comparison with model simulations and fine tuning of the models	8	18	12	6	8	3	12	8	8	83
TOTAL Research/innovation activities	52	94	56	40	46	28	72	46	40	474
Management	10	1	1	1	1	1	1	1	1	18
TOTAL Activities	62	95	57	41	47	29	73	47	41	492

B.5 Project management

B.5.1 Management structure

DOLFIN project management has been planned in order to guarantee clear procedures as regards technical, legal and financial aspects of the project.

The project is structured in **6 scientific Work Packages** plus a work package specifically dedicated to the project management. Each Work package will be led by a senior scientist, the **WP leader** responsible to supervise all important items connected to the implementation of the work of each WP including the development of short terms research plans and the running monitoring of the technical performance. WP leaders will ensure the communication among the partners involved in the same WP, they will arrange meetings between participants as needed and periodical inputs will be sent by the WP leader to the project coordinator.

A **Project Coordination Committee** composed by all partners' representatives and the *Work Package leaders* will be formed to assist the detailed technical management of the project, its overall political and strategic direction and the communication and interaction between the WPs within the consortium. The PCC will be chaired by the coordinator and each partner nominates its representative at the kick-off meeting. The PCC normally meets twice a year but under special circumstances, if critical problems arise, more frequent meetings can be held. During these meetings research progress will be analysed and future directions of investigation will be defined. Before each PCC meeting, the coordinator will prepare an agenda including inputs from partners and minutes of the meetings will be distributed to all project participants.

DOLFIN coordinator will take care with the day-to-day management of the project, communicating with the European Commission services, administrating the financial contribution, managing legal issues linked to the consortium level and coordinating all reporting required within the project. The Coordinator will be assisted in the fulfilment of its tasks by **DE's administrative and technical staff** having a long standing experience in managing international contracts. They will work in strict collaboration with the administrative offices of all partners ensuring the effectiveness of the legal, contractual, financial and administrative management of the project in line with the strategy defined by the Project Coordination Committee.

B.5.2 Consortium Agreement

The coordinator, assisted by DE support team, is responsible for drafting the project **Consortium Agreement**. The CA will establish partner's rights and responsibilities, rules about the management of knowledge and the dissemination of the results, IPR protections and conflict resolutions. The coordinator, in accordance with the decisions of the PCC, will be responsible for the maintenance and the updating of the CA provisions.

B.5.3 Web site

In order to guarantee an efficient and easy access to the flux of information among project and its visibility outside a specific internet homepage will be set up. The **web site** will host a forum ensuring a quicker communication among the partners and a public access area containing project results, newsletters and information about the employment open positions within the project .

B.5.4 Work Plan and Progress Reports

At the beginning of the project the Project Coordination Committee will adopt an **Operational Plan** detailing, task by task, the activities to be carried out in each work package.

The plan drawing up with a pre-defined time-schedule will be completed with resources allocation for each member and represents both a monitoring and checking tool of the objectives actually achieved and at the same time a foresight instrument for the actions to undertake during the overall project life. It will allow that corrective re-planning can be taken on time and also provides the EU with a rapid project progress graphical overview. Any modification of the operational plan, where considered convenient, will be proposed to the partners and illustrated to the European Commission. Once approved the plan will be available on line on the project web-site, open to all partners but protected from public access.

Progress in the workpackages will be regularly reviewed against the agreed milestones. Informal reports will be periodically sent by each WP member to the WP leader and upon completion of each deliverable, a report will be submitted by the WP leader both to the coordinator and the PCC. These reports will be useful to the coordinator in drawing the **Technical Reports (TR)** to submit to European Commission on six month basis. However the actual **reporting time schedule** will be directly agreed with the project officer during the negotiation phase. Periodic and final reports will compare resource usage between expected and actual, providing explanations of differences. This will ensure an early warning systems in the case of problems arise allowing immediate discussion of relevant partners, the re-assessment of the project goals and a new allocation of the project resources to the different workpackages. In addition to this a financial audit at the end of the first year and at the end of the project will be provided by each partner in accordance to the EC financial rules.

B.5.5 Dissemination and Exploitation plans

In order to achieve the largest potential impact of the project results, a formal **Dissemination and Exploitation Plan** will be approved by the Project Coordination Committee at the kick-off meeting. The D&E Plan will outline the strategy for the management of knowledge generated within the project activities, based on a clear distinction between dissemination of knowledge of a general nature (of interest to the scientific community as a whole) and disclosure of specific, technology oriented knowledge required for a successful follow-up of the project (exploitation). This Plan will be managed by the Dissemination Committee made up of experts on IPR issues chosen among the technology transfer executive officers of the partners.

Meetings of the Dissemination Committee will be usually held by via teleconference or e-mail and then it reports to the Project Coordination Committee, suggesting actions to be undertaken. Dissemination activities will be planned according to project achievements and will be performed through the usual scientific channels. These activities will mainly consist in society-related initiatives such as the presentation of original scientific results at national and international meetings (seminars, workshops, conferences annually organised in the frame of the project) and the submission of articles to the most prestigious international journals.

During the mentioned events, dissemination material such as brochures, slide presentations, prototypes, will be distributed to reach the widest variety of possible audience, from the general public to the specialised professionals. Moreover the involvement of those who will be the actors of future research activities is considered particularly critical and specifically didactic material will be produced to be delivered both at school and at University level.

Moreover the Exploitation and Dissemination Committee will be in charge of monitoring the project activity to assure the protection of IPR; promoting the exploitation via licence and patents

whenever possible; advising on the dissemination of knowledge of results and products; supporting partners on the possibility of starting spin-off companies; maintaining an updated list of IPR belonging to each partner generated by the Consortium in the frame of this project.

In principles, the policy of the consortium will be to widely share knowledge produced, with as few limitations as possible in terms of access to results but partners will detail rules and provisions for the management of knowledge in DOLFIN Consortium Agreement.

One of the project partners is a consulting firm and there are participants with experience in the business environment that will support the project decisions and the eventual exploitation of the results.

The exploitation of the results will profit of the experience of a sub-contractor (Bassnet) and their CMOS web portal devoted to cooperative web work with extensions to multi-channels. The sampling and modelling tools developed in the project will be made compatible with this platform, described below. The CMOS systems will constitute a "ready to use" open software, that can be adopted by several organizations.

The CMOS project, from a technological point of view, wants to implement a collaborative web space using which the participants may interact for the inputs to the modules, discussion of test cases and validation of statistical analysis furnished by modules concerning the cases under investigation. It will allow the management of a dynamic and interactive data base that will act as a "nervous system" for data and information transmission about decisions, approvals, control and support for the investigations.

The "repository" of the system will be planned to be able to organize and to contain whatever type of structured information. It will be open to the addition of useful instruments for the analysis. It will also represent the main recovery base for the data-mining process, taking advantage of mechanisms of fragmentation of the information; a mechanism able of containing whichever XML file, implementation of the scheme, with the advantage of being anyway a system based on a relational standard DB, and not having the limit of a hierarchical XML file, allowing one to organize the data so as to form lattices of information.

A further objective of the project is that of succeeding in distributing a management service of the contents, which will be accessible, easily usable and intuitive. The information inside the system will therefore be presented in various ways, depending on the "browser" which is used from the remote interaction device and allowing one to pass from one presentation to another based on the customer needs. The presentations of the information will be given in dynamic and interactive mode or in a static way or, finally, only textual for browsers that do not support images and customer scripting. All the presentations will be developed using considerations of usability of the web interfaces. The pages of the content management system, moreover, will be realized trying to obtain the maximum possible compatibility to the guidelines of the W3C as far as the accessibility of the web contents is concerned. The objective is that of obtaining the maximum level of accessibility wherever it is possible, respecting the technical specifications which constitute an evaluable pre-requirement.

B.6 Detailed implementation plan

B.6.1 Introduction

The structure of the plan is divided into 2 main activities: 1) research activity (Work packages 0-6) and 2) management activity (work package 7).

The *research activity* comprises 7 (seven) distinct work packages:

WP0: Definition of the multidimensional analysis approach about Psycho-Socio-Organization factors through interdisciplinary focus groups;

WP1: Design of the data collection process, data collection and analysis;

WP2: Adaptation of an interactive portal for inter-project communications and organization; development of the interfaces to focus groups.

WP3: Theoretical premises to modelling psycho-socio-organization systems;

WP4: Construction and validation of specific models using collected data;

WP5: Dissemination and exploitation; integration with the CMOS system.

WP6: Re-analysis of the field data, comparison with model simulations and fine tuning of the models.

The workpackage distinction is based on the phases described in section B.1 and follows the basic scheme: Design of variables to be measured --> data collection -->

theoretical/analytical/computational treatment and models --> interpretation and fine tuning.

All phases will be conducted in a framework of continuous collaboration in order to permit a bilateral transfer of knowledge among the different communities involved in the project.

The starting point (workpackage WP0) is a focus group aiming to identify the main variables to be measured through the data collection process.

In WP1 we will collect individual and organizational information using both standard and innovative tools.

It must be remarked that the data design and collection process will be the most expensive in terms of human resources, for two main reasons. The first reason is that it requires a hard work for both the design and the realization of the measurement tool, including person to person interviews and the preparation and implementation of the software to collect and analyse the data. The second reason is that the quality of the data collected in this phase is crucial to the success of the project. This work package will be conducted mainly by the institution with the best expertise in this field, i.e. the CSDC group, the CCC group and the SYM group.

In WP2 we will focus our attention to innovative tools for cooperative working environments, analysing the state of the art of such systems before designing and implementing one to be used in our consortium. This task will be performed mainly by the UNIGE and CSDC group.

In WP3 we will focus on theoretical premises for the models, making a review on the state of the art and producing prototypical models for the two case studies. This workpackage is essentially theoretical and will provide also a bidirectional transfer of knowledge among psychologists and hard scientists through cycles of seminars in order to develop a new common language. This task will affect all groups, but in particular the CREA, CACT, UNIGE, CSDC groups.

In WP4 we will focus on the case studies, extending the prototypical models coming from WP3, continuously validating/improving them by comparison with data coming from WP1. This task will concern all groups.

WP5 concerns the dissemination of results, which will be made with all possible methods, including the creation of a web page, the organization of a final Conference, presentations in other conferences, publications in journals, books, and press announcements. This task will be carried mainly by the CCC group.

In WP6 we will carry the critical re-analyses of the ongoing processes, evaluating the predictive power of models and their usefulness as measuring tools. The final goal of this workpackage is

starting the construction of a true “theory” of psycho-socio organization.

The management activity consists of a single management workpackage. This workpackage (WP7) will be lead by the project coordinator and will deal with all aspects described in section B.5 above. The project coordinator will also have the major responsibility of this workpackage, while a small contribution is needed from each partner.

B.6.2 Work Planning

Gantt chart of the project

<i>Months</i>	<i>0 to 6</i>	<i>6 to 12</i>	<i>12 to 18</i>	<i>18 to 24</i>	<i>24 to 30</i>	<i>30 to 36</i>
WP0	■	■				
WP1		■	■	■	■	
WP2	■	■	■	■	■	■
WP3	■	■	■			
WP4		■	■	■	■	■
WP5	■	■	■	■	■	■
WP6				■	■	■
WP7	■	■	■	■	■	■

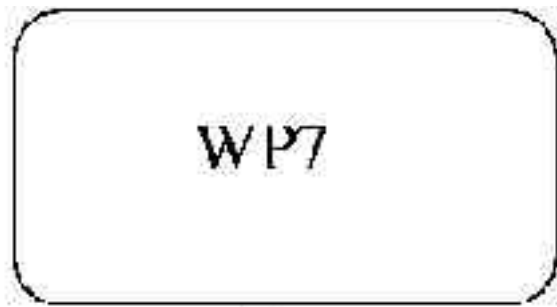
B.6.3 Graphical presentation of the components

Pert diagram of the project

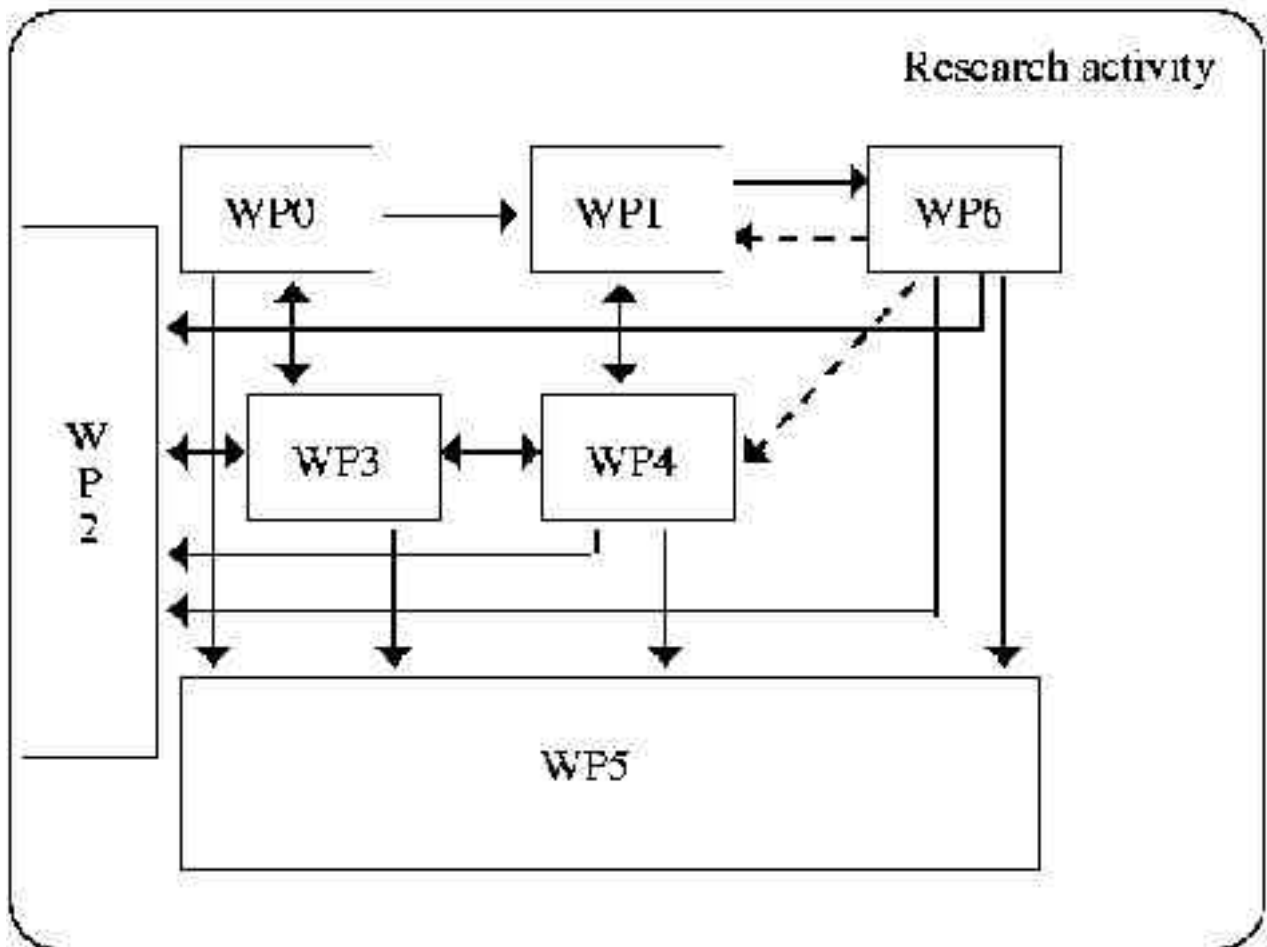
Arrows in continuous line means input-output relationship between blocks.

Arrows in dashed line means a feedback relationship.

Double arrows mean mutual interaction.



Management activity



B.6.4 Workpackage list

Work-package No ⁵	Workpackage title	Lead contractor No ⁶	Person-months ⁷	Start month ⁸	End month ⁹	Deliv-erable No ¹⁰
WP0		7	20	0	9	D2
WP1		2	123	3	30	D5,D8
WP2		8	44	0	36	D3,D9,D15
WP3		4	76	0	18	D6,D10
WP4		9	88	6	36	D16
WP5		5	40	0	36	D1,D13,D17
WP6		3	83	18	36	D18,D19
WP7		1	18	0	36	D4,D7,D11, D12,D14,D20
TOTAL			492			

⁵ Workpackage number: WP 1 – WP n.

⁶ Number of the contractor leading the work in this workpackage.

⁷ The total number of person-months allocated to each workpackage.

⁸ Relative start date for the work in the specific workpackages, month 0 marking the start of the project, and all other start dates being relative to this start date.

⁹ Relative end date, month 0 marking the start of the project, and all ends dates being relative to this start date.

¹⁰ Deliverable number: Number for the deliverable(s)/result(s) mentioned in the workpackage: D1 - Dn.

B.6.5 Deliverables list

Deliverable No	Deliverable title	Delivery date ¹¹	Nature ¹²	Dissemination level ¹³
D1	Implementation of a web site for the project	3	O	PU
D2	Indications on the dimensions to be explored by the data collection process	6	R	CO
D3	A survey on the state of the art of wiki systems	6	R	CO
D4,D7, D12,D14	First, Second, Third and Fourth Periodic Progress Report	6,12, 24,30	R	PU
D5	Report on the qualitative analyses on the focus groups	9	R	CO
D6	Review of the state of the art on modelling individuals, networks and dynamics in psycho-socio-organizational problems	12	R	CO
D8	Preliminary version of the multidimensional battery test	15	R	PU
D9	Release of a draft version of the wiki-based software	18	R	PU
D10	Reports on preliminary models	18	R	PU
D11	Mid Term Assessment Report	18	R	PU
D13	Organization of Conference and Workshops	30	O	PU
D15	Final release of the wiki-based software	36	R	PU
D16	Production of software packages for simulations and predictions	36	R	PU
D17	Dissemination and exploitation activities (publications, press releases)	36	O	PU
D18	Improved models	36	R	PU
D19	Improved data collection tools	36	R	PU
D20	Final report	36	R	PU

¹¹ Month in which the deliverables will be available. Month 0 marking the start of the project, and all delivery dates being relative to this start date.

¹² Nature of the deliverable:

R= Report

O = Other

¹³ Dissemination level:

PU = Public

PP = Restricted to other programme participants (including the Commission Services).

RE = Restricted to a group specified by the consortium (including the Commission Services).

CO = Confidential, only for members of the consortium (including the Commission Services).

B.6.6 Workpackages description

Work package No: 0	Start month: 0	End month: 9								
Work package title: Definition of the Multidimensional Battery approach about Psycho-Economic- Socio-Organization factors through interdisciplinary focus groups										
Participant id	1	2	3	4	5	6	7	8	9	
Person-months per participant:	2	2	2	2	2	2	4	2	2	

Objectives
<ul style="list-style-type: none"> - To create a new common language to tackle psycho-socio-organization phenomena using the framework of small worlds based models. - To develop new social factors forecasting models exploiting interdisciplinary skills. - To define the dimensions to be investigated through the measurement tool

Description of work
We will organize focus groups among us to define the dimensions to be explored by the data collection process.

Deliverables
D2 Indications on the dimensions to be explored by the data collection process (6 months).

Milestones and expected result
<p>An expected result of this workpackage is to encourage the bilateral transfer of knowledge among the communities involved in the project.</p> <p>Another result is the definition of the psycho-economic-socio-organization dimensions to be explored in the data collection process.</p>

Work package No: 1	Start month: 3	End month: 30							
Work package title: Design and implementation of the data collection process, data collection and analysis									
Participant id	1	2	3	4	5	6	7	8	9
Person-months per participant:	6	48	24	-	6	3	36	-	-

Objectives

- To design and implement a multidimensional tool for data collection in organizations
- Software development for the administration of the tool

Description of work

One of the main goals of WP1 is to develop a computer-based psychological analysis tool.

In order to capture *parsimoniously* the dynamic, process-oriented nature of personality, we propose a “Goals analysis approach” to provide a conceptual framework for understanding also the effect of culture on personality.

Psychological assessment is based on traditional and new psychological instruments, implemented via web, complemented with a real-time analyser and simulator able to tune on-the-fly the investigation instruments.

In its **developing** version, the tool is based on three phases.

The *first phase* is a test battery, for profiling the subject under study and to provide the necessary external validation for the new tools.

This step may be performed by several subjects in different moments, or in parallel using a web interface. They will be complemented by other informations, collected in different ways.

These informations are stored in a database.

The *second phase* is the novel one. It is based on the focus group concept, implemented via web using a forum or a chat.

It is meant that many participants act in parallel. Measuring the concordance among the contributions to the forums, based on semantic analysis and time proximity, the system will be able to estimate the distance between the participants in real time, and the degree of clustering among them.

The assumption that the personality and individual characteristics of individuals can be represented

as dynamical systems requires the simultaneous consideration of people's thoughts, feelings, self-esteem, self-efficacy and therefore the heuristics for action. We shall relate the changes of the resulting cognitive-behavioural patterns to internal mechanisms and external forces. We shall test the hypothesis that an attractor for personal dynamics develops through two mechanisms: the synchronization of individuals' internal states in social interaction, and the self-organization of thoughts, feelings and heuristics with respect to a higher-order property (e.g. goal, self-concept). In this way, using cognitive and communication theories, we shall be able to develop/find and analyse appropriate "dialogs arbitrary metrics" to study the eventual attractor that provides cognitive, affective and behavioural stability.

The *third phase* is based on the study of group responses to "problem solving" sessions. In these sessions a selected or self-assembled group of participants is invited to compete for solving a specific neutral task (with respect to their competences) using electronic media. The goal of this phase is to monitor the dynamics of the group and map it into a static connectivity diagram (clustering and distance analysis) and to extract the salient dynamical features (attractors, cycles, frustrations, etc.).

By exploiting the model of an individual developed in other WP, the engine will be able to check the agreement of the measured distance with the one computed by the profiling phase. We are also planning to implement a "stimulating" tool, based on a database of phrases and artificial intelligence, in order to promote the discussion and explore all available "directions". While in this first phase the instrument is intended to work under the supervision of a trained psychologists, it is expected that it can be used in an automatic way for some investigations.

The output of this kind of analysis can be used at individual and community level. On one side, it will permit to test and to adapt the model of an individual. On the other side, it can be used to measure the degree of separation (or the distance) among individuals and the clustering character of community, thus giving informations about the network structure. Finally, since the distance concept that we use have also a time component, it can be used to measure the dynamics of the group. Clearly, all these features (individual, network and dynamics) may interfere in a real community. We shall develop a hierarchical approach based on changing weights for the different optimization phases.

The development of such an instrument will require the participation of all groups, both for the analysis/numerical optimization phase and for checking the methods against simulated communities.

Deliverables

D5 Report on the qualitative analyses of the focus groups (9 months)

D8 Preliminary version of the multidimensional battery test (15 months)

Milestones and expected result

At time 9 months there will be the qualitative report.

An expected result is a further development of the alphabetization process started with the WPO work package.

Work package No: 2	Start month: 0	End month: 36							
Work package title: design and building of a WIKI-type cooperative working space among the project partners.									
Participant id	1	2	3	4	5	6	7	8	9
Person-months per participant:	12	2	2	2	2	2	2	18	2

Objectives

- Adapt a computer environment, based on the wiki model (e.g. www.wikipedia.org) aims at exchanging, in a self-organized way, information among all project participants. The instrument will include other tools like forums, chat rooms, e-mail interfaces and so on.
- Analyse the way information flow settles in the community and how the emerging social network reflects the performance of the system.

Description of work

- 1) Survey of the current wiki-like systems and identification of their success features
- 2) Elaboration of a collaborative software space based on wiki-like technologies
- 3) Distribution and dissemination of the software to the project participants
- 4) Monitoring of the activities and of self-organized information structures within the project, comparison with theoretical models and identification of enabling factors.

The availability of such a tool for the project partners is crucial for the alphabetization process so that each participant will be faced with a self-organized collaboration structure. In addition this way of sharing information will offer a new, more effective way, to share knowledge while the project progresses.

Deliverables

- D3 A survey on the state of the art of wiki systems (month 6)
- D9 Release of a draft version of the wiki-based software (month 18)
- D16 Final release of the wiki-based software (36th month)

Milestones and expected result

- month 6 : surveys done, decision on roadmap to continue
- month 18 : draft versions of software available
- month 36 : final versions available

Work package No: 3	Start month: 0	End month: 18							
Work package title: Theoretical premises to modelling psycho-socio-organization systems									
Participant id	1	2	3	4	5	6	7	8	9
Person-months per participant:	8	8	6	14	8	8	8	8	8

Objectives

- Review of the state of the art of modelling individuals, networks and dynamics in psycho-socio-organization problems
- Transfer of knowledge from psychologists to hard scientists on collection, analyses and interpretation of psycho-socio-organization data
- Transfer of knowledge from hard scientists to psychologists on models of individuals, networks and dynamics
- Elaboration and simulation of first theoretical models of the case studies and comparison with the first available data from WP1

Description of work

A bidirectional transfer of knowledge between the two communities (psychologists and hard scientists) is of fundamental importance for the project. Therefore a cycle of seminars will be prepared and administrated both in presence and using remote collaboration tools. These seminars will be distributed continuously in time in the first months of the project.

In order to produce an interdisciplinary model of the problems in the case studies, we will prepare a review on the state of the art of the models regarding psycho-socio-organization problems, we will distribute it among the participants and discuss it in focus groups.

Finally we will produce and test some preliminary models on the case studies.

Deliverables

D6 Review of the state of the art on modelling individuals, networks and dynamics in psycho-socio-organization problems (month 12)

D10 Reports on preliminary models (month 18)

Milestones and expected result

The expected result is to create a common language between the different communities, and work together on the preparation of the models which will be tested and developed in the other steps of the project.

Work package No: 4	Start month: 6		End month: 36						
Work package title: Construction and validation of specific models using collected data									
Participant id	1	2	3	4	5	6	7	8	9
Person-months per participant:	12	12	6	12	12	6	6	6	16

Objectives

- Design of models suited for the case studies.
- Simulation of the models and production of data in a format compatible with the experimental ones.
- Comparisons between the experimental data and the simulation results.
- Validation of the models through multidisciplinary focus groups.
- adaptive optimization of the models and repetition of previous three steps.
- Elaboration of psychological metaphors for the interpretation of the results of the models.

Description of work

The goals of this work package is that of transforming a model into a measure instrument. For this goal, the CSDC, CACT, UNIGE and CREA group will develop, starting from the preliminary work done in WP2, agent-based models whose results can be compared with experimental data in case studies.

In a first phase, we shall deal with different aspects of the problem.

The CACT group will focus on agent-base modelling based on the meme concept.

The CREA and CSDC group will develop models focused on network robustness and error propagation and individual modelling.

The output of the models will be compared with experimental data in focus groups, composed by an interdisciplinary team.

The second phase is twofold: on one side we shall optimize the relative models using the suggestions of the focus groups and the comparisons with data. On the other side, we shall try to merge the different approaches into a single model, and validate it. One of the validation technique is that of forecasting missing data, which corresponds to using the model to check the consistency of data.

Finally, we shall use the resulting models as predictive tools, both regenerating existing data (consistence check) and comparing the results with available extra data.

One of the goals of this WP is also that of producing easy-to-use software packages, that can be used by the non-hard-scientists partners.

Deliverables

D16 Production of software packages for simulations and predictions (month 36)

Milestones and expected result

We expect to be able to produce at least two tested models for the two case studies.

Work package No: 5	Start month: 0	End month: 36							
Work package title: Dissemination and exploitation									
Participant id	1	2	3	4	5	6	7	8	9
Person-months per participant:	4	4	4	4	8	4	4	4	4

Objectives

Proper dissemination of the generated knowledge beyond the consortium boundaries to reach to the widest number of users at European level.
Communication within the consortium through the project web site.
Overseeing science and society issues related to research activities conducted within the project.
Intellectual property management and industrial liaison.
Promotion of gender equality in the project.
Integration with the CMOS collaborative software.

Description of work

To foster the dialogue with the society a common strategy for the exploitation/dissemination of the results and the protection of intellectual property rights will be agreed by all partners.
An ad hoc Dissemination and Exploitation Committee will be appointed to carry out these activities. The D&E Committee will be made up of experts on IPR issues, appointed among the technology transfer executive officers of the partners and the participation of industrial representatives will be encouraged. It will usually meet via teleconference or e-mail any time when it is necessary to carry out its tasks and it will produce reporting to the Project Coordination Committee every six months, in time for the PCC to include relevant observations into the official reporting to the EC.

Task 1. Public awareness activities and production of dissemination material

The Consortium has already planned to organise but also to take part to a large series of events (congresses, workshops and fairs) connected with the main project items for the disclosing of the project's results beyond its boundaries. During the mentioned events, dissemination material such as brochures, slide presentations, prototypes, will be distributed to reach the widest variety of possible audience, from the general public to the specialised professionals. Moreover the involvement of youngest people is considered particularly critical. Specifically didactic material will be produced to be delivered both at school and at University level.

The dissemination of results will be also carried out via the submission of articles to the most prestigious international scientific journals, web publication and press releases.

Task 2. Project web site implementation

A project Web site will be established and maintained to rapidly exchange information within and outside the project. The web site will collect project news, results, illustrated documentaries and the latest information relevant for the project implementation.

Task 3. Technology transfer activities

The Consortium will keep continuous contacts with DE teams dedicated to the technology transfer activities to face any legal and financial issues of Framework Programme, with particular reference to Intellectual Property Rights, Knowledge management, Consortium Agreement updates.

The project *Consortium Agreement* will manage intellectual property rights issues but also any other question connected with the project implementation such as the internal organisation of the consortium, the allocation and exercise of joint ownership, the management of access rights, the settlement of internal disputes and the management of patents.

Task 4. Gender equality promotion

To facilitate the participation of women to the consortium activities, the Exploitation and Dissemination Committee will directly supervise the gender equality promotion activity and will periodically report to the Project Coordination Committee. Numerous gender dimension initiatives will be implemented by the consortium such as nursery services at each consortium meeting, dedicated workshops on woman's role in the scientific community, staff-exchanges specifically addressed to women.

Task 5. Compatibility with the CMOS system

The models and sampling technique developed during the project will be made compatible and integrated as a plugin with the CMOS content management portal.

Deliverables

D1 Implementation of a Web site for the project (month 3)

D13 Organization of conference and Workshops (month 30)

D17 Dissemination and exploitation activities (publications, press releases) (month 36)

Milestones and expected result

Month 12: Discussion of general issues and strategies for dissemination and order of actions at kick

off meeting

Month 24: follow-up meetings for assessment and evaluation of the development of the project, with focus on dissemination activities

Month 36: foreseen minimum number of publications relative to the project activity and signed by Consortium members on specialised journals and magazines; collection of publications on the web site.

Work package No: 6	Start month: 0	End month: 36							
Work package title: RE-ANALYSES OF FIELD DATA, COMPARISON WITH MODEL SIMULATIONS AND FINE TUNING OF THE MODELS									
Participant id	1	2	3	4	5	6	7	8	9
Person-months per participant:	8	18	12	6	8	3	12	8	8

Objectives

Critical re-analysis of the models in view of the data obtained from the WP1.

Description of work

Focus groups will be organized among the participants in order to critically reanalyse the models and suggest further modifications of the data collection tools.
Fine tuning of the models will be done.

Deliverables

D18 Improved models (month 36)

D19 Improved data collection tools (month 36)

Milestones and expected result

We expect to improve significantly the test models used in WP3 and finally have a validated version of the models for the case studies.

Work package No: 7	Start month: 0		End month: 36						
Work package title: Project management									
Participant id	1	2	3	4	5	6	7	8	9
Person-months per participant:	10	1	1	1	1	1	1	1	1

Objectives

The result expected from WP7 is to manage the project's activities so as to ensure the respect of the time schedule and the quality of the intermediate and final project outcomes. The WP7 supervises the organisation of the project as a whole, co-ordinate the partners' work, interact with the EU Commission and perform all the other activities required for a successful implementation of the project. It will be led by the coordinator, supported by all partners.

Project management will mainly consist in the following activities:

- Provide an efficient plan
- Coordinate the activities of the work packages
- Identify problems early, taken the appropriate actions
- Convene the project Project Coordination Committee
- Manage the project's financing, interfacing each work package to EC
- Progress monitoring.

Description of work

Task 1. Scientific co-ordination

A Project Coordination Committee, made up of all partners' representative and the Workpackage leaders, will be appointed at the beginning of the project to define a strategy for the implementation of the scientific activity and to ensure the technical and scientific monitoring in order to take the appropriate decisions for guiding future developments of the project. Face to face meetings of the Committee will be organised (starting with a kick-off meeting to launch the project) and appropriate communication structures (such as video/telephone conferences, consortium and bi-lateral meetings, Internet communication, etc.) will be designed to facilitate communication among partners. At the kick-off meeting the PCC nominates the Work package leaders that will deal with all technical decisions including the refinement and development of short term research plans and the running monitoring of the technical performance.

The project activities will be monitored in terms of time, cost and quality against the project plans. To this end, periodic progress reports will be submitted to the European Commission every six months and a final report will be drawn up at the end of the project. Periodic and final reports will compare resource usage between expected and actual, providing explanations of differences. At the midterm assessment meeting a critical review of the entire workplan will be performed.

Task 2. Financial administration

Administrative and financial management will be provided with the support of DE administrative staff. Each partner will submit the cost statements and any relevant financial documents to the

European Commission and will provide the coordinator with any relevant contribution in order to keep inter-dependencies under control and to consider possible re-scheduling and reviews. A financial audit at the end of the first year and at the end of the project will be carried out by each partner, in accordance with the EC Financial Rules.

The distribution of the EC contribution among partners and the modalities for the transfer of advance payments will be agreed and detailed in the Consortium Agreement.

Deliverables

D4 First Periodic Progress Report (month 6)

D7 Second Periodic Progress Reports (month 12)

D11 Mid Term Assessment Report (month 18)

D12 Third Periodic Progress Reports (month 24)

D14 Fourth Periodic Progress Reports (month 30)

D20 Final Report (month 36)

CMOS

Milestones and expected result

Month 1: Kick-off meeting

Month 6, 12, 18, 24, 30: follow-up meeting for assessment and evaluation of the development of the project

Month 36: Project conclusion with no major contingency actions open

B.7 Other issues

B.7.1 Ethical issues

Ethical issues checklist

Table A. Proposers are requested to fill in the following table

Does your proposed research raise sensitive ethical questions related to:	YES	NO
Human beings		X
Human biological samples		X
Personal data (whether identified by name or not)		X
Genetic information		X
Animals		X

Table B. Proposers are requested to confirm that the proposed research does not involve:

- Research activity aimed at human cloning for reproductive purposes,
- Research activity intended to modify the genetic heritage of human beings which could make such changes heritable¹⁴
- Research activity intended to create human embryos solely for the purpose of research or for the purpose of stem cell procurement, including by means of somatic cell nuclear transfer.

	YES	NO
Confirmation : the proposed research involves none of the issues listed in Table B	X	

B.7.2 Gender issues

(empty)

B.7.3 Other EC-policy related issues

Only adults persons will be involved in the investigations.

We do not collect or examine in any form sensitive data about health, sexual lifestyle, ethnicity, political opinions, religious or philosophical convictions.

¹⁴ Research relating to cancer treatment of the gonads can be financed