THE UNIVERSITY OF HULL

'FACILITATING SELF-ORGANIZATION IN NON-HIERARCHICAL

COMMUNITIES. A METHODOLOGY FOR REGENERATION PROGRAMS'

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To Amanda, Lu, Popi, Nico, Pin, Nicolas, Andres, Nicole, Yineth & Luis Angel.
I am their historical consequence

Acknowledgements

Abstract

Research purpose: As a by-product in the development of the Quality Management Systems, self-organized working groups were introduced and became a common practice in management. In the last ten years some authors – influenced by the developments in the study of Complex Systems – have re-introduced the self-organization concept as being the future of management. In this approach, the description of the mechanism driving this process has been explored to provide a method to facilitate the emergence of viable organisational structures and to support such organizational behaviour. This topic becomes more relevant in the present times when the community development is more locally oriented and the communities are being empowered to become more autonomous in the definition of the means and results they want to improve their quality of live. It is within this context that in order to facilitate self-organization processes – in a rural community engaged in a independent regeneration program –this research suggest the use of a model inspired in both cybernetics and the self-organization in a biological system.

Methods: This thesis details the development of a three loops framework aimed to facilitate the self-organizing behaviour through the use of a Visualization - Planning - Reflective toolset (V-P Toolset). The framework was deployed within a case study organization (The XOOP) using an interpretivist philosophy of constructionism to guide the research. During its execution the researcher acted as both an observer and participant of the organisational change. Within the context of an action research project, the framework followed a multimethodology design where cybernetic and social tools of organizational analysis such as the Viable System Model (VSM), Narrative and Story-telling analysis and Social Network Analysis (SNA) provided a unique approach to the facilitation of self-organization and the mergence of viable organizational structures.

Results: The VSM and the SNA were used to diagnose the organizational structure. The information provided by these tools was then contextualized

within the Narrative and Story-telling analysis, identifying critical events in the evolution of the organization. This combination of tools provided insights about the self-organizing behaviour of the organization and the mechanism that facilitated (or impeded) the emergence of viable organizational structures throughout the evolution of the observed community.

Conclusions: The introduction of a common language to describe the organization facilitated the endogenous creation of a shared mental model of the community. This representation of the organization made more efficient the exchange of information, the coordination of activities and the autonomous operation of the different working groups. Thus, the iterative loops of the V-P contributed to made this process more efficient and provided evidence about the convenience of the integration of the VSM with the SNA as organizational diagnostic tools.

GLOSSARY

Community: Is a group of interacting individuals sharing a populated environment.

Functional group: A group of people in charge of a particular task.

Homeostasis: Is the property of a system, either open or closed, that regulates its internal environment and tends to maintain a stable, constant condition.

Invariant: Something that does not change under a transformation, such as from one reference frame to another.

Mental model: It is a representation of the surrounding world, the relationships between its various parts and a person's intuitive perception about their own acts and their consequences.

Organization: Is a social arrangement to distribute tasks for a collective goal.

Recursion: Is the process of repeating items in a similar way.

SDWT: The Self-Directed Working Team is a kind of team with autonomy in the decision about what to do (task) and why.

Self-control: A systems ability to control itself, including setting and adjusting its own goals, as well as autonomous adaptation.

Self-organization: Is the process where a structure or pattern appears from the local interaction of the elements that make up a system without a central authority or external element imposing it through planning. This globally coherent pattern appears in a way that is parallel (all the elements act at the same time) and distributed (no element is a coordinator).

Serf-reference: Is the capacity of a system (community) to reflect upon what it does, and deal with aspects such as its identity, values, purpose, goals, and tasks or activities.

Self-steering: Describes the system's capacity to determine internally the path of action or route to follow.

Self-transformation: Refers to the ability of a system to reorganize and restructure itself.

Sensitization: Refers to the process by which a receptor becomes more likely to respond to a stimulus (more efficient). It is an example of non-associative learning in which the progressive amplification of a response follows repeated administrations of a stimulus.

SMWT: The Self-Managed Work Team is a kind of team with autonomy in the decision about how to perform a particular task, but not in the decision about the what to do (task) or why.

SNA: The Social Network Analysis is a methodology used to analyse the properties of social networks.

Task: A Piece of work to be done or undertaken.

Viable: Capable of surviving or living successfully under particular environmental conditions.

VSM: The Viable System Model is a model from organizational cybernetics that suggests which are the minimum and sufficient roles and functions that provide viability to any organization.

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CHAPTER 1

INTRODUCTION

This thesis revolves around the concept of self-organization. This concept is not new, as it can be associated with the work of Ashby (1947), Weiner (1948) and Von Foerster (1960), amongst others, during the early development of cybernetics.

Later, this concept was used in the general systems theory (Von Bertalanffy, 1968), becoming an important tool to explain some of the behaviours existing in many biological systems. However, it was not until the adoption and use of the self-organization in physics in the 70s and 80s – while doing research in the field of complex systems; particularly after the observation of self-organization in thermodynamic open systems by Prigogine (1976) – that this concept was recognized as a genuine topic of research.

Since then, the concept has been widely applied in many different fields – such as Chemistry, Biochemistry, Biology and Computer Sciences – to develop models and explain phenomena such as the formation of crystals (e.g. Whitesides et al, 1991), the folding of proteins (e.g. Muiznieks and Keeley, 2010), herd behaviour (e.g. Bikhchandani et al, 1992), the development and use of cellular automata and the development of artificial intelligence (e.g. Sun and Naveh, 2004), amongst the most general applications.

The cyberneticians applied the concept of self-organization to social systems, developing sociocybernetics as a result. From this branch, the use of networks and connectivity was incorporated into the explanation and eventual manipulation of the self-organizing mechanism in social systems. This was demonstrated by Latane (1996) in the development of his dynamic social impact theory and its further applications, and complemented by Meadows (1999) when describing more effective mechanisms of intervention within social systems.

In general, self-organizing behaviour in communities can be described as the process where a (organizational) structure or pattern of connectivity appears in a system that is without a central authority or any external element imposing its own plans. This pattern or structure is created through the local interactions of the individuals that constitute the system, generating a form of global coherence where the coordination and control of activities are not centralized.

More specifically, the dynamic of communities has been affected by the intervention of official programs where those related with regeneration have been the most extensively promoted. During the history of the development and implementation of these initiatives, the communities have been encouraged to take control and gain in autonomy in the definition and implementation of such projects. As a consequence, they improved the development of decentralized coordination and control, as well as the creation of autonomous and self-managed entities operating in networks (the partnership schemes). Thereby, a challenge was imposed upon the communities and practitioners since they had to cope with the management of these community-based programs promoting non-hierarchical organizations while using standard administrative tools, inspired and designed under the paradigm of centralized planning and top-down coordination and control.

In the last decade, the contrasting nature between the dynamic of development in communities and the use of conventional tools in regeneration programs suggested the necessity to explore and develop new management tools; particularly those oriented towards the incorporation of some of the principles ruling Complex Systems and the self-organizing behaviour.

It is within this context that the motivation for this research was established. As part of an interdisciplinary research program funded by the EPSRC[1], researchers from robotics, biology, physics and social sciences – i.e. business management – gathered and created a common research framework named "Defying the Rules: How Self-regulatory Social Systems Work". Within this framework, a model explaining self-organization and task distribution in ant colonies was developed and imposed as the common platform for each of the

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research participants to ensure that the discoveries would have the potential to be transferable and to facilitate the dialog between the research teams.

The direction of this EPSRC project decided that, since the outcomes of this research should be applicable to the work in social groups, the contribution of the social science (management) research group to this interdisciplinary project should focus on the analysis of self-organizing behaviour in non-hierarchical communities, ideally related with regeneration programs. Following these directives, this work intends to describe how – in the context of a given independent rural regeneration program – the principles of self-organization can be applied to facilitate the emergence of a viable organizational structure, while conserving the autonomous and decentralized nature of that kind of communal initiatives.

The results of the observations from a social science perspective are thus presented in this thesis and unfold in six chapters. This introduction corresponds to the first chapter. Next, chapter two not only describes the evolution of the concept of self-organization, but also the context of the regeneration programs. This exploration identifies trends in these programs, as well as in community engagement. Additionally, it explores the constraints of the existing intervention procedures and exposes the necessity to provide tools that respect and reinforce the autonomy of the recipient communities. Moreover, this review suggests that the concept of a self-organizing management is not new. Following this argumentation, the research questions emerge, pointing out the necessity to connect organizational change with the use of a particular set of self-organizing principles, to provide viability and autonomy to the emerging autonomous organizations.

The third chapter describes the methodological foundations of this research, ending with a description of the selected methodological approach and tools. This exploration of methodologies identified the existence of procedures and tools that facilitate self-organization and highlights the limitations and scope of application of these existing methodologies. This same chapter presents and explains the argument supporting the choice in favour of particular methodologies and tools, where the researcher acts as a participant of the observed system. Triangulation of research methods are chosen, where

qualitative data is privileged as the primary source, whilst quantitative analyses are used to validate the qualitative observations.

The data collection tools include direct observations from action research, interviews, questionnaires and the compilation of documents (e.g. minutes, consultancy reports). The data collected was used to build a case study through the construction of a narrative describing the evolution of the organizational structure of the community and identifying critical events. The strengths and weaknesses of the chosen methodological approach and tools are discussed, with emphasis on the reliability and validity of the research process and outcomes.

Next, chapter four describes the theoretical framework underpinning this research. Along the development of the theoretical framework, the Viable System Model was used to ensure the inclusion of cybernetic principles – in congruence with the background of the concepts of self-organization – and mechanisms of self-organization, to facilitate the emergence of new organizational structures. Additionally, the use of Social Network Analysis was introduced to create a link with the branch of sociocybernetics and to establish a connection with the analytical trends of Complex Adaptive Systems. The chapter ends with a presentation of the analytical protocol used during the intervention and the data analysis stages.

The purpose justifying the integration of these analytical tools was to catalyze the autonomous creation of a shared mental model in the community, recognized by different authors as a core mechanism to facilitate the emergence of self-organizing behaviours and adaptive organizational change.

The structure of this theoretical framework is designed to bring about a repetitive process of organizational self-diagnosis, analysis and implementation of organizational changes, followed by a final stage of critical review, ultimately leading to the establishment of a viable self-organized structure.

The fifth chapter presents the case study and its analysis. The first part corresponds to the compilation and results of the narrative analysis, describing the rural community in Ireland in which the framework and action research protocol was applied under mutual consent. In subsequent parts of the chapter,

the SNA and the VSM offer different – but complementary – analytical approaches to describe the self-organizing principles operating throughout the evolution of the organization, following the steps suggested in the framework.

Finally, the sixth chapter introduces a critical discussion of the methodology and findings of this research. Also suggested are some new topics to explore, in order to increase the understanding of how self-organization occurs in social groups and to propose some complementary topics for future research, derived from the observations made in this study.

The structure of this document is completed through the presentation of the references and finally complemented with the appendices, where supportive material and data are offered to facilitate comprehension and to support the arguments presented in this study.

To summarize, this chapter offered a general overview of the different sections that constitute this work. It also presents a description of the context and constrains that defined the execution of this research. The following chapters present thus in detail the context, the theoretical foundations, the research and methodological approach, and the results derived from this research.

CHAPTER 2

LITERATURE REVIEW

2.1   <u>INTRODUCTION</u>

Regeneration programs were implemented in Britain at the end of the II World War. Since then, modifications have been introduced accompanying the variation in public policies in the last 60 years modifying the orientation, management and participatory mechanisms; providing the communities with more autonomy in the design and execution of such initiatives. Rural regeneration – sharing the same schemes and principles used in urban programs – became a critical issue after the integration of the local economy in the context of the EU, demanding novel approaches and offering opportunities to experiment in new social and urban designs, some of them oriented towards the self-empowerment of individuals and the promotion of autonomous organizations.

The concept of self-organization is discussed in this chapter, from its origins in cybernetics and physics to more focused applications and developments in manufacturing, following the traditional school of management. Where self-organization is recognized as a powerful mechanism to simplify management and release the work potential of teams and communities; some methodologies have been developed to induce such behaviour from both perspectives, the ones that relate to the study of SO in complex systems and those derived form manufacturing and team work analysis. This chapter ends with a presentation of the typology that compares these two traditions, opening up the possibility of integrating these two views of the same phenomena and concluding with a presentation of the aim, objectives and principal questions driving this research

2.2   <u>REGENERATION</u>

A sequence of initiatives can be traced since the Town and Country Planning Act of 1944 and Urban Program in 1968 to the New Deal for Communities, NDC (1998) with different policy orientations in a continuum of discrete phases of evolution, varying from reconstruction (50's), to regeneration (90's) (Roberts & Sykes, 1999). A brief description of the most relevant programs is presented in the Appendix 1.

From the sequence of programs presented in appendix 1, some lessons learned were the understanding of the need to work with and between different reliefs agencies, as well as how to plan a strategy to design locally oriented regeneration programs. This was evident in the implementation of the Area-Based Initiatives (ABIs) and how it was adopted as a role model throughout the evolution of the regeneration programs. On these, the form of non-departmental public bodies has become the principal policy instrument with which the government intervenes to deliver urban regeneration in the UK through the Neighbourhood Regeneration Program (NRP). This – non-departmental public body – scheme is highly embedded in the model of design and operation of programs that followed; as it promotes autonomy, empowering the local bodies in the choice of priority projects and budget administration. The NRP also promotes partnerships to include the community and private sector in the decision making process, participating as investors in the regeneration programs (Diamond & Liddle, 2005).

The recent socio-demographic changes (e.g. local out-migration) suggest the need to encourage those who wish to leave areas of renewal to stay, via improvements in education and health services. Thus, this indicates that the regeneration programs presently focused in "hard" structure development needs; should be reoriented towards the integration of "soft" elements of development (people-based outcomes such education, leisure and health among others), where the active participation of the recipient community in the definition and implementation of these soft components in the regeneration process becomes fundamental. (Beatty et al, 2008).

Critically, it is important to highlight the NRS and NDC as they share many of the same characteristics and foundations of the modern UK regeneration programs (e.g. ABIs), seemingly as an addition of layers of monitoring and delivery procedures to existing systems, introducing and facilitating partnerships schemes between public, private and third sectors. As a consequence of the resulting convoluted network and layers of administrative procedures a major failure emerges, consisting of the excess of generality in the definition of activities and targets amongst these different regeneration programs. In addition, the increasingly bureaucratic procedures coexisting with poor definitions of the internal rules used to evaluate the bids[1] – despite the existence of case-specific public terms of reference – made this scheme untrustworthy and difficult to understand by the communities (Kearns & Turok, 2000).

These initiatives (NRC & NDC) are iconic in the regeneration initiatives, due to incorporated inter-agency working schemes whichschemes that are dependent upon the capacity of the existing local state agencies and local communities to ensure that change is maintained. Both indicate that is necessary to create conditions for effective collaboration between welfare agencies to develop local neighbourhood responses and increase the participation of the communities in the decision-making processes; meaning that a new level of administrative complexity management must be developed to face such new, dynamic inter-agency and community relations. From there, a new discussion on the skills and knowledge needed by the practitioners emerges (Newman, 2001).

Related to the partnerships mechanism, since the aggressive introduction of the partnership scheme in the 80's a serious situation has become evident where the communities viewed most of these partnerships with suspicion. The autonomy and enterprise driven profile that literally bypassed the government and community participation and control has generated discomfort; and there exists the perception that the partnerships are cosmetic arrangements with local actors displaying those associations which they think the government wishes to see. (Beswick & Tsenkova, 2001).

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[1]   The application for funds is done through a public bidding process. The bids must comply with some technical requirements such as format and composition of the applicants – typically favoring partnerships that include community and third sector participants.

An additional negative characteristic of the partnerships scheme is a consequence of the competitive system to locate and evaluate the bids. It generates fragmentation of power, inequity and exclusion; constraining community participation in the decision-making process, and discouraging/disempowering the losers of the bidding process to participate and get involved in further regeneration initiatives (Kearns & Turok, 2000).

Consequently, the planning procedure for regeneration programs has recently been understood as a complex phenomenon where the (traditional) planning approach proves itself to be unable to integrate the different factors and processes involved. Particularly the dimension and multiplicity of problems related to the intentions initially defined to orientate the transformation process and its dynamic change (evolution) as the regeneration programs are implemented (Breda-Vazquez, 2004). Other applications of complexity demonstrate that the planning process in regeneration initiatives under the new policies of participatory design and locally based initiatives, present emergent properties as mechanisms of adaptation and evolution; suggesting that if the decision making process in regeneration can be described as a self-organizing process, a new perspective for intervention without violating the nature of such process should be embraced as an important analytical tool for future regeneration programs (Moobela, 2005).

Further developments in view of regeneration programs as complex phenomena, indicate that to obtain full engagement of local stakeholders in the decision-making process and management practice; more locally integrated, inclusive and holistic state regeneration policies and practices should be created. In this context, some elements from the Complexity theory should be considered in the development of new intervention schemes, such as regulated autonomy and complex ethics as well as the introduction of communicational schemes (Shine, 2006). In this sense, Osborne et al (2002), and Tsenkova (2001) suggest that improvements in the bottom up approach of the regeneration process should be done, giving more autonomy and control to the intervened communities, and providing them with more efficient tools of (self) organization with the capacity to deal with the organizational and technical aspects of the implementation of such programs.

The roots of this approach can be traced to the work of Axelrod and Cohen (1999), when suggesting that these particular characteristics of self-organizing regeneration schemes are not new. They indicate that empirical evidence of successful relations (amongst individuals and individuals and institutions) share a similar pattern of interaction in the construction of social capital (civics), facilitating coordination and cooperation. They present as the foundations of such self-organizing mechanisms the principles of proximity and activation; describing the factors determining how agents come to interact, and the factors determining the sequence of their activity, respectively.

From the understanding of the relevance of the concept of sustainability, a new initiative was put in place in the UK in 2003 under the title: *Sustainable Communities Plan. Sustainable Communities: Building for the Future* (Office of the Deputy Prime Minister, 2003)*.* This initiative puts emphasis on the development of both urban and rural areas through the Regional Sustainable Development Frameworks, which are participative mechanisms where Regional Chambers, Government Offices, Regional Development Agencies, business, local authorities, charities and voluntary groups participate in the definition of objectives and priorities for sustainable development. It provides guidance as to how to involve local communities in more active ways, as a set of parameters to measure sustainability locally.

In concordance with this official framework, from the paradigm of the Complex Systems conceptual developments were presented, proposing tools and guidelines to foster the self-empowerment of individuals and the self-directed sustainable development of communities. Some of these proposals suggest the use of Evolutionary Systems Design and Social Systems Design to drive the transition towards sustainable communities – basically suggesting open end designs able to change and adapt according to the surrounding circumstances (Laszlo, 2004); and to foster the idea of embodied systems, acceptance of uncertainty, the recognition of the failure of control paradigms and the necessity of reflexive processes (based in the theory of Complex Adaptive Systems) to generate co-evolutionary governance in social systems (Rotmans et al, 2005).

2.2.1 Rural Regeneration

An appreciable change in the dynamic of rural areas began to be noticeable in 1999 – 2000, with the addition of many countries to the European Union, accompanied by dramatic changes in rural activity in the west, north west, south west and midland regions of the UK and in Ireland, where the number of tenants of farms with less than 20 hectares fell by 37% and the number of specialist dairy farms decreased by 38% demanding a complete reorientation of rural development policies (O'Connor et al, 2006).

Ireland, with an economy linked to rural activity was more sensible to these changes in the rural economy. To cope with this new dynamic the partnerships scheme was introduced through the LEADER and LEADER+ programs (2000-2006). The emergence of the "Celtic Tiger"[2] from 1993 stimulated off-farm employment and its consequent out-migration, creating the necessity for a complementary set of subsidies under the Rural Environment Protection Scheme – REPS - (1994) to maintain the profitability of the already deteriorated rural activity. A second partnership scheme was launched in 2000 as part of the 2000-2006 Rural Development Plan and a third Scheme was released in 2004 ending a sequence of official programs aimed to subsidize and try to increase the production in usable lands via diversification of activities.

The outcome of this policy was the inclusion of a wide range of activities classified as rural and therefore able to receive subsidies. Among these new activities are the farmhouse bed and breakfast, sport horse breeding, farm campsites, equestrian centres and golf.

In this context of diversification of rural activity, the National Spatial Strategy was launched in 2002 aimed to rebalance economic development and reduce pressure on the east coast. This was done by promoting small towns and villages as development hubs depending on their capacity to accommodate employment, residential and other functions in an attempt to provide a framework to stimulate in-migration to these areas in decline. The collateral effect arising from the introduction of this strategy was a change in the housing

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[2]   Celtic Tiger is a colloquial term that refers to the economical growth in Ireland starting in 1993 and decaying abruptly in 2007 – 2008.

and settlement local policies, eroding – in most of the cases – the planning controls for housing in the countryside (Matthews, 2002).

Parallel to the implementation of these schemes, extension services played an important role in the inclusion of the third sector – local development organizations and community groups in the management of rural areas. An example of this was the "Rural Viability" service implemented in 2001 that facilitated the participation of non-governmental organizations and community representatives on the boards of regional bureaus and facilitated the operation of independent initiatives.

Despite efforts to include the community in the definition of projects in the rural regeneration initiatives – as with the urban-based regeneration programs – these initiatives are still top-down driven and operated by complicated networks of delivery agencies. Compared with the urban programs, rural regeneration presents just three characteristics: 1) the influence of local geography upon community involvement, 2) the influence of local demography upon human capital available and 3) the strength of community identity in isolated areas that can favour – in some cases – or militate against learning from, or working with other communities (Osborne et al, 2002).

2.2.2 Independent Initiatives

These initiatives emerged in response to the need to incorporate a systemic approach to regeneration programs and to encourage the self-empowerment of individuals acting locally towards the creation of sustainable communities, aside and beyond the intricate network of delivery agencies and the (imposed) dependence on practitioners. The most successful and recent of these independent actions has its foundations in the theory of management of peak oil and was created to facilitate the transition to a less oil dependent society. In this context the aim of the Transition Town initiative (mainly oriented to be implemented in existing urban settlements) is to facilitate the creation of autonomous transitive solutions without dependence on the authorities and the official initiatives. To do so, the Transition Town Network was set up in Spring 2007 as a charity to inspire, encourage, network, support and train communities

"as they consider, adopt, adapt and implement the transition model in order to establish a Transition Initiative in their locale. The transition model emboldens communities to look peak oil and climate change squarely in the eye and unleash the collective genius of their own people to find the answers to this big question". (Transition Network: Tackling Peak Oil and Climate Change, Together. 2008).

To facilitate change in the community, the Transition Towns Initiative have created a wide range of materials, training courses, tools and techniques that are oriented towards providing information to the community, generate awareness and create the conditions to allow the community to self-organize around the autonomous definition of what is needed to be done, to adapt and face the desirable and affordable changes to reduce its carbon footprint and become more sustainable. In the final stages, formal contact with the official sector is suggested once the plan of changes have been identified and agreed by the community.

Another independent initiative is the Ecovillage. In general, Ecovillages are intentional communities with tightly-knit social structures governed through inclusive decision-making processes – with extended use of consensual decision-making procedures, united by common ecological, social and/or spiritual values. Frequently associated with rural independent regeneration projects, Ecovillages are experimental development models created by new incomings inserted into the region (ideally) following the scheme of in-migration to depleted rural areas   (Newton et al, 2008; Irrgang, 2005). Settled in 1972, Findhorn Ecovillage in Scotland is the more iconic expression of a sustainable life-style in the UK. Working with the simple principle of not taking more away from the Earth than one gives back; Ecovillages are consciously diminishing their ecological footprint as demonstrated by the Findhorn project with half the UK National footprint average, as a mechanism to generate long term viability (The Findhorn Ecovillage, 2008).

2.2.3 The Administrative – Managerial Tools for Regeneration

Due to an increasing recognition and participation of the communities in the regeneration initiatives, different areas of management as well as skills and abilities must be considered when working with them. Ahmed et al (2006), indicate that the community must develop some specific abilities in three evolutionary stages namely: emerging, developing, maturing and well functioning. These abilities are related to functional areas: a Financial System that includes accounting, budgeting, financial review (external audit) financial resource base and salaries; External Relationship dealing with external stakeholder relationships and public relations; and Structure and Management determining the mission, legal base, internal stakeholder relationships, board or management committee, management style, human resources (staff and volunteers), work organization, team development, conflict resolution, administration and diversity, among other variables related to the organizational architecture of the regeneration practitioner staff and the structure and organization of the intervened communities.

Ahmed et-al also identify a set of tools for capacity building; some of them of general use in project management and strategic planning such as Brainstorming, SWOT, Mind Mapping, PEST, Portfolio Analysis, STAR Model[3], SMART method[4], MBO and Gap Analysis, amongst others. Additionally, they recognize a number of tools developed specifically to support programs or activities where communities and/or communitarian work are involved. Among them are the Capacity Builders (National Agency to Address Capacity Building) which is a scheme advising on the development of social projects; and the Community Development Foundation 2004 which is an audit scheme of the community programs and an approach to the measurement of communitarian work –including reports and official documents.

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[3] The Star model: Kates and Galbraith (2007). These authors suggest the use of superimposed matrices to design an organization, taking account of several components and variables such as 1) Strategy, 2) Structure, 3) People, 4) Rewards and, 5) Process. The wise use of these design elements provides policies that a manager can control to affect employee behavior, influencing performance and (organizational) culture, by acting through the designed policies that affect behavior.
[4] The MBO principles are: a) Cascading of organizational goals and objectives, b) specific objectives for each member, c) participative decision-making, d) explicit time period and e) performance evaluation and feedback. These are complemented by the checking of validity of objectives (SMART) which states that the objectives should be: 1) Specific, 2) Measurable, 3) Achievable, 4) Realistic and, 5) Time-related. (Drucker, 1954)

More ambitious in terms of management and control of the administration process of social/communitarian projects are the evaluation/development tools and toolsets coming from the application of complexity principles. A description of the main attributes of the most relevant tools is listed in Appendix 2.

2.2.4 Current Problems

Several problems have been identified and reported by different authors. General problems are related to the attitude of the practitioners; but the most dramatic complications are referred to the structure of the different programs and methodologies adopted throughout the history of the regeneration initiatives and the real participation of the communities in the regeneration process as well.

Some of the difficulties related with the practitioners are resistance from welfare and social workers; and lack of analysis of power (Diamond and Liddle, 2005). These complications have their roots in the development of decentralized strategies and empowerment of communities which diminished the dominant role of the practitioners, and/or; the adoption of new managerial approaches that differed from the current adopted administrative practices. The relations of power between the communities now empowered of their regeneration programs and processes, and the public administration, is seen as independent and autonomous from the local government, far away from the local political dynamics and then not valuable as target to local political management.

Related to these reported failures present in the regeneration programs, is the recognition of the complicated environment that affects the practitioner who has to work in inherently complex relationships of authority. Newman (2001) recognizes (contradictory) elements of the complexity related with the administration and implementation of regeneration programs that affect the practitioner e.g. The short term output demands, measurability (tangible) of intervention processes and practitioner management, high competition, time limited funding, and the need to move from rationalist-positivist ethos to competence based models and the managerialization of welfare practice. Policymakers and managers have often been found to fail to distinguish

between capacity and skills among regeneration workers, as an undesirable result of the Government's modernization agenda.

When considering the internal dynamics of regeneration programs, other concerns emerge including: relations between professionals and local activists who operate in anti-democratic ways (the 'ugly citizen'); competition between local community groups; and the need for an adequate concept of the public service ethos (Mayo et al, 2007); added to the inflexibilities of mainline service provision, where two distinct local discourses of participation exist (official and communitarian) and these are locked in a destructive conflict for dominance. (Dargan, 2002); probably induced since the beginning of the regeneration initiative whenever the NDC approach reflects the priorities and assumptions of what is possible (and desirable) in neighbourhood regeneration involving the identification by external agencies of a specific physical area within which a number of initiatives will be located. The classification of neighbourhood by external welfare and professional agencies is a process in which local actors (tenants and/or residents) are included only after the event, opening the door to a third problem: the lack of community participation (Diamond and Liddle, 2005).

At organizational level, Osborne, S. et al (2002), indicate that regeneration programs occur in the form of interorganizational networks, and this puts in the hands of the partnerships managers, the future and development of the regeneration initiatives, where incredible transaction costs emerge in terms of time and resource commitment. Many of these interorganizational networks and partnerships show a lack of community involvement in the strategic levels of funding and policy making with community members not having the skills or structural support to do so. It is clear that the strategic planning arena needs linking to community levels.

Taylor et al (2002), indicate that an effective regeneration program needs to be implemented and operated through local networks, and these networks need to respond to the broadening range of players involved – moving beyond local authority staff – to encompass residents and other professionals and agencies

across regional programs. These networks must also be capable of including partnerships involved in regeneration and social inclusion where networking can fulfil a vital role in facilitating exchange on domain issues.

Additionally, networks need to expand beyond their current membership of senior program managers, to engage a wider audience of participants whenever the wider and diverse connectivity seems to be a key factor to the success of the implementation and operation of regeneration programs (Moobela, 2003) and the empowerment, autonomy and self steering of local organizations to increase the rate of survival of the regeneration initiatives (Prahalad, 2005).

After more than three decades in the execution of the regeneration programs in the UK, several management tools were adapted and developed to fit the specialized demands of the practice of communitarian development. Some of them are merely replicas of current administrative tools; some others are special adaptations of existent administrative tools, guides and toolkits, and a few more, are sophisticated toolsets closely related to the recognition and application of the systems and complexity theories where their functional principles are applied in regeneration programs.

2.3 **SELF-ORGANIZATION**

2.3.1 Development of the concept

The self-organization (SO) concept impacted management since its introduction in this field by Ashby (1947, 1961). Since then, two main variants in the application of this concept can be identified: one closely related to the development of cybernetics – and organizational cybernetics – systems thinking, Complexity theory and more recently with the theory of Complex Adaptive Systems. The other, associated with the organizational revolution in manufacturing processes introduced through the emphasis on autonomous team works, is closely related to the increasing popularity and success of quality management systems.

The branch related with manufacturing processes and quality was based upon the socio-technical work design theory emphasizing the autonomy and organizational independence of the work units (Trist & Bamforth, 1951; Herbst 1962). These work units are supposed to internally self-regulate their work tasks internally without supervision once decoupled from the centralized systems of monitoring and control and exercise its self-regulation based upon the expertise of multi-skilled team members who deploy – self-organize – themselves depending on the requirements of the ongoing group task (Cherns, 1979; Emery, 1972).

The successful application of autonomous groups worldwide during the 60s and 70s resulted in the generation of many different approaches and descriptions of the autonomous group concept due to the differences in the environment of application (e.g. interdependences between manufacturing operations, flow systems). In consequence, differences in the terminology used reflect differences in the approach to the definition of autonomy and self-organization.

Examples of this variety of approaches – and the terminology used – can be found in the work of Davis and Wacker (1987) who treated autonomy and self-organization as an uni-dimensional attribute based upon the extent of group decision making over a series of task work attributes (e.g. group goals, work methods, task assignment, process technologies, work hours, member discipline, group and member leadership, team membership, internal information flows and job design decisions) as criterion for the identification of – what they called – self-maintaining teams.

From an opposite perspective understanding autonomy and self-organization as a multi-dimensional property Susman (1976) offers a typology of autonomy (and autonomous groups) based upon the extent of group decision-making. He presents three different levels where self-regulation occurs, these are:

- Self-regulation of the work system within the group
- Self-determination of the work unit within the enterprise and,
- Self-management of the group within the hierarchy of the enterprise.

Hackman (1986) adopted a different approach analyzing the group decision-making regarding work performance, the monitoring and management of production processes, design of the group itself and leadership of the group. From his study, a set of indicators and a new classification of teams were generated describing the groups as manager-led, self-managing, self-designing and self-governing, respectively.

In general, despite the different ways in which autonomous groups have been defined, two main drivers are identifiable to describe the autonomous group design these being: internal self-regulation of the group and autonomous self-control of the work task.

The use of the paradigm of empowerment offers a different perspective to talk about self-regulation and SO in groups. From this approach, Cooney (2004) describes how the term self-management can take two different positions on the question of operational independence of the group. The first one aligned with the concept of autonomy (described in the previous paragraphs) with its focus on how the group and group members self-regulate work tasks. The second one, centred on the concept of empowerment to discuss the way the team and team members interpret and self-manage their work role and structural integration within an organization.

On the exploration of the structural integration of self-managed work teams (SMWT), Manz and Sims (1987, 1993) indicate that – with regard to how external power relations affect the capacity for self-management of teams – SMWT has limitations since the employee can influence how things are done but they can not decide what things are done or why. This circumstance leads these authors to suggest a new interpretation under the name of self-leading teams; conceptualizing self-management and autonomy not as a decision-making attribute, but as a motivational property. In this new approach the team is defined in terms of its potential to motivate team members by developing a positive orientation to their work role. Therefore, these authors make a distinction between groups exhibiting self-regulation of work processes, groups

doing self-management of the individual behaviour of the team members and self-leadership of members' participation within the broader enterprise.

As a continuation of the study on empowerment as a reference to describe the autonomous and self-organizing behaviour of groups, Wellins et al (1991, 1994) add that when members take over many of the operational responsibilities previously in hands of manager and supervisors (e.g. decide what to do and why); and when these functions are officially delegated to the teams the group is said to be an empowered natural self-directed work team (SDWT).

Since the introduction of self-organized teams in the 60s, several works have been done monitoring the performance and acceptance of this practice in the field. Some reports indicate that in 1990 forty-seven percent of the Fortune 1000 companies used the SMWT (Cohen, 1994) and at the end of the twentieth century Lawler & Finegold (2000) reported that three out four of the Fortune 1000 companies and eighty-seven percent of the manufacturing industries of this list were using SDWT.

More recently, the exploration of the mechanisms as to how SDWT-SMWT works has produced an extensive literature mainly from psychological analysis– at group and individual level – of this phenomenon highlighting the importance of leadership and its implications in teams and organizations. Among the most relevant documents from this line of analysis is the study produced by Druskat & Pescosolido (2002) describing the shared mental models and how decisive they are in the configuration and groups' self-regulation. The outcome of this exploration is a set of different tools to guide on how to assemble and provide direction to SDWT-SMWT (e.g. the four functions & eleven behaviours described by Druskat & Wheeler, 2004).

With regard to the limitations in the use of SDWT and SMWT, Cooney (2004) states that these methods ate not recommended in environments where highly standardized task performance is expected, in which case, traditional methods of hierarchical planning and control seems to be more effective.

The second branch of study of SO – related with the study of complex systems and the development of cybernetics – was more oriented to the exploration of the principles ruling this phenomenon in physical and biological systems. This exploration begun with Poincare (1899), when he introduced the notion of Complex Systems whilst working on equations to predict the trajectory of planets (the three body problem). He demonstrated that it is mathematically impossible to find an exact solution even for a simple deterministic system containing three elements interacting in a non-linear fashion. His discovery broke ground in the further development of chaos theory and the non-linear systems as explained by Pavard & Dugdale (2006).

Later in the exploration of complexity, Weaver (1948) offered a distinction between disorganized and organized complexity, defining disorganized complexity as one resulting from a system having a very large number of parts with generally random interactions, whose properties can be described using probability and statistical methods. He describes organized complexity as a situation associated with non-random/correlated interactions between parts – not necessarily a large number – that, when interacting with each other manifest system properties not present or dictated by the individual parts (e.g. emergence, SO).

Within this context, the concepts of order and SO were revisited by the pioneers of cybernetics as a matter of the academic discussion and introduced as a valid field of research by itself. Following this line of development Ashby (1947) explained SO as a system that changes its own organization, rather than being modified by an external entity. He explains that this change can be recognized in two different forms of order: one, is the increasing connectivity defined as a transition from separated agents to interconnected agents with the correspondent variation in the perception of order from one external observer (since then, SO is presented as a perception of the observer who is the one that determines what and what is not order). The other form of identifiable order is the separation between two categories of organizations, the bad and the good, being the bad ones those that are not efficient, and good ones described as those that operate efficiently.

From this simple definition, the concept of SO became familiar and extensively used in the development of cybernetics, generating new conceptual developments as the one provided by von Foerster (1960), who introduced the concept of "order from noise" and the use of thermodynamics to describe SO when explaining that paradoxically, the larger the perturbations (noise) that affect a system, the more quickly it will end in an attractor (eigenvalue/eigenbehaviour)[5]. Later, Beer (1966,1979) explained the nature of complex systems and the mechanisms to be used in order to provide control through the understanding of the dynamic of communications and control and the probabilistic behaviour in such "unpredictable" systems via the introduction of (self) regulatory mechanisms to induce homeostasis[6].

Beer also provided a novel approach to the understanding of the dynamics of complex systems; he says that order is an intrinsic property of the universe in which perceptible variations occur in the transition order-chaos-order (and not the usual at that times chaos -order -chaos). He goes on to state that it

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[5]   The prefix "eigen" is itself a German word which means "proper" or "characteristic. An eigenvalue is a number that is derived from a square matrix. A square matrix is itself just a collection of n rows of n numbers. An eigenvalue is usually represented by the Greek letter lamdba (λ). Let A be a square matrix (a collections of n rows of n numbers which means that there are n x n numbers in total). Let x be a nonzero vector. A vector is just a column of numbers. A nonzero vector is any vector where not all the numbers are 0. By convention, a vector that consists entirely of 0's is called the 0 vector.
We say that a number is the eigenvalue for this square matrix if and only if there exists a nonzero vector x such that $Ax = \lambda x$ where: **A** is the square matrix; **x** is the nonzero vector; **λ** is a nonzero value.
In this circumstance, λ is the eigenvalue and x is the eigenvector.
Rocha (1996) explains that the term eigenvalue/eigenvehaviour was used by von Foester to describe the existence of solutions for an indefinite recursive equation based on Jean Piaget's recursive structure of implications describing an observer's account of an interaction between a subject and an object. This equation basically asserts that what is observed at one particular time (obs_t) is the result of a cognitive/sensory-motor operation (*COORD*) on the previous instance of observation (obs_{t-1}): $obs_t = COORD(obs_{t-1})$ The particularity of this expression is that it is recursive and without any particular starting point, or initial conditions. Thus, any specific instance of observation will still be the result of an indefinite succession of cognitive operations. The "solutions" (*Oi*) to this equation which maintain their structure (or operation, or function) when cognitive/sensory-motor operations are on them performed, again and again, as the equation pursues its indefinite recursive chain: $Oi = obst = COORD(COORD(....COORD(obst-n= Oi))...)$ In other words, for a long succession of cognitive operations, the structure of *obst* does not change (frame of stability); when this happens, *obst* is called an *eigenvalue* and represented by *Oi*. *Eigenbehaviour* is thus used to define the behaviour of autonomous, cognitive systems, which through the closure of the sensory-motor interactions in their nervous systems give rise to perceptual regularities as objects.
[6]   Beer defined homeostasis as the balance or condition of equilibrium needed between the amount and diversity of information generated by a system and the amount and diversity of information that can be assimilated by the manager of that system. In general, the system will produce a high volume of diverse information and the manager must be able to cope with such amount and diversity (filter and catch the pieces that are relevant for the well functioning of the system). Also as the manager does not produce much information (in terms of quantity and diversity), he must have a mechanism to amplify his output when transferring information to the system and maintain the condition of balance.

demands just a few mechanisms of control and not much energy to generate order–stability in a system. Beer, therefore, opens up a new perspective in the study of the dynamics of complex systems and the exploration of control of complexity. This understanding is synthesized in a very elegant way when affirming that systems tend to their most probable state, meaning that at the edge of chaos, the systems will tend to the closer configuration of order. He also describes order as dependant on the nature of the system, the surrounding environment and the observer's relative perspective.

From biology, in the 60s the concept of SO was explored and used in the development of the General Systems Theory (Bertalanffy, 1962) who adds to Ashby's definition the idea of progressive differentiation, indicating that SO is more than a change in connectivity and purpose (bad-good organization). SO implies a more sophisticated relationship as it is the existence of increasing complexity in terms of information and/or diversity in the system, which is noticeable by the identification of differentiated-specialized agents. Further conceptual developments to explore/explain SO in biological systems were developed adding – in the understanding of this phenomena – principles coming from cybernetics (Varela 1984), population dynamics and dynamic systems (May, 1979) and Complex Adaptive Systems (e.g. Arcaute et-al 2008), as will be explained in subsequent sections of this chapter.

It was in the 70s whilst physicists and chemists studying phase transitions and other phenomena of spontaneous order in particles that SO was recognized as a genuine research field in physics due (mainly) to the work of Prigogine. Prigogine (1976) explained that SO in open systems occurs from a state far from equilibrium, providing evidence of the failure of the second law of thermodynamics when applied to open systems, and also showing how these systems tend to equilibrium through dissipative structures. From his work, terms such as dissipative structures and attractors become frequently used to explain the behaviour of self-organizing systems.

Later, Haken (1977) introduced the concept of synergetics from his experiments with light amplification by stimulated emission of radiation (LASER) and the

dynamic of fluids; indicating that SO may be explained by the existence of an order parameter or "slaving principle" and when it appears as the result of the cooperative interaction of the elements of the system at microscopic level, dramatic modifications may be observed – at macroscopic level – in the system through an expression of the slave principle (dominant behaviour – eigenbehaviour). The consequence is an important reduction in the degrees of freedom (disorder) that macroscopically reveal an increase of order (pattern formation). It is an important conceptual development as this particular concept has a further development in the induction of SO in social groups (see section 2.3.2)

Later in the 80s, more sophisticated and powerful computational capacity became available. This new capacity for data analysis catalyzed the development of the mathematics of non-linear dynamics, statistical mechanics, statistical physics, and chaos. The development of new sets of experiments applying these analytical capacities, tools for modelling and simulation allowed a detailed exploration of SO in complex systems. These experiments and models were mostly quantitative and mathematically formulated (e.g. diffused-limited aggregation in the formation of chemical crystals. Sander, 1981), being the most representative of this line or experimentation the Self-Organization Critically (SOC) (Bak, Tnag & Wiesenfeld, 1987, Christensen & Moloney 2005), widely applied to model natural phenomena and described as a property of dynamical systems which have a critical point as an attractor.

The most popular metaphorical explanation of SOC is the sand pile experiment on which new sand grains were being slowly sprinkled onto a sand pile to cause "avalanches" where the grain of sand that generates the avalanche is unpredictable; this refers to the introduction of the critical point phenomena, and demonstrates that complexity can emerge in a robust manner from simple interactions not dependent on finely tuned details of the system. This suggests that the emergence of complexity from simple local interactions could be spontaneous, and therefore, plausible as a source of natural complexity rather than something created in laboratories under controlled and finely tuned variables.

Simultaneously, Varela (1984) presented his explanation of principles of SO in natural systems with the inclusion of cybernetic considerations. These principles are:

1) Every operational closed system[7] has eigenbehaviours;
2) Every operational closed system changes by natural drift.

In his work, he explored the internal closure of autonomous systems and states that there are no self-organizing systems, but self-organizing behaviours are deployed by systems – characterized as network-like – that produces a landscape of internal coherences to maintain their identity while assimilating external-environmental inputs. In other words, the system maintains its organization and identity by modifying its structure to cope with the external changing conditions in a way that is dictated by the system's closure and corresponding eigenbehaviours. As long as systems (network-like) can adopt many different configurations (changing their structure) to preserve its identity, the choice of a particular configuration is determined by the interaction with the environment (natural drift). In this model, the author doesn't explain the rules for structural change (new network configuration).

Subsequently, the notion of "Complex Adaptive Systems" (CAS) appeared (Waldrop, 1992) being associated with the Santa Fe Institute for the Sciences of Complexity, building on the work of the pioneers John Holland (1995), Stuart Kauffman (1993), and Robert Axelrod (Axelrod & Cohen, 1999), among others; differing form chaos and complexity because its more holistic point of view and emphasis in self-organization and learning – path dependence – as their main

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[7]   Varela (1984) explains operational closure as "a class of organization". In fact, every system, once distinguished according to certain criterion – given by an observer – has two complementary aspects: its organization, which are the necessary relations, that define a system, and its structure, which is the relationship/linkages between the components, which integrate the systems as such. Thus, an organization is invariant while a system maintains its identity without disintegration; structures can vary to satisfy organizational constrains. In consequence, some autonomous systems exhibit an internal determination or self-assertion, and to describe such systems the main guidance is not a set of inputs but the nature of their internal coherences/internal regularities (eigenbehaviours), which arise out of their interconnectedness. Hence the term operational closure. The main consequence of it is that (environmental) inputs become a perturbation (noise) if they are no longer necessary to specify the system's organization.

properties (Dooley, 1997). This approach was initially highly quantitative, based in the use of extensive computer simulations and predominantly inspired by biology and social systems (e.g. ants, termites, bees, predator-prey models) rather than physics and chemistry. Examples of these applications are the description of the SO of bees (Schmickl & Chailsheim, 2008), or models for the design and control of traffic lights (Gershenson, 2007).

It is from this – CAS – approach that the description of SO as a 'fitness landscape' is re-introduced by Kauffman (1993), when arguing that the complexity of biological systems and organisms may result for far from equilibrium self-organization and from Darwin's natural selection theory. In essence, he explored autocatalytic sets, gene regulatory networks in developmental biology and fitness landscapes in evolutionary biology.

Kauffman (1993) finally suggested a general description of the self-organization phenomena in the form of an N-K Model: N being the number of agents (genes in his original proposal) and K the number of inputs (connection degree). The dynamic relation between N-K produces a set of cyclic values (attractors) that typically respond to a relation of $N^{1/2}$ when $K \sim 2$, typifying what he calls a behaviour at the edge of chaos, where the system ensures both necessary stability (the sensibility to small disturbances is small) and potential for progressive evolutionary improvements. He describes these characteristics as the background conditions for an evolution of genetic cybernetic systems, becoming the foundation for the development of further simulations of artificial life.

Later, Holland (1994) continuing with the use of multiple agent systems and cellular automata (specialized software and methodologies to model the behaviour of interacting agents) introduced what he considered the seven elements of self-organizing behaviour. These are four properties and three mechanisms being:

- Properties

- Aggregation: A collection of – self-organizing – entities whose behaviour in conjunction differs of their behaviour individually. Here behaviour is an emergent consequence of the ever-changing interactions of the forming group.

- Non-linearity: This refers to the property of systems when small, incremental changes can invoke sudden, unexpected threshold changes, making the system unpredictable.

- Flows: Are webs or networks of interactions. The flows – through these connections – vary over time, and nodes and connections can appear or disappear as the agents adapt (or fail to adapt) to the changing environment.

- Diversity: Is a measure of the system variety. The greater the number of agents and interactions, the greater the diversity. Diversity is an antidote to the nonlinearity; the diversity of the system (organization) should be commensurable to the current and potential diversity of the environment with which it is linked and in which it is embedded (similar to the concept of variety management).

- Mechanisms

- Tagging: tags are a way of labelling and giving significance to something, linking it to action. How something is tagged defines what it is, provides it with an identity and role in the process of selection. In management, tags are used to define the boundaries of membership conditions of an enterprise. As an analogy with the immune system, the organizations first have to characterize their (environment) fitness landscape, then find the right set of tags to define the company, then, the groups of individuals will be able to quickly identify, distribute, share, and coordinate the searching of fitting landscapes – here a similitude with the function of the Systems 4 – mainly – and 5 – this last one while providing a the definition of the system's identity – in the VSM (see page 36 in this chapter and Walker 2001).

- Internal models: these are representations of the system (organization) itself. The internal model can be tacit or explicit. A tacit model simply suggests a current action under the implicit prediction of some desired future state. The explicit model is used for explicit, but internal, exploration

of alternatives – again, a coincidence with the mental models of the VSM when it is understood as a language to describe the organizational structure and its graphic representation (explicit model).

- Building blocks: this mechanism is related to the mechanism of internal models. Fitness depends on the ability to recognize regularities and constraints in an environment and to evolve an effective repertoire of reusable responses. These reusable responses are the building blocks – It might be a concordance with the VSM structure as it acts as a building block in all the different recursive[8] levels of the organization.

Following the tradition of CAS, with the use of strong computational models and inspired by biological systems, the SO process has been explained and interpreted from social animals to human organizations, where the networking among individuals operating around an attractor – e.g. tasks, attractive fields – and sharing their local information, produces global coordination and synergies among the whole set of activities performed by the social group (Schmickl & Crailsheim, 2008; Carapiet & Harris, 2005; Anderson & McMillan, 2003).

Following this trend and inspired by the work with ants dome by Dr. Sendova-Franks, Arcaute et al (2008) created a model to describe how SO occurs based on the division of labour in ants colonies[9]. This model has been tested to explain SO in ant colonies and in artificial social systems (robots and cellular automata – multi-agent systems). This computational model offers some elements that can be considered in the interpretation of the SO behaviour in communities, which principal assumptions can be described as:

1- Task allocation – This involves the identification of the task and the reception of information about its status (e.g. task completed, task in

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[8]   Recursive/recursion: The most common application of recursion is in mathematics and computer science in which it refers to a method of defining functions in which the function being defined is applied within its own definition. Such process of invoking the previous instance in the definition of the next is said to be 'recursive'. In this document the term is used more generally to describe a process of repeating objects in a self-similar way (e.g. the matrioskas, a Russian dolls in which one doll contains – and is contained in – a doll that is a replica of itself).
[9]   The ants have been used to describe SO in communities due the simplicity of their behaviour. The fact that there is no centralized information in the ant colony, their – relative – uniformity and the mechanism to identify and assign tasks make of them a good experimental subject to explore the rules of SO in social systems.

progress, new task). It is this element that generates local processes of self-regulation/self-organization - where the ants exchange information and distribute themselves so as to serve the task efficiently - without centralized information or control. Note: This model assumes by default, that tasks are the attractors around which social behaviour in communities occur.

2- The tasks act as attractive fields, constantly emitting information about their status,, attracting ants according their distance from the source and their sensitivity to the signal /information emitted.

3- The ants (or agents) are sensible to relevant information and will prefer to perform the task that presents the strongest relative signal to which they are receptive (i.e.the closest one, the one to which they are most sensitive)

4- Each task receives just a certain number of ants (agents) and then suspends the emission of information when the task is satisfied and, therefore, closed. After a period of time, the task may be reopen, emitting signals and receiving agents (ants)

5- At the beginning, the ants are equals and non-hierarchically organized – genetically they share almost identical DNA as they are all sisters, offspring of a unique queen – in terms of sensitization to the tasks; the distance to the task being the only variable determining their relation to it.

As the ants start to interact with the tasks, it happens that due to the repetitive attendance to a particular task, they become sensitized (that is, more sensible to perceive information coming from the task they repeatedly attended) and increasingly more specialized/differentiated.

This model states that from the ants interaction with the task and the gaining of experience (learning), they become more sensitive and by definition more specialized/differentiated. In this model the self-organizing behaviour comes from their ability to perceive information related to the task, and their flexibility to move from one task to the other as needed, implying exchange of information, that allows the ants to distribute them amongst the active tasks and attend them efficiently.

The 21st century saw the development of increasing research in complex networks. This was inspired by the growth of the world-wide web and models proposed by Watts and Stroglatz (1998) to analyze SO in small world networks related to many different self-organizing systems, such as neural networks, open source software networks, spatial games, genetic control networks, and biological oscillators, amongst others. In general, the self-organizing activity of these networks is still being explained, using the appearance of attractors as a mechanism to identify ordered structures (Propenko, 2008).

From the CAS studies, research on SO started to explore the virtual networks and social interactions occurring in the virtual world, adopting the use of Social Network Analysis (SNA) as analytical approach to describe some of the SO phenomena reported in this new environment (Propenko, 2008). .
As described by Scott (1991), the foundations of SNA are related with the development of the graphs theory, but groups working independently in several fields, particularly in psychology and anthropology, made the main developments that occurred in the development of modern social network analysis.

The major contributions coming from psychology can be associated with the development of sociometry and sociograms (Moreno, 1951). Moreno described sociometry as the inquiry into the evolution and organization of groups and the position of individuals within them. He introduced sociometry as a science of group organization that deals with the problem of describing a social group not from their outer structure – the group surface – but from their inner structure; revealing the hidden structures giving the group its form: the alliances, the subgroups, the hidden beliefs, the forbidden agendas, the ideological agreements, the 'stars' of the show, amongst others.

To represent such hidden structures he developed the sociograms; a systemic method for graphically representing individuals as points/nodes and the relationships between them as lines/arcs. Moreno used sociograms to identify social leaders, to uncover asymmetry and reciprocity in friendship choices, and to map chains of indirect connection.

With the use of a different approach Lewin (1943) through his studies in group behaviour, came to the conclusion that groups function within a field of conflicting social forces. He described the group as existing in a social space consisting of the group and it's perceived environment. The group and the environment interact and the group members, on the basis of their perceptions and experiences construct the meaning of these interactions. He represents the field as points connected by lines where the points are individuals, their goals or their actions, and the lines represent the interactional or causal consequences that connect them. In essence, the field model is about representing interactional interdependences that are divided into regions, separated by an absence of lines connecting them. Such graphic representation of relationships could be analyzed mathematically with the use of vector theory and topology; giving the foundations for the development of topological psychology.

From research into group perception and attitudes, Heider (1958) introduced the balance theory. This theory states that the mind seeks balance (an absence of tension) by trying to hold ideas that are not in conflict with one another. When this principle applies also to attitudes towards other people (group interaction) imbalances develop, because not everyone is interacting equally with everyone else at the same time. When these imbalances make themselves evident (expressed as tension or dislikes among subgroups of people), they exert force to resolve themselves through changes in the group structure.

In addition to Heider's theory, Cartwright & Harary (1956) showed that the outcome of this process could be expressed mathematically, necessarily driving a group to be subdivided into cliques, within which all ties are negative. Also indicating that all groups in which there is any imbalance, are in a state of slow transition towards cliques.

The most relevant contributions to the development of SNA from anthropology can be traced back to 1933 when Mayo published his studies in human relations (in industrial contexts). He observed the relationships amongst workers and discovered the 'informal organization' that he describes as the hidden social structure, which seemed to have as much effect on worker productivity as anything else in the working environment.

Later, the so called Manchester School lead by Max Glukman and with active participation of John Barnes, Elizabeth Bott and Clyde Mitchell, studied the structure of relationships among people and how these relations affected not only the individuals but society as a whole (e.g. cohesiveness[10]).

These concepts and theories from sociology and anthropology describing the relationships within a group where finally consolidated and translated into mathematical form by White (1970). His work allowed these 'soft' characteristics of groups to be measured and modelled, providing the foundations of the quantitative side of SNA.

Since then the SNA became popular in academic literature due to the publications of Lee (1969), Granovetter (1974) and Milgram (1967), describing how information flows in social networks and how the distance between individuals not directly related is relatively short (the small world network).

Lately, in the development of the quantitative side of the SNA, Krackhardt (1994) and Wasserman and Faust (1994) continued with the use of theoretical and methodological tools related with the use of the graphs theory.

The Quantitative approach to SNA have shown that social networks are not static, but dynamic entities that change with time (e.g. position of the nodes, connectivity), making the SNA an appealing field to explore from the CAS perspective (Nohria and Eccles, 1992; Dorian and Stokman 1997). In this sense, the SNA have been used in the understanding of organizations as

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[10] This term refers to the force bringing group members closer together. Cohesiveness has two dimensions: emotional (or personal) and task-related. The emotional aspect of cohesiveness is derived from the connection that members feel towards other group members and to their group as a whole. Task-cohesiveness refers to the degree to which group members share group goals and work together to meet these goals. The cohesiveness can be affected by member's similarity, group size, entry difficulty, group success and external competition and threats.

adaptive and evolving systems (Morel & Ramanujam, 1999).

The use of SNA to analyze organizational evolution is compelling because of the hint of SO underlying these areas of research, making the SNA an ideal tool to explore many organizational phenomena from a CAS perspective, as demonstrated by the work of Snowden (2002), while developing his CYNEFIN model of learning based on CAS, SNA and SO; or by Benham-Hutchins and Clancy (2010) when using CAS and SO to improve the performance of the NHS, amongst others. This particular approach has generated many publications and was found to be inspirational in the outlining of this work.

2.3.2 Self-organization and Social Systems: Complex Systems and Cybernetic Approaches

Buckley (1976), from a sociological and systemic perspective, describes social systems as the most adaptive and persistent, explaining how they fit with the generalities of CAS (Appendix 3). He presents cybernetics as the language that best helps to describe/understand the mechanics of CAS (in agreement with Beer, 1966); recognizing that all the physiological and socio-cultural processes of control, involve the same cybernetic principles of information flow along feedback loops.

Additionally, Buckley (1976) introduces the concept of morphogenesis to describe how a social system maintains its structure. In his description of the morphogenic process, the social system explores the variability of the environment and simultaneously, redefines the (homeostatic) mechanism for maintaining-structure, its "steady state". Also, he suggests SO as the most important mechanism to explain morphogenetic properties in the dynamics of social systems. Consequently, since the introduction of his sociological and systemic approach to the study of social systems, the CAS paradigm has been applied to the study of organizations (e.g. Anderson & McMillan, 2003; Mitleton-Kelly, 2003; Carapiet & Harris, 2005) as an interpretive theoretical framework to describe complex behaviours in firms, organizations and communities.

Within this sociological and systemic approach and aimed to build a link with the manufacturing explanation of SO, Stacey (1996) grounded in principles of group psychology and psychoanalysis created a list of eight parameters describing the differences existing between the description of SO in groups from manufacturing and the complexity perspectives. His work was reassumed by McMillan (2004) who complemented Stacey's list with six additional parameters (appendix 4), founded in her experience in human resources management and the application of principles of chaos and complexity in a real case. McMillan found – through the use of the different typologies to identify forms of SMWT/SDWT and self-organized groups from the complexity perspective – that in the real cases analyzed, these behaviours were not clearly differentiable as the teams matched both typologies[11].

Through their conceptual and empirical work, these authors drew out the initial steps to integrate the two perspectives of analysis of SO, but did not suggest a particular methodology to facilitate such behaviour in groups; offering instead the principles of complex systems as analogies to describe this behaviour in observed organizations.

Synergetics seems to be one of the branches of complexity sciences applying SO to the design and control of social systems. As explained previously, the main concept in relation to SO is the existence of an "order parameter" (Haken, 1984), and the introduction of general laws of synergetics such as the fact that systems are composed by many subsystems; the cooperation of subsystems produces new properties of the system; microscopic changes produce macroscopic changes via order parameters and slaving; symmetry breaking and conflict are essential to induce SO; and some solutions are mutually exclusive, generating a landscape of probabilities (Haken, 1980). These laws are the body of conceptual and instrumental development of synergetics in management with models created following a rigorous and sophisticated mathematical formulation. From these principles and a strong mathematical description of the behaviour of individual elements of the system, some tools

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[11]   In McMillan (2004) The use of the typologies to identify whether a team operates as SDWT/SMWT or as a self-organized team (from the complexity perspective) was done analyzing two groups operating inside a particular organizational structure. Therefore, these groups were granted with a sort of formal recognition.

have been developed, such as the 12 leverage model of Meadows (1999) who applies the order parameter concept and elements from Forrester's dynamic of systems. This implies that identifying and modifying an order parameter (e.g. communication direction and/or communication links), a complete new behaviour can be generated in a social system due to a variation in its internal dynamic; moreover in order of sensitivity, she offers a list of 12 places where to intervene in a system parameters – 12th in her list (Appendix 5) is one of the least effective.

A more developed application of Haken's ideas – and in general the synergetic principles – is presented by Latane (1981), Latane & Bourgeois (1996) and Latane & Nowak (1997) throughout the development of his Dynamic Social Impact Theory. He uses mathematical models to explain the mechanism of how information can be distributed in a social network and how the variables affecting the connectivity of social networks explain their stabilization, expressed as uniformity of information/knowledge/opinion amongst the network members (see section 3.3.5 in the next chapter).

An increasing interest in the application of the theory of complexity in social systems derives in another branch of study lead by A. Hanken, the cornerstone of which is his book *Cybernetics and Society* published in 1981. In this book he describes humans as cognitive/affective systems from a cybernetic perspective, using the notation developed by Ashby. Hanken provides a description of the cybernetic principles and explains the functions ruling different social systems such as the autocratic and democratic systems; collective systems with and without communication; systems with and without collaborative formation; and the mechanics of collective and individual decision making; at the end providing a general classification of social systems and a guide to identify their cybernetic properties.

The interest of cyberneticians in social systems finally produced the formal presentation of Socio-Cybernetics, as an application of cybernetics more agent-oriented and observer-dependent; summarized and presented in 1984 in the Sixth International Congress of Cybernetics and Systems, by Gayer & van der

Zouwen (1986). They developed a theoretical framework around existing experiences with regard to the planning and steering of specific social systems; and the extent to which and under what conditions, social systems are amenable to steering efforts.

Following this trend of Socio-Cybernetics, Klabbers (1986) presents a social system as an aggregation of actors (individuals) who create collective (organizational) structures composed of substructures and sub-substructures, arriving at the level of the individual, reducing the potential complexity within this recursive arrangement. He offers an example of its implementation as a recursive model for the human resource planning at universities (1986: 81). In this application two support systems (PERFORM and FORMASY / software tools) were designed and implemented to provide information at each recursive level (level 0 – Minister of education; Level 1-University; Level 2 – each faculty). Inside this system, some individuals are more willing and/or capable than others to coordinate activities; therefore, they are in position of control of information and gain more insight than those in operational positions. Thus, the level of comprehension that is a necessary condition for self-steering - of a system - is not distributed uniformly over all members of social systems.

If knowledge distribution is the core issue for self-steering – as it can be deduced from the theories described above – what is desirable from a methodological/functional perspective is the enhancement of information and knowledge distribution amongst individuals inside the social system, to facilitate the SO behaviour and improvement of performance of the system. With regards to this issue, Klabbers affirms that the adequate use of support systems (information systems) increases self-steering for two reasons: firstly, each actor is provided with opportunities to estimate and understand possible consequences of policy options for the social system as a whole and for each of its parts; and secondly, the use of intelligent support systems simulates a switching of perspectives, facilitating the understanding of the system from different roles, responsibilities and inside positions, increasing the self-observation capacities of social systems and improving the self-steering as they can clearly define the context for all actors, providing the individual with the

resources to autonomously evaluate the relevance and implications of their own actions.

With regard to the application of cybernetics to explore the SO phenomena in social groups Aulin (1986), offers an important distinction from his analysis on causality and the interpretation of Ashby's law of requisite variety, claiming that Socio-Cybernetics (self–steering) is a science in itself. This is distinct from Bio-Cybernetics (SO, autopoiesis), and machine oriented cybernetics (Artificial Intelligence), due to the nature and autonomy (will/conscience) associated with the agents creating social systems.

In addition to statements coming from socio-cybernetics, Luhmann (1986) introduces the idea that social systems are self-organizing and self-reproducing. These social systems do not consist of individuals, roles or acts as traditionally assumed, but of communications that are viewed as the elementary unit of social systems, where the concept of communication is the connection between certain actions and actors. The chain of communication can then be understood as a chain of actions. This enables the system to communicate about their communications and to choose their new ones. This author also affirms that the elements of communication in a self-referential system are "recursively produced and reproduced by a network of communications that cannot exist outside of such a network", introducing into the socio-cybernetics the idea of recursive structures, previously expressed by other authors.

A more comprehensive and robust explanation of the complexity of self-organizing systems in the human context comes from organizational cybernetics. This was introduced by Beer (1959) as the result of exploring the application of cybernetics within organizations using Ashby's concept of the black box. From the observation of natural processes, the evolution of the brain and the nervous system[12], Beer presents the idea of scientifically designing an

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[12]   Llinas (2001), about his description of the evolution of the neural system. He indicates that in the primitive stages of development of the neural system it was composed of primitive sensorial organs (e.g. statocyst - balance, and a patch of cells that detects light – light censoring) and a notochord. Also, that even the most primitive mobile organisms can perform the complex proprioceptive function – the proprioceptive function is related to so-called 'muscular memory'. In essence what it does, is to inform about the status of the muscles and the relative position of each part of the body with respect to itself

organization as a system capable to learn, adapt, and evolve. Consequently, in 1966, he explored the foundations of cybernetic control in systems and suggested cybernetics as the most powerful tool available, with an appropriate language capable of assimilating and describing the complexity of organizations. He suggests a transition from mathematical formulation to more flexible and creative descriptions, preserving the rigor of the mathematical foundation of the model's formulation.

As an evolution of this exploration, Beer (1972) presented the Viable System Model (VSM, Appendix 6) as a model with basic and sufficient conditions to provide viability to any kind of (social) system, describing the organization from his understanding of the human neural system, in a deductive process that ends with the presentation of core principles such as recursion, variety management and autonomy, as building blocks necessarily present in any viable self-organizing (organizational/social) system.

Following the description of Walker (2001), the VSM can be explained briefly as a set of five recursive and interconnected systems these being: System 1 (S1), related to the primary activities or operations, which is the part that does something (e.g. production); System 2 (S2), relates to the provision of a mechanism to ensure stability (conflict resolution), whenever conflict of interest is inevitable as the parts of the S1 interact. System 3 (S3) is related to internal regulation, optimization, and the creation of synergies. It works through having a current (internal) overview of the interactions at the S1 level – here and now detecting the best ways to do the S1 operations.

(e.g. without looking we know the relative distance and position of our feet - equivalent to the definition of self-reference).

Note that these rudimentary elements of the neural system do not imply the capability to develop complex processes such abstraction and prediction (in neurophysiologic terms one of the most sophisticated functions of the brain is to predict, in terms of anticipation of actions to do. This function is achieved by the automatization of pulses and sets of movements that are adaptive responses to external stimuli (e.g. when something is about to hit the eye, the brain does not 'predict' that something is coming. The sensor stimuli makes the brain anticipate the effect and activates sets of protective movements – the blinking of the eye – automatically, without thinking about it. Such rational exercise – thinking – follows the action). The advanced functions (forecasting and abstraction) started to be present where developed and sophisticated sensorial organs and more complex motion, together with bigger brains emerged in the evolution of the species.

The role of System 4 (S4) is to ensure that the operational units (S1) once stabilized and optimized - by the function of S3 - can survive in a changing environment. This system scans external conditions, identifying and evaluating threats and opportunities, and producing plans and strategies to adapt and ensure long term – there and then – viability. In other words, this system is in charge of the functions of self-reference / self- consciousness. Finally, System 5 (S5) provides the overall context in the form of policy and/or identity, personalizing the ultimate authority of the organization.

In the *Heart of Enterprise* (1979), Beer presents a description of the internal mechanics of the VSM and a simplification of all the physiological principles used in the creation of the VSM. This leads to the definition of the principles of organization, the axioms of management, and provides a questionnaire to diagnose the relation between autonomy and identity, described as the engine that provides control of the organization's self-organizing process.

His most novel proposition is that homeostatic control – which is the capacity of a system to hold its critical variables within accepted/tolerable limits in the face of a variable environment – is distributed throughout all the structure of the system, where control is the function that facilitates the existence and coordinated operation of the systems (with emphasis in the systems 1, 2 and 3).

Beer finally presents a visualization of the recursive model with its five subsystems in mutual interaction providing a dynamical homeostatic stability and viability (survival capacity) in the short and long term, through processes of learning, adaptation and evolution.

Later, in his book *Beyond Dispute* (1994) Beer recognizes that in his VSM, systems 3 and 4, due to their nature in the decision making process (internal/short term planning - vs. – external/long term planning), might present conflict. He presents the Team Syntegrity as a mechanism to facilitate the free flow of information and awareness about the individual and global comprehension (global conscience and understanding), to facilitate the process of planning in a non-hierarchical and participative way in order to avoid conflict.

In the development of organizational cybernetics, and particularly how the VSM facilitates SO, Espejo et al (1996) state - based on the work of Beer – that networks between individuals are the outcome of SO and self-regulation processes that are facilitated by a recursively structured organization. Additionally, they explain that the pre-requisite to create an internal mental model – critical for development of self-awareness – is the habit of observation, which implies a temporary detachment from the activity in process. To complement the description of self-organization inside the VSM, they identify the mental models as vital to generate organizational learning, describing them as an increase in the organization's capacity for effective action – that is achieved by sharing mental models.

In a further development, Schwaninger (2006) explores the use of the VSM and the concept of recursion and heterarchy[13] to provide intrinsic control and efficient coordination, while preserving self-determination and autonomy of interconnected and interdependent network structures of co-owned businesses (the kind of configuration that is frequently seen in SMEs when expanding their operations).

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[13] This term is defined in cybernetics as a form of organization resembling a network or fishnet. Where authority is determined by knowledge and function. McCulloch first employed it in a modern context in the early development of cybernetics, particularly the branch dedicated to the study of the brain and the development of artificial intelligence. Additional definitions of this concept accepted in social sciences are: "a system of organization replete with overlap, multiplicity, mixed ascendancy, and/or divergent-but-coexistent patterns of relation"; and "networks of elements in which each element shares the same 'horizontal' position of power and authority, each playing a theoretically equal role".

2.4 **SUMMARY**

The review of the evolution of regeneration programs reveals that the actual trend is to provide relief in a more comprehensive way. This means that the programs are not only concentrated in the development of infrastructure (e.g. housing) but include many of the "soft" elements that constitute the foundations to support the emergence of healthy communities (e.g. leisure facilities, health and education, spaces for community interaction). The design of such spaces must be customized according to the necessities of each individual community, and this demands a high level of participation by the recipients, in all the stages of development of the regeneration initiatives. This factor imposes the necessity of a change in the actual methodologies used to design and implement regeneration plans. The actual scheme of partnerships is still business oriented, undermining and constraining participation of the community at the initial stage of the design of such regeneration proposals. In addition, the multi-agency cooperation schemes in which these proposals are presented, makes the bureaucratic administration of the regeneration initiatives inaccessible to the communities, and imposes these practitioners as legitimate intermediaries between the partnership members (including the community) and the local government.

Unfortunately, the management tools intervening in all of this process is still attached to the standard practice in business; meaning that many of these tools ignore the complex dynamic and the participative nature of the process that is necessary to provide viability in community-based projects.

For this reason, two solutions emerged to cope with these limitations; 1) The recent development and test of tools grounded in Systems and Complexity, designed to enhance the participative nature and role of communities in the design and implementation of SO regeneration programs, and 2) the increasing emergence of independent initiatives, where autonomy, self-determination and self-organisation is promoted to guarantee the highest level of community involvement in the design and execution of regeneration projects.

Regarding self-organizing behaviour, the contemporary study of SO in social systems appears to be the sum of parallel, concurrent and sometimes complementary developments coming from different branches in the study of complex systems and cybernetics (Complexity theory, Complex Adaptive Systems, Cybernetics, Socio-Cybernetics, and Synergetics). In this context, the theory of CAS offers a solid theoretical ground for the observation of change and SO in organizations, while suggesting some of the (proven) tools to analyze such phenomena such as it is the SNA.

In the centre of this conceptual development, the process of creation of the VSM brings together almost all of the propositions previously explored in this section, in regard to the description of how SO occurs in social groups. (e.g. Beer, 1966; Haken, 1984; Klabbers, 1986; pertaining to the presence of recursive structures and organisational shared mental models. Beer 1979, 1985: Espejo 1996: Cohen, 1999; and Axelrod & Cohen, 1999: converging around the function of shared mental models).

To recapitulate, the common characteristic in these theories is that the ability of the organisation to contrast the external environment with a model of itself (the organisation in its current state) generates global awareness or consciousness of the state of the organisation's components (self-reference). Thus, it facilitates the creation of autonomous and coordinated decision-making processes amongst the operative groups (SO), which emerge more easily when occurring within a recursive organisational structure.

The VSM offers a conceptual model of organization as a recursive structure with decentralized, autonomous, and democratic decision making activities that facilitates individual/group awareness and self-steering, by providing a graphic representation in which sufficient and necessary roles, functions and communication channels provide organizational viability.

This model is built around the operational activities (S1)[14], which are determinant to the present and future subsistence of the system; where the creation of a common identity and language facilitates its coordination. The VSM suggests cybernetic language (when applied to management) as an attenuator of diversity (variety), and in consequence; presents itself as a tool that facilitates learning (internal understanding through the creation of a – unified – mental model) and the emergence of adaptive and evolving properties (analysis and response to changes in the external environment), necessary in viable systems.

To conclude, this review reveals that the approach to SO from complexity sciences when applied to social (human) groups, uses these principles (mainly) as analogies to drive the description of the observations performed in organizations (e.g. McMillan, 2004; Stacey, 1996; Mitleton-Kelly, 2003); it being noticeable the lack of use of the quantitative models and tools accompanying such theories and models of SO in complex systems.

In addition, this exploration on the evolution of concepts has not found methodologies conceived specifically to facilitate the emergence of the viable organisational structures that catalyse self-organizing behaviour in communities (at least from the CAS perspective). In consequence, to explore this – apparently – unexplored issue, the aims, research questions and objectives defining the forthcoming development of this research are stated as follows:

Aim:
- To develop a framework based on the principles of SO, as mechanisms to facilitate organizational transformation in communities.

Research questions:
- What kind of organizational structure results from the introduction of SO principles in non-hierarchical communities?

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[14]   Note the affinity with the description of SO in the ant's model, where tasks (operational activities) are the engine that generates SO behavior.

- Which methodologies and tools would be useful to support SO in communities striving to improve their organizational resilience?

Objectives:
- To study a rural regeneration program to identify practices and methods that facilitates the emergence of self-organizing, non-hierarchical organizational structures.
- To develop, test and validate a methodology oriented towards the diagnosis and facilitation of self-generated viable organizational structures.

Hypothesis

The introduction/creation of a common organizational language amongst members of a social system, facilitates the emergence of robust organizational structures coming from self-organizing processes.

This chapter offers a review of the concepts and theories that have been developed in order to study SO in organizations. It concludes with the presentation of the aim, research questions and objectives that drive the development of this research. In the next chapter, methodological aspects to be considered in this research will be explored, taking into account discoveries presented in this chapter. In particular, those related to some of the tools and theories used in the development of this work, such as the methodologies for SO, the VSM and SNA, given the fact that SO is a main concept in the theory of CAS, the SNA has been proven to be useful in the exploration of SO, and the VSM seems to be a theoretical model that captures and consolidates most of the concepts and theories intended to facilitate self-organizing behaviour in social groups.

CHAPTER 3

RESEARCH APPROACH AND METHODS

3.1 <u>INTRODUCTION</u>

In this chapter, the research methodology is presented following examination of the existing research paradigms and concepts in the social sciences. The justification for the selection of an interpretive paradigm is given, in concordance with the subjective nature of the research topic, taking into consideration findings coming from literature reviews, with regards to the use of theories and tools used in the study of SO. Next, the ontological and epistemological postures are discussed, as well as the research approach, methodologies and tools to be used in different instances of this study. The chapter ends by summarizing the ethical implications related to the choice of data collection methods.

3.2 <u>RESEARCH CONCEPTS</u>

3.2.1 <u>Research approach</u>

Two main approaches are possible in the study of organizations: the quantitative/objective approach and the qualitative/subjective one. Smith (1983) indicates that the debate as to which approach is better to describe social phenomena, can be traced back to the 19th century, when the validity of physical research methods to describe social facts was discussed. Neuman (2003) specifies that, at that time, two philosophical schools presented their arguments in favour of one or the other approach: the positivists with an empirical background lead by the ideas of Newton and Locke and the idealists, based on the Kantian tradition.

Complementarily, Smith (1983) explains that the positivists considered among others the following issues, suggesting quantitative research as opposed to the qualitative approach:

- The objects of social study have no inherent meaning and the observer has an independent reality; therefore, its relationship to research-knowledge is a subject-object one.
- Social science research must be emotionally neutral to eliminate bias.
- Research should benefit society by producing laws, identifying causal effects and facilitating predictive analysis.

However, the same author affirms that the idealists argued that, in social sciences, the object of study is not inanimate but is the outcome of human minds; therefore, it is not possible to separate the researcher and his research from the research object, describing the research as a subject-subject relationship. In this context, Neuman (2003) indicates that the product of knowledge is an interpretive understanding rather than laws or predictions. Smith (1983) continues to explain that understanding, from the idealist perspective, is a hermeneutic (interpretation) process in constant change – with no endpoints – where human meaning must be context bound and not possible to be defined as "scientific", due to the lack of referential criteria and to the dependence on individual values.

In this sense, Smith (1983) describes the contemporary discussion as the difference between realism and idealism. Where realism – as the basis for the subject-object research relation – states that reality exists independently of people and that knowledge corresponds to truth and is reality. Thus, because of this independency, research does not affect the object of study. On the other hand, Neuman (2003) explains the actual idealists' position; they affirm that reality is a mind construction and, consequently research is a subject-subject relationship (intersubjectivity), where the research object is not independent of the researcher and reality is agreed in a social context.

To determine the researcher's paradigm, three consequences coming from the differences in the philosophical approaches must be understood. According to Smith (1983), these are:

1) The relationship considered between researcher and research object determines the research methodology. Realists, due to the subject-object relationship, will prefer instruments to accurately measure the research object. Idealists, due to the subject-subject relationship (intersubjectivity) with the research object, understand the research instruments as part of the researcher. In other words, if social life is only understandable through an examination of people's selection and interpretation of events and actions and human activity is not a behaviour – as adaption to material conditions – but an expression of meaning that humans give (via language) to their conduct, the preferred method of research should be one where the observer is a participant of the observation.

2) Concerning the relationship between facts and values, objectivity in a realist approach is provided by the separation of the researcher's values and worldviews from the object of research; the knowledge is considered public and the use of the same methods should produce the same answers. On the other hand, idealists believe that objectivity is a social agreement of values and social interests; the research is conducted based on their values and worldviews and similar results are based on common perspectives where facts and values are intertwined.

3) The researcher's goal in quantitative research is to explain, predict and develop universal laws, whereas qualitative research seeks to understand and interpret the meaning people give to their situation. In the latter case, a rational method of interpretation is needed, where the researcher must understand the context of the situation and particular actions (Neuman, 2003).

Furthermore, Smith together with Dainty (1991), address the qualitative-vs-quantitative debate by discussing a number of key issues that differentiate these perspectives:

- The role of the researcher and his relationship to the object of study (Fundamentally the same approach as previously presented by Smith in 1983).

In this approach the inquiry from the inside (qualitative approach) is achieved by the researcher becoming part of the organization, trying to understand the mindsets of the people and to interpret and understand their points of view via unstructured interviews. The epistemological assumption here is that to experience, is the way to gain knowledge; therefore, the best way to understand an organization is to become part of it, validating knowledge experientially. The disadvantage of this methodology is that the findings may become distorted with the values of the researcher, exposed indeed to the weaknesses inherent in subjectivity. The inquiry from the outside (quantitative approach) is research based on data produced by the organization (e.g. financial reports), where the researcher has no impact on the organization. Their role is to observe from an epistemological position defined by the belief in an external reality of facts, governed by laws.

- The sources of categories

Here, the inquiry from the inside has no preset categories, they emerge through research and experience; therefore, the exploration and interpretation of the situation indicates the issues that may drive to the generation of theories grounded in a particular phenomenon. Inquiry from the outside is guided by a predetermined set of categories, to the extent that some categories may be ignored.

- The aim of the inquiry

  The aim of the inquiry from the inside is to understand particular phenomena as they present themselves at a given moment in time. The inquiry from the outside intends to generalize and make universally applicable laws.

- Different types of knowledge

  Stemming from the previous point, inquiry from the inside generates specific knowledge about the particular situation studied, whereas the inquiry from the outside produces theoretical statements that are universally applicable.

- The data and meaning

  In the inquiry from the inside, the researcher must have direct experiential contact with the organization under study, in order to gain understanding about its culture, context, people, resources, purpose, earlier events and future expectations that constitute the background of a particular situation. For example, knowledge is thus related to the employees' perception of the organization, that is to say the phenomenal field. By contrast, the outside inquiry removes idiosyncrasies to find generalizations applicable to all organizations; data is considered real in all situations and settings, it is controlled, depurated (statistically) and randomized to be context free.

3.2.2   Research paradigm

The present research is related to direct observation of a social organization; therefore, it is important to consider that all theories of organization are based upon a philosophy of science and a theory of society. Consequently, assumptions are made about the nature of the phenomena under study (ontology), the grounds of knowledge (epistemology), the relationships between human beings (human nature) and the ways used by the researcher to investigate and obtain knowledge about the observed world (methodology) (Burrel & Morgan, 1979; Mason, 1996; Guba & Lincoln, 1994).

Guba & Lincoln (1994), state that inquiry paradigms defined for the researcher legitimate limits of inquiry. In this context, Smith & Dainty (1991) specify that to add rigor to the research it is important to understand the values, paradigms and assumptions underpinning the research. Not understanding these properties may potentially lead to an unsuccessful result.

To gain in understanding of the inquiry paradigms, these sets of assumptions can be grouped and superimposed to produce an analytical scheme for studying sociological theories relating to the nature of the social order, generating four paradigms as shown in figure 1. In this arrangement, one set relates to the nature of the perception of the phenomena and the generation of knowledge (objective vs. subjective approach), the other concerns the nature of the social order (radical change vs. regulation) as described by Burrel & Morgan (1979).

This particular arrangement becomes convenient for the purposes of the present research, because the nature of the case study around which this research revolves. This case study exposes the occurrence of SO in a non-hierarchical community as a proposal of radical change in the way communities organize themselves to cope with: 1) the challenges coming with the adoption of sustainable lifestyles, 2) the communal design and development of a regeneration initiative, and 3) the tensions with the traditional procedures regulating the development of conventional organizational structures.
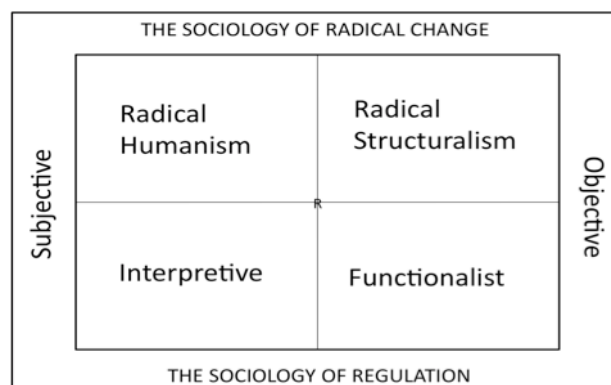
Figure 1. Four paradigms (Burrel & Morgan, 1979)

The four paradigms thus define four views of the social world. As with any other map, it provides a tool for establishing where the researcher is, in a continuous – but divided – theoretical framework. Hassard (1993) describes the four divisions of the framework as following:

- Functionalist (paradigm)

    The society has a real, concrete existence and systematic character and is directed toward the production of order and regulation. The observer is objective, value-free and distanced from the subject-matter by the rigor of the scientific method.

- Interpretive (paradigm)

    The social world possesses a precarious ontological status. Then, social reality – although possessing order and regulation – does not possess an external concrete form. Instead it is a product of the intersubjective experience. The world then is best understood from the viewpoint of a participant in action. The researcher deconstructs the phenomenological process through which shared realities are created, sustained and changed.

- Radical humanism

    As in the interpretive paradigm, there exists the assumption that everyday reality is socially constructed. However, radical humanism critiques this social construction, where actors are prisoners of their own construction as well as the alienating modes of thought that characterize life in modern societies.

- Radical structuralism

    Social reality is considered a fact. It possesses a hard external existence of its own and takes a form that is independent of the way it is socially constructed. The social world is characterized by intrinsic tensions and contradictions. These forces serve to bring about radical change in social systems as a whole.

3.2.3   <u>The ontological questions</u>

Having selected one of the above paradigms as a general theoretical framework of analysis, to further develop the inquiry perspective, the first question to be addressed concerns the nature of reality – what is reality – and what can be known about it (Guba & Lincoln, 1994; Neuman, 2003). To discuss the possible answers to these questions, four new other paradigms are described by Guba & Lincoln (1994), each one implying its own assumptions.

– Positivism

In this paradigm reality is an external and independent phenomenon governed by laws and causal effects.

– Post-positivism

This set of beliefs assumes that reality is imperfect because of the imperfection of human intelligence and the complex nature of phenomena.

– Critical theory

This paradigm states that political, social, cultural, economic, ethnic, and gender values create reality.

– Constructivism

In this paradigm reality is an intangible construction of the human mind, shaped by experiences of the world and dependent on the individual, which reality can be modified by new information; in other words, truth (reality) is relative and dependent on one's perspective.

About the latter, Schwandt (2000) recognizes the importance of the subjective human creation of meaning, yet without rejecting outright some notion of objectivity when it indicates that – in constructivism – knowledge and truth are created perceptions. People construct knowledge by inventing concepts, models and schemes of the world, and testing them; through new experiences knowledge is modified.

In addition, Miller & Crabtree (1999) and Searle (1995), indicate that constructivism is built upon the premise of a social construction of reality where pluralism – not relativism – is stressed, with focus on the circular dynamic tension of subject and object. Neuman (2003) complements that definition by indicating that constructivism is a variety of interpretive social science, related with hermeneutics[15].

Since the object of the study is the expression of SO in non-hierarchical communities aiming towards sustainability in the context of independent regeneration initiatives, an exploration on the nature of the SO phenomenon is required to define the ontological perspective of this research.

In order to explain SO, the second law of thermodynamics is frequently used, indicating that the state of order is identifiable when the entropy[16] of the system is negative (negentropy) and when such state of order is not imposed by an external agent (Heylighen, 2003). According to the postulates of the second law of thermodynamics in isolated systems, the entropy can only increase, not decrease; this means that the final state of thermodynamic equilibrium is the one with the maximum entropy. However, physical self-organizing systems cannot be isolated and demand a constant input of matter/energy with low entropy; this causes these systems to eliminate the internally generated entropy through the output of dissipation.

Dissipative structures emerge to dissipate energy, maintaining the system far from thermodynamic equilibrium. To describe this behaviour the second law of thermodynamics is expressed at a more abstract level as statistical entropy, indicating that order emerges into a set of possible states, but the specific final

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[15]   Hermeneutics: a theory concerned with examining text to discover meaning and where the researcher's goal is to obtain a holistic understanding from deep exploration of text parts
[16]   Entropy is a term that describes the degree of 'randomness' of the particles that compose a substance (e.g. the atoms of a solid material are nearly arranged in fixed positions, vibrating gently but not swapping places, therefore presenting a kind of structure in which randomness (entropy), is low. The contrary can be observed with the same material in its gaseous phase. The atoms travel in any direction occupying different regions in space, colliding together and with the container. Therefore the randomness of structure of their distribution is high)

state is not possible to predict. Therefore, the description of the emergence of organization is expressed in terms of probability (Nicolis & Prigogine, 1977).

Beer (1966:360) resumes this interpretation of the second law of thermodynamics as "*every system tends to its most probable state*", indicating that the probabilities are relative to the level of observation and that the conjunction of values of all the variables considered relevant, is defined by the observer. Consequently, it is possible to identify different levels of entropy at different levels of observation of a given entity. Beer indicates that, despite the subjectivity paradox embedded in the role of the observer, organization is more than entropy; it is a structure that has an intention or purpose. Beer explains his statement with the example of ice cream. When ice cream is taken from a refrigerator and left in a warm room, it will melt, losing its solid shape. We can say that the ice cream disorganizes itself since it loses "*its purpose of having a solid shape and consistence*" but, from a physical perspective, it becomes more ordered by achieving thermal equilibrium with the room. The paradox is that the purpose of the system is not an objective property of the system but something set by the observer. In different terms, Ashby (1961) writes: "*A substantial part of the theory of organization will be concerned with properties that are not intrinsic to the thing but are relational between observer and thing.*"

This is particularly true in the study of SO in a social system, where this phenomenon is recognized as a collective communicational process and explained not only by the dynamic of the communications but by the context, content and attributes of the communicating agents (Luhnman, 1986). In consequence, the SO of a social system is dependent on the cognitive properties of the observer's system, indicating that it (the observing system) is a property of the observed system, as Von Foerster (1981) suggests when explaining the observing systems and the foundations of second order cybernetics. Therefore, it is not possible to separate the observer from the observed system; the valuation of the observations depends on the observer (it may vary from one observer to another) and, even with the same observer, it may differ in time, due to differences in the observer's cognition between

observations, the variations of the social system between observations and consequently, the interpretations about the observed system.

In consequence, since the observed reality depends on the observer's perspective, the position taken in this research is the constructivist one, following the tradition of the interpretive paradigm

3.2.4 Epistemology

Saunders (2006) describes the epistemological positions that can be assumed by the researcher as:

- Positivism

    Natural sciences; the observer is independent and value-free.
- Realism

    The senses show us reality as the truth; reality is independent of the mind.
- Interpretivism

    Phenomenology and symbolic interactionism; the researcher understands the world from the research subject's point of view.

Two main and opposite perceptions are common in epistemology. The first one, associated with the positivism, is linked with the illustration and origins of the scientific method; it is based on tangible facts, where the phenomena are explained through causal relationships and reality is understood as independent from the researcher (Collins & Hussey, 2003; Burrel & Morgan, 1979). The second associates with anti-positivist tendencies, where the researcher may be a participant of his own observation and his beliefs provide a platform to the observed facts and explanations. In consequence, the researcher needs to be a participant of the observation, in order to understand the perspective and behaviour of human beings (Collins & Hussey, 2003; Burrel & Morgan, 1979).

Morgan & Smircich (1980) indicate that humans react to their environment through interpretation; human behaviour and knowledge is modified by the information coming from the environment and changes and evolves, as new

information is received and interpreted. Therefore, groups of humans may develop a shared reality for a given situation; however, it can be fickle and disappear (i.e. when the group not longer shares the same interpretation of a reality). The knowledge of such reality can be gained only through phenomenological interpretation, as reality is a construct that the human mind shapes through experience. The implication is that the understanding of reality and group behaviour from this perspective can only be gained by participating in the construction of the observed reality.

In this respect, it is important to recognize that the description of the (self-) organizing process depends on the individual and on the shared interpretations that members of the community have about their own organizational development, and that this description depends also on their cognition (i.e. the understanding of their experience, learning, awareness).

In consequence, *interpretivism is the selected epistemological approach because it respects the individual perceptions of the community members with regard to the studied phenomenon and provides a research perspective that allows the researcher to describe the organizational process from their point of view. Also, interpretivism is congruent with the aim of this research as it seeks to explore the application of SO principles in a specific community, and not to predict or forecast any self-organizing process in general.*

3.2.5 The methodological question

According to Guba & Lincoln (1994), the methodological question deals with how the researcher will find the elements to answer the research problem. The answer to this question is bounded by the ontological and epistemological positions selected previously by the researcher. These authors offer a review of the methodological implications set by the choice of different paradigms listed as follows:

- The positivist paradigm: Under this paradigm the methodology should involve the statement and empirical analysis of one hypothesis, where the conditions of the experiment are controlled to prevent bias.

- Post-positivism: Emphasizes falsifying hypothesis. To interpret people's actions, the methodology should prefer a mechanism where the viewpoints are solicited without the researcher's interaction.

- The critical theory: Demands a dialectical methodology where misconceptions are transformed into an informed understanding of the research subject.

- Constructivism: Demands an agreed and informed interaction between the researcher and the subject of the research.

- The participative paradigm: Requires a collaborative form of enquiry through democratic dialogue as co-researchers and co-subjects; where people determine the research question and the methodology to explore them.

- The objectivist or positivist ontological position: Demands objective forms of knowledge and the precise measurement of relationships using quantitative methodologies.

Taking into consideration the position of the researcher – his relation with the observed system – and the nature of the data that can be collected in this research (where there are not many elements that can be numerically quantified e.g. meaning, organization, structure among others), clearly the quantitative research methodology does not seem to be appropriate; in consequence, *this study must favour (mostly) methodologies of a qualitative nature.*

Smith and Dainty (1991) suggest that researchers should try to combine the two approaches (the qualitative and quantitative one) to draw strength from both so as to create the most complete description of the observed social phenomenon by:
- Doing both qualitative and quantitative research combining the results
- Alternating between the two methodologies, or
- Develop a new approach by combining the rigors of positivist science with the context based grounding of the non-positivist one.

Mingers & Hill (1997), open the space to multiple paradigm research with pluralist methodologies, on the proviso that the limitations of each paradigm and philosophy (and methodology in consequence) are well recognized and connected coherently, in accordance with the nature of the problems (research question) and the recognition that real-world problem situations are highly complex and multidimensional. Different paradigms focus on different aspects of the situation and so; a multi-methodological approach is necessary to deal with the full richness of the real world. The fact that the intervention is not a simple and discrete event but a process with different numbers of phases, tasks and problems in each stage, indicates that some methodologies seems to be more appropriate to some phases than others and its articulation brings a more rich observation, from the perspective of pragmatism, despite the paradigm of incommensurability.

Checkland and Holwell (1998) add to this line of argument that the research needs to be flexible (both, in how the procedure of a particular methodology is used as well as the use of different methodologies) to cope with emergent social phenomenon.

Saunders et al (2006) explain that, in the selection of research methodologies, the definition of the research approach provides direction to the final choice of research strategies to be used to collect information and suggest two approaches – not necessarily exclusive – in accordance with the quantitative-objective or qualitative-subjective nature of the research, the deductive and the inductive.

They describe the deductive approach as closely related to positivism and the tradition of natural sciences, where the researcher is independent of what he is about to observe. It involves the development of a theory that must be rigorously tested; the definition of variables to be considered and their causal relationships. The validation of the outcomes requires a highly structured methodology and depends on the replication and further generalization of the observations, demanding samples of sufficient numerical size.

Regarding the inductive approach, it is described as closely related to interpretivism. The emphasis is to gain understanding of the meaning –why and how, rather than the what - of human events as well as the context of the research; here the researcher is part of the research process. The variables to describe human events are not predefined as they emerge as the research evolves, demanding flexible methodological structure. The outcome is a theory that explains the observed human events, where generalization is not the main concern, and validation is provided by social construction.

A third option corresponds to the Action Research approach. Cherry (1999), describes the strength of this approach when explaining that through the integration of inductive and deductive approaches from the basis of qualitative research, it is possible to improve reliability and credibility to inductive approaches. The addition of elements coming from the deductive approach to test the insights coming from an initial inductive exploration is not only possible but recommended (Cherry, 1999; Saunders et al, 2006).

Consequently, Action Research is the selected methodological approach in this research, as the purpose of this work is the description of social phenomena, where the variables driving SO are not clearly known and to describe the self-organizing process in an observed community, the researcher will be a participant of the observation, conveniently applying qualitative and quantitative methodologies in two research phases.

3.3   RESEARCH METHOD AND DATA ANALYSIS

3.3.1   Action research (AR) – Approach

Action Research is described as a form of applied research, where the researcher is involved as part of the organization within which the research is taking place. With the focus on action, particularly in the promotion of change within the organization, the purpose of the research (action) is not just to

describe, understand and explain observed events, but also change them (Saunders et al, 2006).

The AR strategy is founded upon a systemic sequence of reflective cycles. Reflection on the experience, learning, theoretical and methodological presuppositions is done systematically following a process that commences with an initial idea and criteria for change intervention (Thornhill et al, 2000). Coghlan & Brannik (2005) describe the reflective stages of AR as expressed in figure 2; where the reflective cycle starts with a diagnostic stage, followed by planning action, taking action and finally evaluating action. Each stage is subject to a critical evaluation considering analytical sub-stages such as experiencing, interpreting and taking action.

Greenwood & Levine (1998), and Saunders et al (2006) note the strengths of AR are related to its focus upon the processes of change. As these authors recognize, change over time on the initial research/intervention, presupposes that the consequence of reflective cycles is the most valuable characteristic providing flexibility, adaptability and integration of newly generated knowledge and produces tangible and desired results for the people involved. In addition, the participative nature provides a democratic knowledge – generation process that produces insights both for researcher and participants.

The criticism of AR is related to the role of the researcher and the issues of validity and bias (Bunning, 1997). Waterman et al (2001) indicate that confusion about the nature of AR is generated by the way influential writers use terms from their own disciplines, even suggesting their own unique approach (e.g. John Heron – psychologist – Co-operative Inquiry; Orlando Fals Borda – political activist – Participation-AR; Peter Senge – Organizational Learning – Community-AR).

From: Coghlan & Brannik, (2004: 35)
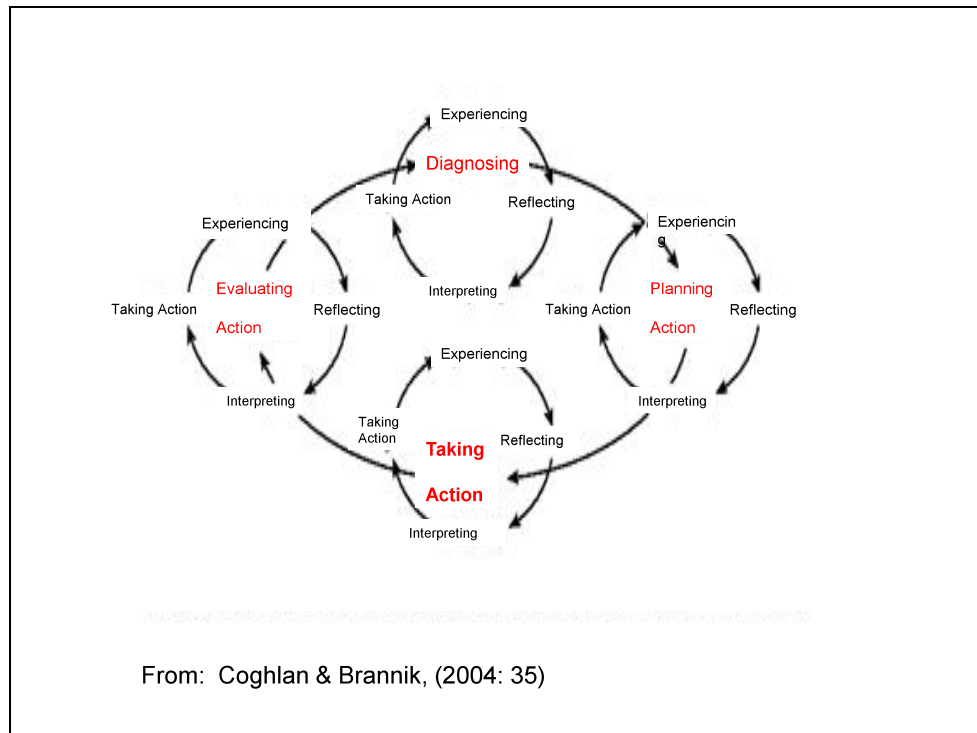
Figure 2.   Systemic Sequence of Reflection & Critical Evaluation in Action Research.

To avoid confusion, this research will follow the basic procedure described by Coghlan & Brannik (2004), with the inclusion of systemic thinking, not as an AR approach but as guidance for interpretive practice (Flood, 2001). Also, it will incorporate concepts coming from organizational learning (Community-AR - Senge & Scharmer, 2001, among others); VSM and CAS as interpretive frameworks being consistent with the cybernetic foundations of AR – Lewin, (1946) described AR as a participative and cyclic research process where the (researcher) self-regulation, autonomy, control (participant – research process), and (dialectical) communication take place.

The traditional (objective) scientific method focuses on generalisability, validity and reliability to evaluate the quality of the research outcome. Thompson & Perry (2004) indicate that AR is related with subjective research and demands a different set of criteria to evaluate its quality. They suggest four criteria:

1) Truth value/credibility

This concerns how data reflects the reality of the phenomenon investigated. It can be achieved through triangulation; the suggested strategies are the combination of data sources (e.g. prolonged engagement) – *in this research a three-months in-house academic advice was done to build a case study as part of an ongoing process over a three-year period*. The use of rival explanations and possibilities to analyze the data – *this research considers principles of SO coming from complex science and explanations of SO from traditional management*; pattern matching; and review and affirmation of research findings by those respondents, to generate internal validity – *done in this research through the socialization, discussion and acceptance of results with the observed community*.

2) Applicability/transferability

This can be done through the creation of thick descriptions, generating and using a rich research database including all the documents produced in the research process. Two tactics are suggested, one where the research findings are compared with the previous experiences of the participants; and other where *learning from the project are transferred from one subgroup of participants to the other*.

3) Consistency/dependability

Inquiry audit to determine the fairness of the process of inquiry. *It will be provided by detailed descriptions of how data was collected*.

4) Neutrality/conformability

To demonstrate that the data is reliable, factual, confirmable or confirmed. *In this research, documentation of the interview protocols, tapes and transcriptions of interviews; documentation of*

the AR methodology and documentation of agreements were done *with the participants*.

3.3.2   Case Study – Research strategy

Case Study (CS) is described by Shepard & Greene (2003), as one of the several ways to do research related with social science (or even socially related). CS consists in an in-depth investigation/study of a single individual, group, incident or community. Yin (1994:1), defines it as an empirical enquiry that investigates a phenomenon within its real-life context, suggested as '*a preferred strategy when 'how' and 'why' questions are being posed, when the investigator has little control over events and when the focus is on a contemporary phenomenon within some real-life context*'.

This author also locates CS as one of the basic approaches to empirical work, these being: experiment and survey, associated with a positivist paradigm; archival analysis, focused on the past that can adopt a positivistic or anti-positivistic character, depending on the strategies adopted; history, focus on the past; and CS, concerned with contemporary issues, closely related with constructivism.

From the constructivist paradigm, one of the advantages of CS as a research approach is the close collaboration between researcher and participant, while the participants are encouraged to tell their stories (Crabtree & Miller, 1999) and through these stories they describe their views of reality, enabling the researcher to better understand the participant's actions (Lather, 1992).

With regard to the participants' views of reality, Yin (1994) provides a guide to classify the sources of information in CS, with comments about strengths and weakness in each case as illustrated in table 1.

Criticism of CS is similar to that reported for AR, due to the subjectivity originating in the study of specific events involving human dynamics. Remenyi et al (1998), write that the CS weaknesses may be related to the participant's inability to recall events accurately, the disclosure of feelings and the bias

associated with the research presuppositions; all of them affecting issues of credibility and generalization.

Source of Evidence	Strengths	Weaknesses
Documentation	-Stable. Can be reviewed repeatedly. -Unobtrusive. Not created as a result of the CS. -Exact. Contains exact names, references, and details of an event. -Broad coverage. Long span of time, many event, and many settings.	-Retrievability. -Biased selectivity. If collection is incomplete. -Reporting bias. Reflects (unknown) bias of author. -Access. May be deliberately blocked.
Archival Records	(Same as above for documentation) Precise and quantifiable	(Same as above for documentation) Accessibility due to privacy reasons.
Interviews	-Targeted. Focused directly on case study topic. -Insightful. Provides perceived causal inferences.	-Bias due to poorly constructed questions. -Response bias. -Inaccuracies due to poor recall. -Reflectivity. Interviewee gives what the interviewer wants to hear.
Direct Observations	-Reality. Covers events in real time. -Contextual. Covers context of events.	-Time consuming. -Selectivity. Unless broad coverage. -Inflexivity. Event may proceed differently because it is being observed. -Cost. Hours needed by human observers.
Participant – Observation	(Same as above for direct observation) -Insightful into interpersonal behaviour and motives.	(Same as Above for direct observation) -Bias due to investigator's manipulation of events.
Physical Artefacts	-Insightful into cultural features. -Insightful into technical operations.	-Selectivity -Availability

Table 1. Sources of Evidence. Adapted from Yin (1994).
The highlighted lines indicate the selection strategies used in this research.

Yin (1994) indicates that four tests have been used to establish the quality of any empirical research, and these are relevant to CS. Additionally, he suggests some tactics for dealing with the quality test; presented in the table 2, some of them (highlighted) were adopted in this research.

Additionally, Eisenhard (1989) suggests that to enhance reliability, the use of CS protocol is indispensable. She proposes a sequence of eight steps, initiating them with the previous preparation of the CS intervention, where conceptual approaches are considered; and finalizing with closure, where theoretical saturation is recommended to reinforce the internal validity. Yin, (1994) argues that protocols are not just essential, but critical in the design of CS interventions so as to provide guidance in the selection of sources of information and support validity, preserving the chain of evidence.

Test	CS tactic	Phase of research in which tactic occur
Construct Validity	- **Use multiple sources of evidence.** - **Establish chain of evidence.** - **Have key informants review draft case study report.**	- Data collection - Composition
Internal validity	- Do Pattern matching. - **Do Explanation building**. - Address rival explanations. - **Use logic models**	Data analysis
External validity	- **Use theory in single case studies.** - Use replication logic in multiple case studies.	Research design
Reliability	- **Use CS protocol** - **Develop CS database**	Data collection

Table 2. Tactics to enhance the quality of Case Study research. Adapted from Yin (1994). The highlighted lines indicate the procedures applied in this research.

3.3.2.1 The CS protocol

Following the suggested stages by Eisenhard (1989) and Yin (1994), the CS protocol of this research presents the following steps:

- Getting started: In this stage the definition of the research questions and possible a priori constructs were done. Constrained by the main objectives of the EPSRC research project "defining the generic rules of self-organization in social systems", the findings and hints coming from the literature review and conceptual definitions coming from the EPSRC research group attending this research, a theoretical framework was produced and is explained in detail in the next chapter.

- Selecting the case: The objective at this stage was to establish constraints to extraneous variation and sharpen external validity. It also concentrated efforts on the identification/selection of theoretically useful cases, which was achieved via theoretical – not random – sampling and focused the attention on specified populations. This case offered several benefits; first, the opportunity to explore a process of organizational change from the emergence of critical events to the moment of stabilization after several years; secondly, the character *sui generis* of the CS in the context where it took place (country, local innovative conditions, local impact); and finally, the offer of open access to information and an invitation extended by the

organization to be studied, so as to participate actively (via academic advice – consultancy) in their change process.

- Crafting instruments and protocols: Here, the design of data collections and practices to gather information was considered. The intention was the acquisition of data and evidence in such a way that not only provides elements to develop theory, but contributes to the construction of validity. Here the suggested procedures are the triangulation of evidence, the use of multiple data collection methods and combined qualitative – quantitative data. The description of the different data collection methods used and triangulation of data in this research is explained in the following sections of this chapter.

- Entering the field: Additionally to the standard procedures to enter and collect information in the field such as a proper introduction of the researcher to the participants, a clear identification of sources of information, notification of the visit/interviews in advance and the following of ethical procedures[17] in research; here, the aim is to overlap data collection and analysis including field notes and apply flexible and opportunistic data collection methods – when possible. This first contact with the participants revealed possible adjustments to be considered in further data collection, and allowed the investigator to take advantage of emergent themes and unique case features.

- Analyzing data: The early inspection of data is recommended within-case analysis, to provide the researcher familiarity with data and preliminary theory generation. The detailed procedure of data analysis is presented and explained in a further section of this and the next chapter.

- Shaping hypotheses: In this stage the iterative tabulation of evidence for each construct sharpens the construct definition, validity and measurability. It is part of the iterative cycle of analysis present in the theoretical framework of this research and explained in depth in the next chapter.

- Enfolding literature: The comparison with similar and conflictive literature builds internal validity, raises the theoretical level and sharpens the

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[17]   See 3.4. Securing Funding and Ethical considerations.

construct definition. In this research it is done through the presentation and analysis of each intervention stage throughout the narrative of the CS.

- Reaching closure: Theoretical saturation – when possible – is the eventual final stage of the analysis, it occurs when the researcher finds only repeated patterns in the sampling process. Saturation demonstrates that the research process is complete. At this stage the CS report is created. Complementarily, the draft of the report will be (was) presented not just to peers but also to the participants and informants in the CS to obtain their approval, in this way enhancing the accuracy, hence increasing the construct validity of the CS.

In this research, the CS report will follow a linear-analytic structure (Ying, 1994), where the sequence of subtopics involves the issue or problem being studied, a review of the relevant literature, the analytical method used, findings from the data collected and analyzed and the conclusions and implications of these findings. To facilitate the readability the CS will be presented reflecting the different – organizational – developmental stages of the observed organization (XOOP in this study) following a longitudinal narrative, using as core method the VSM analysis to illustrate/consolidate the information coming from different sources such as questionnaires and interviews. The Social Network Analysis (SNA) will provide insights into punctual moments in the observation and description process, to complement the VSM description. With regards to the dissemination of the findings of this research, a presentation was carried out to show these findings to the XOOP members, as a feedback mechanism for the learning process of the participants. Also, some presentations have been carried out providing a useful mechanism to show the outcomes of this research[18] to a wider learning community.

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[18]   Preliminary results of this research were presented in conferences such as EmergeNET3 – Warwick 2009, and NLA 2009 and Kybernetes (2010). The abstracts of these presentations are in the appendix 7.

3.3.3 Interviews – Research tool

Saunders et al (2006), indicate the existence of different typologies of interviews; in these typologies the interviews are categorized according to the level of formality and structure. According to these authors three categories exist and are defined as: Structured interviews; using questionnaires based on standardized or identical sets of questions that must be presented to the interviewee, using the same tone of voice so as to prevent any bias. Semi-structured interviews; these are non-standardized. The researcher has a list of themes and questions to be covered; these may vary from interviewee to interviewee. Unstructured interviews; are informal interviews used to explore in depth, a particular event. Typically, unstructured and semi-structured interviews are related to exploratory/explanatory studies where the dominant research approach is qualitative; the structured interview is frequently associated with descriptive studies, closely related to quantitative approaches.

Semi-structured interviews are the preferred choice of data collection in the first phase of this research, due to the nature of the research approach and strategy adopted. This type of interview offers the opportunity and flexibility to explore in depth, a particular phenomenon and the possibility to consider new topics for examination not included in the initial interview design (Saunders et al, 2004).

Saunders et al (2006) and Yin (1994), indicate that research using semi-structured or in-depth interviews will not be able to produce generalizations about the entire population and this in particular must be clearly stated by the researcher to avoid any unrealistic assumptions about the ability to replicate research findings. However other researchers, in order to understand the research process and enable them to reuse the results of this research, may refer to information about the principles underpinning the research design.

In respect to the quality issues related to semi-structured interviews, Saunders et al (1994), write that the lack of standardization and issues of bias affect reliability in this type of interview. Interviewer bias may occur when comments, tone or non-verbal behaviour create bias in the way interviewees responds.

Interviewer bias may be caused by perceptions about the interviewee and the nature/sensitivity of the participants to provide sensitive information, resulting in partial or incomplete descriptions of the analyzed situation.

Saunders et al (2006), suggest some tactics to overcome interviewer and interviewee bias, these are: preparation and readiness for the interview; level of information supplied previously to the interviewee, appropriateness of the interviewers appearance, opening comments to demonstrate credibility and friendliness; neutral behaviour during the course of the interview, demonstration of listening skills; scope to test understanding-confirmation of adequate interpretation of interviewee answers; and recording data. These tactics were used in the course of the present research.

A final issue relating to the quality of interviews is the sampling to provide validity and reliability. According to Saunders et al (2006), a sample is needed when it is not possible to survey the entire population. The authors indicate that sampling methods can be divided into probability and non-probability samplings. The probability sampling is preferred in large populations, where the chance or probability of each participant to be selected at random is the same and statistical inference is required to answer the research question. Non-probability samples are used when the probability of each individual to be selected at random from the total population is not known or not possible; being impossible to answer questions that require statistical inferences. Under these circumstances it is still possible to generalize about the characteristics of the population, but not on statistical grounds; which is frequently the situation in CS.

Since the research was done through the observation/participation in one selected CS (XOOP – Ireland; 65 members) and since the focus was the observation of organizational structures, the information was preferably located in positions/roles where decision-making processes occur. For this reason a purposive or judgmental sampling was used, where it was possible to select cases that are particularly informative (Neuman, 2000). Therefore, the strategy used was a homogeneous sampling focused on one particular subgroup (managers, decision makers, founding and senior members; 25 participants in

the selected case study) in which the sample members were similar, enabling this study to explore in-depth the observed event (Patton, 2002). The execution of the interviews followed a cascade model in which each interviewee was asked to suggest the name of the following key person(s) to be interviewed. This iterative process continued until the set of referrals become repetitive, indicating that the information from most of the key persons – from the perspective of the interviewed – has been collected.

3.3.4 Story-telling research tools

In-depth analysis is a technique to explore texts, frequently used in the analysis of interview transcriptions. The aim is to detect patters in the narrative which meaning depends on the objectives and context of the text exploration though the identification of recurrent key-words; narrative analysis has a similar mechanism but focused on stories, tales or descriptions of events providing construction or reconstructions of personal-social events where patterns frequently are associated with critical events (Webster & Mertova, 2007).

Webster & Mertova (2005), indicate that critical events can be identified through the impact on the storyteller, as the level of impact becomes evident in the story told. They can exist in different contexts within an organization and be noticeable in the description of organizational structures, governance, discipline processes, authority, operational procedures and performance expectations; becoming a relevant research strategy for the present study.

Some of the characteristics that facilitate the identification of critical events are listed as they: exist in a particular context; impact the people involved; have life-changing consequences; are unplanned; may reveal patters of well defined stages; are only identifiable after the event; are intensely personal with strong emotional involvement.

Webster & Mertova (2007), note that narrative inquiry allows researchers to present experience holistically in all its complexity and richness, attempting to capture the whole story, whereas other methods tend to communicate

understandings of studied phenomena at certain points with the omission of intervening stages. The story-telling methodology is presented as appealing to research, due to its capacity to deal with issues of human centeredness and complexity in a sensitive manner.

With regard to the evaluation of quality Polkinghorne (1988), indicates that the validity of narrative is more associated to meaningful analysis rather than with consequences; and reliability is not the stability of measurement but the trustworthiness of the notes and/or transcriptions; in consequence it is not convenient to apply this criteria, frequently used in traditional approaches. Huberman (1995) suggests that new measurements such as honesty, verisimilitude, authenticity, familiarity, transferability and economy should be preferred.

To enhance quality in narrative research Webster & Mertova (2007), present some tactics to be adopted in regards to Huberman's quality criteria. Related with honesty, trustworthiness can be obtained through confirmation by the participants of the reported stories of experience. About verisimilitude, the record of similar experiences is the recommended strategy; it suggests that a set of stories about the same topic is necessary to evaluate this property where similar experiences are expected to be noticeable, indicating homogeneity-congruence. Familiarity, associated with things that become routine; is a risk in the narrative analysis, where interpersonal distancing is the recommended strategy to make the familiar strange again and provide an independent perspective of analysis. Transferability is gained by the use of contextualized critical events; rich descriptions of events in the context of narrative inquiry can provide insights for application in another setting. Economy is related to the resources needed to analyze narratives; the use of identification of critical events attenuates the risk of generating endless categorization of data.

Subsequent to the various convergent studies of SO in social systems, the methodologies to facilitate this process have also been developed from different perspectives, such as game theory (e.g. Ostrom, 1995), complexity (e.g. Sociocracy - Buck & Endenburg, 2004), systems thinking (e.g. Agile/Scrum - Takeushi & Nonaka, 1986; Open Space Technologies - Harrison Owen, 1991; World Café - Brown & Isaacs, 2001), communication theory and networks theory (e.g. Dynamic Social Impact Theory - Latane, 1981) and complex adaptive systems (e.g. KALiF - Kelleher et al, 2001).

As has been described briefly, these methodologies can be classified into two categories. The first group of methodologies and tools are related with game theory and synergetics: these theories are based on mathematical and probabilistic models to explore/explain, model and control the internal mechanisms of the self-organizing process. In this group the diagnostics of connectivity and social network structures are used to selectively introduce information and activate specific agents, in this way changing the structure of the social network (e.g. Ostrom; Latane - Dynamic Social Impact Theory), and generating reasonable predictions of the outcomes derived from such manipulation. The second group of methodologies and tools, based on the dynamic of complex systems, is oriented towards providing guidelines concerning how to create environments that facilitate communicational processes and coordination of activities (i.e. Agile, Open Space Technologies, World Café, KALiF), rather than exploring or controlling the internal mechanism of the self-organizing activity. These methodologies do not pretend to anticipate possible outcomes, being more in consonance with the unpredictable nature of complex systems. There are a variety of methodologies that can be used to facilitate self-organization in human groups:

- Ostrom (1990): She describes social capital as the interaction amongst individuals spending time and energy working to find better ways of facilitating achievements that in their absence could not be possible. The

investment in social capital often takes the form of bargaining over which rules will be adopted to allocate the benefits and costs of the communal action. In this context, the self-organizing process is presented as the endogenous bargaining mechanism driving the autonomous/communitarian process of distribution/access to common goods. To facilitate such self-organizing process, her methodology provides a set of instructions intended to provide guidance on how to participate in coordination and the communal decision-making process. The elements of her methodology are:

- Define limits: what is going to be managed and by whom
- Specific procedures and rules based on local experience
- Flexible mechanisms for collective decision-making
- Accountability with participation of the beneficiaries
- Gradual sanctions. Beneficiaries must be involved in the imposition of sanctions
- Conflict Solution Mechanisms: low cost and accessible
- External Recognition of the right to organize themselves

The main application of this methodology is to build consensus on – the autonomous application of – rules of access and use of common goods. Here, the self-organization process is understood as a mechanism to create social capital. The application of these principles has been focused in the public administration of common goods, where the empirical results suggest that this methodology induces the best results in medium sized organizations (Shepsle, 2010). Ostrom (1995) when describing the environment in which this methodology is more effective, indicates that better results are achieved when the task recognition is an emergent phenomenon and the rules are used to drive a non-standardized operation, when open communications are indispensable and decisions as to how to interact and engage with the task are made consensually. (Notice the coincidences with the limitations to apply SMWT/SDWT).

- Takeushi & Nonaka (1986): They presented their adaptive methodology (Agile/Scrum) as one designed to control unpredictable processes via

planning iterations that: while adopting a particular – flat – organizational structure where basic roles are present in the work team (project manager, customer representative, gatekeeper); ensuring that a basic mechanism to share information about the project every 24 hours is in place; and providing a protocol to develop and deliver outcomes agreed with internal and external clients, the self-organization occurs in the form of synergies inside the work group. This behaviour will be noticeable by the autonomous assignment/recognition of tasks and the understanding of the general status (overview) of the project's execution. The elements of this methodology are:

- Teams and tasks are built (and maintained) in instability.
- Self-organizing project teams: Must be autonomous, self-transcendent and open to cross-fertilization via internal diversity.
- Overlapping development phases: This demands the shared division of labour, multi-skilled workers and a cooperative environment.
- Multi-learning: Multi level and multi functional learning amongst the team members should be encouraged.
- Subtle Control: Control through peer pressure and control by love. The work schedule should be maintained slightly overloaded.
- Organizational transfer learning: The experience/knowledge produced in the management of the team task, should be distributed inside the organization by formal training or via informal tutoring procedures

The main application of this methodology is in the coordination of operative groups (task distribution-completion), widely extended in the production of software. Despite its widely documented success, Beck (1999) and Boehm and Turner (2004), reported some limitations such as the number of team members (no more than nine is strongly recommended[19]), the co-location of the teams (non co-located teams failed with this methodology), and its implementation to design mission-critical systems where failure is

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[19] Kevin Brady (2006) indicates when talking about this methodology that some elements must be considered at the time of its implementation; among them, the fact that modern economic theories put individual interests ahead of the interest of the group, and the Karl Paper's first law of collective action: "You can never get more than five people to agree on anything".

not an option at any cost (e.g. software for surgical procedures). In addition Brady (2006), while describing the methodology as a people oriented process, indicates that the leadership of the team is a crucial factor, therefore, dependent on the psychology of the leader and allowing teams to be taken over by strong personalities leading to mini-dictatorships. Also, the process can facilitate the concentration of knowledge when it is not documented properly (facilitating concentration of power and the emergence of dictatorship) and when dictators emerge most of the talented people tend to leave the team.

- Buck & Edenburg (2004). These authors provide a mechanism to create a consensual and participatory bottom-up decision-making process initially called sociocracy, and then presented as Dynamic Governance and Dynamic Self-governance. Conceived to be applied – ideally – in consensual and egalitarian organizations. The methodology is presented in the form of a guideline, specifying rules for the election and participation of the organization's members involved in the decision-making process and a procedure to simplify it. The elements of this methodology are:

  • Consent: The decision is made not when the majority expresses its opinion but when there is no opposition.
  • Election of persons: The decision making process is carried out by selected members (nominated delegates) at every hierarchical level representing all the diverse groups interested or affected by the decision.
  • Circles of participation (decision-making): Provides guidance on how to create a recursive structure to attenuate variety, but ensuring that key information is not omitted in the process.
  • Double linking: Specifies that two members of every interest group at every recursive/hierarchical level are allowed to participate in the decision making process, as it goes up in the decision-making process of hierarchical structure.

This methodology has been applied in more than 200 SMEs in The

Netherlands and in iconic community projects such as Findhorn eco-village in Scotland. It has also been implemented in some colleges and universities in Canada and the Netherlands, but despite this, and the existence of a network of institutes spreading the use of this methodology, the adoption of these principles just suits organizations keen to question and act towards the creation of new or alternative interpretations of the concept of ownership, constituting a limitation for its adoption in all types of organizations. With regards to the literature supporting this methodology, the existing documents are constituted by cross-referencing publications (e.g. Findhorn publications talking about themselves and advertising some Dynamic Governance institutes and vice versa)[20], a fact that diminishes the independence and ultimately the validity in the academic contexts.

- Latane (1981). He suggests a theory where society is understood as a complex, self-organizing system of interacting individuals. His Dynamic Social Impact Theory (DSIT) explains four forms of order resultant from the iterative and recursive non-linear relationship of individuals, which connectivity and diversity can be "socially influenceable" through modifications in the attributes of spatially distributed individuals (Harton & Latane, 1997). As a methodology, DSIT provides a mathematical model of the effects of strength, immediacy, and number. In essence, the methodology insinuates that through affecting the hubs in a social network, it is possible to create a new common agreement over basic ideas. This mathematical model provides guidance on the number of people in a community that must share a common interest to create a consensual majority.

To achieve that, the DSIT makes three assumptions: 1- People vary in strength or persuasiveness. It can be seen as commitment to their positions, power, richness or attractive physical appearance, or strong arguments and rhetorical skills. 2- People influence each other in proportion to a multiplicative function of their strength, immediacy and number. Immediacy is

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[20]   Dynamic Self-Governance. New Findhorn Association; Governance Alive.

defined as the closeness of a person in physical or social space. Empirically, it seems to be the inverse of the square of the physical distance separating two individuals. And 3- People will change their opinions if and only if the pressure to change (due to strength, immediacy and number of the opposition) is greater than the pressure not to change (from their own conviction plus the degree of support their social network provides). The basic components of the methodology are:

- Consolidation (reduced diversity): over time majorities grow in size and minorities decrease.
- Clustering (spatial SO): People are most influenced by their closest neighbour.
- Correlation (emergent linkages): Over time the opinion of the group members converges, even in issues not under discussion. Their opinions in a variety of matters are correlated.
- Continuing diversity: Because of clustering, the belief of minorities continues on within the group.

This methodology is widely applied in social engineering, marketing, political marketing as it has been experimented and widely used to analyze persuasion and social influence (Harton & Bullock, 2007) and the emergence of subcultures (Latane & Bourgeois, 1996). Some criticism has emerged since empirical evidence suggests that the four elements described in the theory, may not be the only ones that generate self-organizing behaviour and the emergence of subgroups based on the individual influence of the group members as indicated by Heath & Hearth (2007).

- Harrison Owen (1987?). He introduced the Open Space Technologies (OST) as a tool designed to facilitate planning and decision-making processes, through a set of simple instructions to be executed by a facilitator. The OST assumes that all the participants (in the meeting) have a genuine desire to avoid confrontation and participate actively in a problem-solving situation, and that order is the natural state of the system (as a coincidence with Beer's

statement Order-Chaos-Order). As the purpose of this tool is to generate a kind of agreement in the topics to be discussed in concurrent meetings, the facilitator must guarantee that: 1) every issue of concern to anybody is laid upon the table. 2) All issues are discussed to the extent that the participants care to do that. 3) A full written record of all discussions is created and distributed to all participants. 4) All issues are ranked in order of priority. 5) Critical "focal issues" are isolated and Next Step actions identified for their resolution.

The OST's principles are presented in parallelisms to Kaufman's essential preconditions for SO, being: 1) A relatively safe nutrient environment. 2) High levels of diversity and complexity in terms of the elements to be self-organized (equivalent to the complexity of the issues to be resolved, and diversity, to the people needed to solve it). 3) Living at the edge of chaos, meaning that dynamism and instability are necessary (equivalent to a high level of actual or potential conflict). 4) An inner drive towards improvement, hence the natural tendency is to create groups to improve efficiency (motivated by a short time in which to make a decision). 5) Scarcity of connections, self-organization will only occur if there are few prior connections between the elements (no more than two); empirically perceived after several applications that groups with no previous connectivity manage to solve situations using OST more quickly than groups with previously developed connections. The principles ruling conduction by the facilitator are:

- Whoever comes, are the right people: The only requirement is that they are people who care to do something.
- Whatever happens in the only way that thing could have: Keeps people focused on the here and now.
- Whenever it starts is the right time: Creativity happens (or not) when it happens.
- When is over it is over: Do what you have to do and when it is done move on to something useful.
- Law of two feet: If you find yourself in a situation of not learning/not

contributing, use your two feet and move to someplace more to your liking.

With many reported applications this methodology has been used to create consensus and originate decision-making inside diverse working groups. Although, when comparing it with other Large-Group Interaction Methods some weaknesses were identified, among them the fact that it demands that facilitation holds the space with a minimum of intervention (that implies a non-common role and expertise in facilitation); also that the use of the OST has significant logistical requirements, being particularly expensive in terms of participant's time; and finally, that the method would need content experts, a fact not considered in the instructions for its application (Bryson & Anderson, 2000).

In addition, these authors in their comparative study found that the OST does not show a well-articulated theoretical base; and the empirical evidence shows signs indicating that the OST as being more useful for creating ideas, rather than to design and implement actions.

- Brown & Isaacs, (2001). Introduced as a planning and decision-making tool, the World Café suggests a conversational process, following a networking pattern hosting conversations about questions that matter. These conversations link and build on each other as people move between groups, cross-pollinate ideas, and discover new insights into the questions or issues that are most important in their life, work, or community. The process is oriented to create an emergent collective intelligence. Founded on systems thinking and organizational learning paradigms, and based on the generative and self-organizing properties of a system, the open communicational process is facilitated following five steps to coordinate and generate general consciousness of the issues exposed through the conversational rounds. These steps are the development of conscience, capability, commitment contribution, and collaboration. The sequences of activities in this methodology are:

- Set the context: Define issues, participants, and time.
- Create hospitable space: Make everyone feel free to offer their best thinking. Provide sufficient elements to encourage people to write and share their ideas.
- Explore questions that matter: Focus on "what is useful here" questions.
- Encourage everyone's contribution.
- Connect Diverse Perspectives: different rounds must be programmed. People must move from one table to another, meeting different people as the conversational rounds progress. One person must remain at each table acting as host and creating a record of all the previous rounds, to be shared with the new travellers as a starting points to the new conversational round.
- Listen together and notice patterns.
- Share collective discoveries: make the discoveries of each table visible to everyone. Then a common reflection must be done on the new discoveries as final stage of the methodology.

As with the OST, this methodology has been used to discover ideas in groups with diverse backgrounds. The most evident outcome of these two methodologies is the emergence of a collective intelligence directed by self-organized processes.

- Kelleher et al (2001). These authors presented the KALiF methodology as a toolset that facilitates and accelerates the process of self-organization and network development, by focusing resources on individual learners, making the exchange of knowledge more successful and hence more attractive, and by creating the social conditions (on-line and off-line) for the effective construction of effective relationships. The conceptual grounds are the concept of community of practice, the generic model of community evolution, the ecology of ideas, and the role of the independent learner. A common component in all these theories is the relevant role of communications, transference of knowledge (content/context of communications) and network strength and evolution (nature, dynamism, and strength of links). The

methodology is presented to the communities of practice and is supported by KALiF facilitators who monitor the evolution of the social network, the content of the communications, and injecting energy into the problem solving process through the identification of emergent issues and facilitating the participation of the community members in all the three modules which are: 1) Web-based secure discussion and knowledge exchange facility; 2) Groups of interest, team building; and 3) Individual coaching and training to facilitate role definition and network sponsorship. The elements in which this methodology is founded are:

- Acceleration of network formation: Online software enables and enhances the natural process of learning, conversation, knowledge diffusion and application.
- Knowledge repository: The community creates an – open source – knowledge repository, as a reflection of their interest and needs; and as a space for the definition of their purposes and values.
- Learning Champions: The encouragement of individual learning performance is administrated via mentors and coaches, and events such as knowledge markets, facilitating face-to-face exchange of problems and solutions.
- Collaborative knowledge networks: Result as an emergent property of the conversational environment, providing a unique differentiated knowledge network with strong identity.

The main application of this toolset is the creation of communities of practice in many different contexts in Europe, such as the European Project to Preserve Artisan Practices (Haldane & Bond, 2004) and the Learning and Training in Industry Program (Kelleher et al, 2001). The limitation related to the use of this methodology is associated to the fact that it has copyrights and its distribution is linked to a use license. It also demands KALiF experts to run the implementation of the virtual platform and computer literacy from the final users, imposing some restrictions to access the benefits that can be derived from the use of this methodology.

It is important to highlight that almost all the methodologies described above have – at some extent – as one of their functional principles to facilitate self-organizing behaviour, is the identification of what is needed or wanted to be done by a social group (e.g. word café, OST), or, once the task is defined, the self-organizing behaviour is induced through the definition of procedures and functions/roles that affects the interactions and synergy amongst the members of the work group (e.g. Agile/Scrum, KALiF, DSIT).

To summarize, the methodologies to facilitate self-organization in social systems can be classified into two categories. The first group of methodologies and tools are related with game theory and synergetics: these theories are based on mathematical and probabilistic models to explore/explain, model and control the internal mechanisms of the self-organising process. The diagnostics of connectivity and social network structure are used to selectively introduce information and activate specific agents, in this way changing the structure of the social group (e.g. Ostrom; Latane - DSIT). The second group of methodologies and tools based on the dynamic of complex systems provides guidelines concerning how to create environments that facilitate communicational processes and coordination of activities (i.e. Agile, OST, World Café, KALiF), rather than exploring or controlling the internal mechanism of the self-organizing activity.

However, none of these methodologies provides information of the mechanism needed for the emergence of the organizational (viable) structures and neither provides detailed observations on the nature of the emergent organizational structures resulting from SO. Also, the CAS or systemic background underpinning the characteristics of these methodologies was not completely clear (except KALiF which CAS background is clearly described by Kelleher et al, 2001). For these reasons, these methodologies where only used as guidance in the development of the theoretical framework of this research. This study adopted the use of the VSM as a model that provides insights about how to create viable organizations and, as an alternative to analyze SO in the CAS

context, a proved method (SNA) was adopted.

3.3.6 Social Network Analysis (Software)

Husman & van Dulin (2003) offer a comprehensive review of the most common software used for SNA (although, the number of programs grows constantly as developers produce software for specific applications). They explain that the majority of software uses ASCII data format. These software can be found in the form of packages of graphic user interphaces (GUIs) or packages built for scripting/programming languages (e.g. UCINET and Snowball, respectively). Some advantages and disadvantages are reported for each of these categories of software, for instance, GUIs packages are easier to learn and use and are well documented, while the scripting tools are more powerful, flexible and able to be adapted to the particular requirements of the user but frequently requires training and skills in programming. The SNA software is distributed either as free open source licensing packages (e.g. PAJEK, VISONE) or as a private licensed application, that in many cases offers free downloadable packages (e.g. UCINET,).

One of the important features of SNA software is the visual representation of social networks; it helps to understand network data and facilitates the qualitative interpretation of the network through changes in the layout, colour, shape, and size of nodes and links, among other properties of the network representation. Also, the data entry format that can vary from easy and friendly excel sheets and matrixes, to convoluted (but more complete in terms of data containing information about individual characteristics of the nodes) lists of contacts and texts formats.

Regarding the variety of tools built for the visualization and analytical study of the features of social networks, the International Network for Social Network Analysis (INSNA) maintains a list of the software packages and libraries in their Computer Programs for Social Network Analysis webpage.

After testing some of the most popular and accessible software for SNA, the decision to use GUIs based software (UCINET, VISONE and PAJEK) was made by the interdisciplinary team participating in this research based upon the following arguments:

- Accessibility: UCINET, VISONE and PAJEK can be freely downloaded. The only constraint exists with UCINET, which free use lasts for just three months, after which a license must be acquired.
- Data entry:
    - PAJEK can receive data (using terminals .net, .paj, .dat(UCINET), .ged, .mol) or it can be created directly in the form of a list of matrix (.net, .paj).
    - UCINET accept data in Excel format, text, .net(pajek), krackplot, negopy and proprietary (##.d and ##.h).
    - VISONE can receive data in formats such as GraphML, (.dl), Pajek (.net), Excel (.csv), Matrices, and Edge lists formats.
- Platform:
    - PAJEK runs in Windows, Linux and Mac OS X environment.
    - UCINET can work in Windows only.
    - VISONE can operate in JAVA (Windows, Linux, MacOS).
- Software orientation:
    - PAJEK is designed for the analysis and visualization of large-scale networks.
    - UCINET is a comprehensive SNA tool.
    - VISONE does interactive analysis (graphic) and visualization of social networks.
- Analytical properties:
    - PAJEK can be used mainly to calculate most centrality measures and identify structural holes.
    - UCINET can perform the centrality measures, subgroup identification, role analysis, elementary graph theory and permutation-based statistical analysis. The package has also

strong matrix analysis routines, such as matrix algebra and multivariate statistics.

- VISONE can calculate centrality measures, clustering, cliques and components.

- Support:

  - PAJEK does not provide support or a virtual helpdesk. Neither does it provide a manual, but a printed and electronic version of the document describing the features of the program is available.

  - UCINET provides support to the buyers of the license. Helpdesk and forums (with free subscription) are available and manuals and guides that explain its applications and how to use the software can be found on the Internet.

  - VISONE does not provide support nor a virtual helpdesk. There are no manuals to explain how to use the software, but a downloadable document exists describing the features of the program.

Understanding the strengths and limitations of each software and the nature of the analysis to be performed, in which the focus will be given to the identification of subgroups and key actors through the use of centrality measures such as degree and betweeness (Ortiz-Arrollo & Hassain, 2008; Sathik & Rasheed, 2009), the interdisciplinary team opted for the adoption of UCINET, even when the free use of it is constrained and it runs only in Windows environment.

3.3.7 Triangulation – Data analysis

The analysis of the data collected was guided by the theoretical framework of this research, that includes particular analytical tools such as the VSM diagnosis and SNA - in this study, the variables describing social networks were analyzed with the use of software such as UCINET (Borgatti, Everett & Freeman, 1999), and PAJEK (Batagelj & Mrvar, 2008)

Mingers and Hill (1977), David & Sutton (2004) suggest that when approaching the research object from different methodological approaches; triangulation may involve more than one round of data collection and a set of different research strategies or theoretical frameworks. Saunders et al (2006) add that the use of a mixed methodology, results in a stronger research design and more reliable and valid findings, where triangulation offers balance and complementarities between the emphasis of each qualitative and quantitative methodology.

This integration of – research – tools and techniques is supported by a multi-methodology approach considering that: in the real world, situations are complex and multidimensional, different paradigms focus attention on different aspects of the situation and a multi-methodology is therefore necessary to deal with the richness of the real world. In addition, the intervention is a process that typically proceeds through a number of different stages, each one with different tasks and problems demanding different tools/methodologies. And finally, the fact that many people are using multi-methodologies in practice, make of it an empirically valid method whenever the mix of research techniques and tools are displayed coherently in the solution of a particular problem. (Mingers & Brocklesby, 1995; and Jackson, 2003).

Since this research consists of two phases, triangulation will be sequential rather than simultaneous. The first phase is interpretive, enriched with some few quantitative methods (e.g. questionnaires – SNA). At this point, action research provides the research context to construct a case study where direct observations, story-telling techniques and semi-structured interviews are applied to provide information about the organizational structure.

Mingers (2006) indicates that the VSM theoretical model to interpret organizational structures may also be understood as diagnostic methodology/technique, demanding information about purposes, structure, environment and communication within an organization. Therefore, the design of the semi-structured interviews and the story-telling inquiry is oriented to initially provide the requested information by the VSM. The SNA, fed by questionnaires will provide the quantitative description of such communications,

as a more complete description of their nature and dynamics (de NOOY et al, 2005) which interpretation will follow the theoretical frameworks and theories of CAS, SO and VSM.

In general, the use of these tools pretend to identify and explain the mechanisms of how tasks are identified and defined in the observed organization; under which organizational structures it happens; and which organizational structures favour the distribution of activities to cope with a particular task; also, evaluate the impact of the use of the theoretical framework as an interpretive method in the data analysis stage, which most noticeable outcome is the identification of groups (SNA) in close relation to the execution of the roles and functions of the VSM.

3.4   **SECURING FUNDING AND ETHICAL CONSIDERATIONS**

The University of Hull – Business School (HUBS) has a procedure to guarantee the attendance of ethical considerations in all the research activities where University's members might be implicated, whether performing teaching or research activities. A report of the research activities was presented to the ethical committee of the university with a copy of the consent form (a standard form provided by the ethical committee) to be presented to all the participants in this research. Once approved by the university's ethical committee the research protocol was executed and in all cases the consent form was presented and explained to each participant prior to the inquiry.

Additionally, all those interviewed were asked to give their permission to record the conversation. When declined, no recordings were made. Name of the organization where the case study was conducted, names of the interviewed and names of referred people or any other private institutions mentioned are kept confidential. To do so, the name of all the participants and referred people in the interviews and questionnaires were coded and the name of the organization where the case study was carried out, as well as the name of any

other organization or institution mentioned, was changed to guarantee anonymity.

3.5 <u>SUMMARY</u>

This chapter presented the philosophical perspective from which this work will be executed, taking into consideration the nature of the phenomena to be studied and the position from which the researcher will perform the observations. In this order, this work will take the constructivist perspective following the tradition of the interpretive paradigm, because this research approach respects the individual perceptions of the community members with regard to the studied phenomenon and provides a research angle that allows the researcher to describe the organizational process from their – the community members – point of view.

In this work the AR was the selected methodological approach, as the purpose of this research is to describe self-organizing behaviour in a community, where the researcher will be a participant of the observation, providing insights and evaluating the process of SO occurring within the observed community.
Semi-structured interviews and questionnaires will be used to capture data about the structure and self-organizing behaviour. The UCINET software was selected to perform the SNA, due its comprehensive properties and the provision of abundant literature to guide its use. The information coming form the interviews and SNA information also have the potential to be used to do the organizational cybernetic diagnostic VSM.

The next chapter presents the conceptual background that will be used to develop the theoretical framework that supports the facilitation of Self-

organizing processes, with emphasis on the generation of viable organizational structures.

CHAPTER 4

CONCEPTUAL AND METHODOLOGICAL FRAMEWORK FOR COMMUNITY SELF-ORGANIZATION

4.1 INTRODUCTION

Understanding self-organization as a communicational phenomenon in social systems, the Visualization-Planning Toolset (V-P) is presented in this chapter as the theoretical framework that drives this research. This theoretical framework incorporates principles of organizational learning, organizational cybernetics, self-organization (SO), and social network analysis. The aim is to observe and analyze the emergence of self-organizing processes in communities, specifically, the creation of the necessary (viable) organizational structures needed to support such SO processes. The character of organizational viability will be evaluated through the use of the theoretical model suggested by Beer (1966, 1972, 1979, and 1985).

In this work, the V-P is introduced as a sequence of activities designed to systematically observe and interpret the organizational environment that facilitates SO, distributed in three loops as follows:

1. Visualization: Consisting of diagnostic procedures to produce a visual and unified representation of the organization using the Viable System Model (VSM) and Social Network Analysis (SNA).
2. Planning: Suggested as a cycle of organizational design activities, oriented to cope with the organizational requirements to be viable.
3. Reflection (critical): Where the outcomes of the first and second loops are contrasted and compared with theoretical foundations supporting this methodological framework, to facilitate self-awareness of the evolutionary process of the organization.

Following this brief description, this chapter will aim to explain the context, theoretical foundations and core concepts that support and explain the design of the V-P toolset.

4.2 <u>CONTEXT AND CORE CONCEPTS</u>

4.2.1 <u>Context</u>

A description of the evolution of the concept of SO and the tools to facilitate this process in human systems, has been provided in the previous chapters. In general, the SO has been applied extensively in the manufacturing environment as a pragmatic task-oriented procedure to increasingly provide autonomy to the operative working groups. From a different – and more abstract – perspective SO has been reintroduced in the field of management, as a concept grounded on theories and models developed to explain such behaviour in chemistry, physics and biology. The development of the models to explain SO in these sciences happened at the same time as the development of cybernetics, the study of complex systems and ultimately the development of the theory of CAS.

Inspired by these last perspectives and influenced by theories coming from biology and the study of complex systems some models emerged, designed to explain and facilitate the operation of organizations founded in Self-organizing principles (e.g. Beer, 1959, 1979, 1985; Hanken, 1981; Latane, 1981; Klabbers, 1986; Kauffman, 1993; Latane & Nowak, 1997, among others). From these groups of theories and methodologies the organizational cybernetics becomes prominent, as it offers a model supported by a comprehensive body of theory that encompass almost all the principles for SO that the previous models and theories have postulated.

In this sense, the VSM was introduced as a model based on SO that suggest the tasks[21] – presented in two categories of activities, these being the operative or

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[21]   Note: In this work and for the purposes of this theoretical framework we use the generic word "task" to refer to any work or activity to be done, understanding that the VSM makes a distinction among tasks, classifying them as primary and secondary activities, and specifies different roles and functions for each

primary ones and the supportive or secondary ones – and their mutual interactions expressed in the form of a network that connects the different roles and functions (performed by people) and tasks. The particular design of these connections, roles and functions offers an insight into the self-organizing structural arrangements that provides impulse and provides the requisite conditions to (theoretically) generate viable organizations. This model, despite its sophisticated abstractions and definitions of tasks (presented as roles, functions and subsystems) establish a connection with the most traditional use of SO principles in manufacturing, as it revolves and is designed around the basic tasks of one organization (the primary activities). To explore the mechanisms of SO, the study of CAS in biological systems now applies methods for the analysis of evolving networks. This path of analysis also considers the task as the main element that provides the impulse to self-organizing behaviours in communities (e.g. Arcuante et al, 2008).

By following in this route of analysis, this research proposes a Visualizing-Planning Toolset (V-P) – founded on the principles of self-organization – integrating a different set of tools to allow the organization/community to obtain a clear comprehension of the complexity related to their activities. A V-P approach enhances the community/organization's capacity to generate autonomously evolving organizational structures, to cope with the particular demands of their operational environment. To do so, core concepts and basic assumptions are presented in the context of complex adaptive systems. The location of the conceptual theories related with this research, is presented in the next figure (figure 3).

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category of task. The use of "task" as a generic term helps us to relate this work to the terms used to describe SO in the Ant's model, as it does not make any distinction among the activities acting as attractive fields. It also facilitates the creation of parallelisms with the models and theories describing SO (SMWT-SDWT) rated with manufacturing.
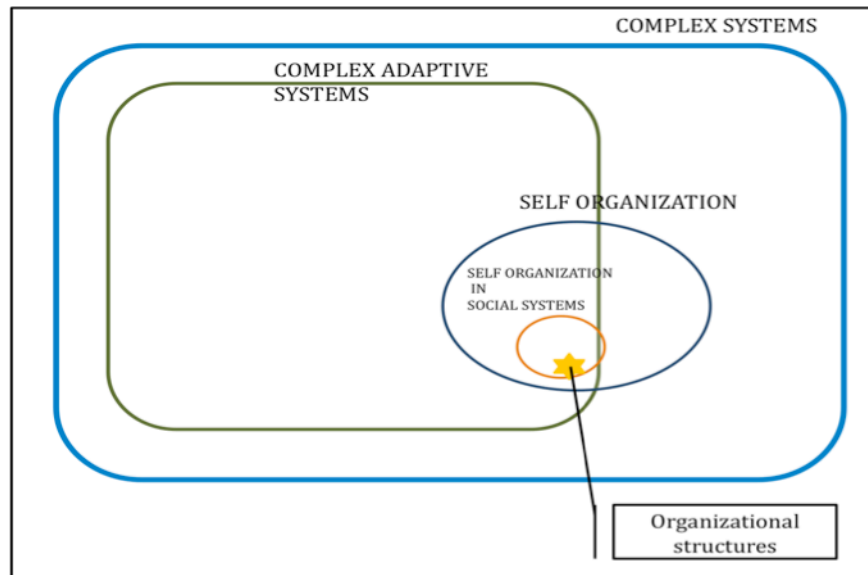
Figure 3. Position of the research topic

4.2.2 Core concepts

To unify the interpretation of theoretical and functional principles presented in this theoretical framework and supporting V-P, the following concepts are of importance:

Organization: This methodology adopts the concept from Ashby (1961: 18) i.e. that *we should define parts as being organized when communication (in some general sense) occurs between them*. This definition makes no reference to any usefulness of the organization, demanding only connectivity between the parts and regularity in behaviour. Ashby explains that this definition of organization has two different interpretations: for example, from the engineer's perspective all organizations are bad ones, as there always exists the possibility of improvements in the performance of the system; and from a biological (evolutionist) perspective, the basic assumption is that all the organizations are good ones, resulting from a natural selection process.

Therefore, it is appropriate to recognize that there is no such thing as a perfect organization, it is always relative to the context and/or the criteria used to

determine the order status of the system, and what is meant by good (organization) must be clearly defined in every case.

In consequence, if the notion of good organization is associated with the ideas of performance and adaptation, from an organizational perspective this study defines order as the (organizational) structure that is capable of fulfilling predetermined operative/functional requirements and goals that need to be achieved at a given time.

Self-Organization: The working definition of self-organisation adopted in this study is:

"A dynamic and adaptive process of communication, choice and mutual adjustment, based on the pursuit of a common goal by the organization members (in this research, a community); where the social system spontaneously develops and maintains an organizational structure, without direct external control".

This definition is based on the ideas of Lunhmann (1986), Kauffman (1993), and Holland (1995). The "structure" refers to the elements defined by Robbins & Judge (2007) as determinants of the description of any organizational arrangement, being 1) Work specialization, 2) Departmentalization, 3) Chain of command, 4) Span of control, 5) Centralization and decentralization, and 6) Formalization. Beer (1966) also describes structure as the assembly of systems and sub-systems that cope with environmental requirements; this definition is more functional and comprehensive, and is the preferred approach in this theoretical framework. With regard to "external control", this indicates an absence of direction, manipulation, interference, or pressures from outside the social system, not excluding data input, as long as these inputs are not control instructions.

The identification of the boundary of the social system is extremely important and is related to their functional-operational characteristics. In that sense, the operative social unit of study will be understood as the group of people actively linked to the execution of a particular task – social network into the operative activities of the community. In consequence, passive members not associated in any way to the

execution of the identified tasks will be considered external to the system, unless the observation in field indicates the contrary; therefore, this definition of boundaries will be reconsidered.

Self-control: A systems ability to control itself, including setting and adjusting its own goals, as well as autonomous adaptation (Schwaninger 2006).

Self-transformation: Refers to the ability of a system to reorganize and restructure itself (Espejo et al 1996, Schwaninger 2006).

Self-steering: Describes the system's capacity to determine internally the path of action or route to follow.

Self-reference: this term refers to the capacity of a system (community) to reflect upon what it does, and deal with aspects such as its identity, values, purpose, goals, and tasks or activities (Espejo et-al 1996, Schwaninger 2006). Beer (1979) uses the term 'self-consciousness' to describe the capacity of a system to compare itself (or the image of itself) with its immediate context. He also indicates that this is a necessary capability of meta-systemic management. In contraposition, he introduces the concept self-image to describe the capacity of individuals to visualize, locate, and create a picture of themselves into the context of a group or organization. This last term is equivalent to 'self-observation', as used by Klabbers (1986).

Viable: Beer (1985) describes a viable organization as one that can survive in a particular sort of environment, is able to maintain a separate existence and in consequence enjoys some kind of autonomy. Although, its existence is never independent of other existences, even though the organization has a separate identity.

Recursion: Beer (1985) defines recursion as the (structural) next level, that contains all the levels below it.

Invariant: A factor in a complicated situation that is unaffected by all the changes surrounding it (e.g. the speed of light). This concept must not be confused with **homeostasis** that is defined by Beer (1985) as a property of the system's internal environment to remain stable, despite the system having to cope with an unpredictable external environment.

Community: The theory of community, as explained by Smith (2001), presents many different descriptive categories often difficult to separate. A group of descriptions (community of area; interest; and communion) describes community as a group of people sharing a common characteristic (location; practice or identity; or attachment to a place, group or idea). A second category describes community as a network and a social system. Thus, from the understanding that people living close to one another do not necessarily interact, the traditional descriptions of community (associated geographical areas) are not realistic nor do they explain how individuals create links and evolve to form social (functional) systems. Therefore, this approach explains the creation of groups from the characteristics of the individuals and their connectivity-attachment to a particular social network.

With a functional approach, Lave & Wenger (1991) use the concept of communities of practice, to refer to an organizational phenomenon where social groupings occur, thanks to the desire to transfer skills and practices from one member to another. In a wider sense, a community of practice is also described as a social entity whose members are bound together, with a mutual understanding of a problem or issue, and a desire and commitment to solve it.

In consequence, the definition of communities of practice represents a leading edge in organizational development, connecting with more developed theories of organizational behaviour, closely related with the actual interest in the analysis of connectivity and social networks.

Because of the variety and the amplitude of scope present in the existing definitions of community, it is not clear how to operationalize this concept in the context of this research. For this reason, in this framework we adopt the Arrow et al

(2000) definition of community: a group of people with a common interest, creating links, in the form of interactions and communications where not all the members participate actively and simultaneously. Therefore, a community or social system is an aggregation of multiple interconnected small groups sharing a common interest, but with different functions, showing complex, adaptive, dynamic, coordinated, and delineated relations amongst members, tasks, and tools.

Functional Group: We can relate this concept to the definition of roles and functions and the different subsystems in the VSM. The functional group might be defined as a network of members-tasks-resources tasked with performing an activity and/or responsible for achieving a goal. In simple terms it can be described as the group of people who are in charge of one task. In this sense the functional group would be closely related to the operative working groups (VSM – S1).

4.3 THE VISUALIZATION-PLANNING TOOLSET (V-P)

Understanding social systems as a CAS, this framework (V-P) uses the principles of SO explained previously. Specifically, the elements facilitating SO in social systems described by Beer (1979, 1985), Latane (1981), Varela (1984), Klabbers (1986), Holland (1995), and Arcaute et al (2008); which are incorporated into different stages, to provide the adequate communicational and cognitive conditions to facilitate self-organizing processes.

Some relevant features common to almost all the most developed of these models and methodologies to explain and facilitate SO are: the generation of an internal model of itself - as clearly described by Varela (1984) as primordial for SO behaviour to occur. The juxtaposition of this internal model with a model of the external conditions generates global awareness or consciousness of the state of the organization's components (self-reference / self-conscisiousness). This favours the creation of an autonomous coordinated decision-making process (self-organization), as described by Klabbers (1986) and more completely by Beer

(1979,1985). Additionally, this mechanism of self-reference facilitates SO when it occurs within a recursive organizational structure (Beer 1979, 1985; Varela 1984; Klabbers 1986), the identification and definition of tasks as a key element to trigger the self-organizing process being its most important outcome, as insinuated by Arcaute et al (2008).

In addition, to complement the design of this theoretical framework, the principles of SO suggested by Latane[22] (1981) and Klabbers[23] (1986) are incorporated, in particular, the suggestion of providing information management tools to generate a common global understanding of issues affecting the social system (self-reference).

Through the generation of shared – organizational – knowledge produced by the use of the V-P, the expected outcome is the emerging capacity for abstraction: providing the individuals with the faculty to observe the organization from different perspectives (the other person perspective) and to make individual decisions in harmony with the unknown (but most probable) decisions of the other group members as suggested by Klabbers (1986).

Since the SO processes are related to connectivity amongst individuals, and the shared use of – informal – information systems; the basic assumption of this framework is that the self-organization process in communities is mainly a communicational phenomenon affected by the communicational structures, through learning and shared understanding.

To support the basic assumption of this framework, it relies on the fact that most of the methodologies that have been designed to facilitate the self-organizing process, affect at some level the dynamic, context, and environment of the

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[22] Dynamic Social Impact Theory (DSIT). Based on the network and communication theories, suggest that SO can be driven in social groups towards a particular consensual form, if the connectivity – centrality properties such as strength, immediacy and numbers – is manipulated. The DSIT offers guidance about how to manipulate connectivity.

[23] Suggest that information management tools increase self-steering while providing global awareness in social groups and, stimulate switching perspectives making possible the understanding of the social system from different roles, responsibilities and positions.

communications; either controlling the flux of information and the communicational channels (e.g. Klabbers 1986; Latane 1981), or just providing the adequate communicational space to facilitate social interactions (e.g. AGIL-SCRUM/ Takeuchi & Nonaka, 1986; Ostrom, 1995; Sociocracy/ Buck & Endemburg, 2004, KALIF/ Haldane & Bond, 2004).

Consequently, this framework offers not just the development of tools to facilitate the emergence of organizational structures that catalyze SO in communities, and the introduction of the notion of awareness and self-reference through the use of mechanisms of information management, but the function of planning that provides long term viability to the organization (and not reactive responses as typically occurs with self-organizing processes), all founded in the VSM architecture.

Finally, with regard to the application of the principles of organizational learning considered in the design of the V-P, some relevant elements of the theory developed by Argyris & Schon (1978) were adopted, while presenting synergies with the cybernetic and SO theories, as described by Espejo et al (1996).

The elements of the Argyris & Schon's theory considered in this theoretical framework are: the single (learning) loop described as the operationalization of given instructions, goals, rules or values; where error–and-correction processes are used as balancing mechanism. This single loop learning can be identified with responsive organizational structures where dominant roles and functions of command and control prime, as its main function is to detect and correct deviations. The double loop (learning) occurs when error is detected and corrected in ways that involve the modification of the organization's underlying norms, policies, objectives, interactions and ultimately – if the process of individual and group learning is embodied in the culture of the organization – the ethos underpinning the organizational structure (in coincidence with the meta-systemic – management – roles and functions of the S3, S4 & S5 in the VSM. Espejo et al, 1996).

Argyris & Schon (1978) also suggest the Models I and II (Appendix 7) which are descriptions of the mindsets – in relation with Holland's description of internal models – that facilitate any of the learning loops into the organization. They also consider as desirable the adoption of the Model II description of social virtues and behavioural patterns, that this model always encourages a change of behaviour that makes the single- and double-loop learning for individuals easy in their organizational environment. This is done in Model II through encouraging feedback, awareness of other people activity, awareness of one's own activity and self-reflection as it is presented in the six stages of their intervention strategy.

In consequence, if the (organizational) learning processes are deeply related to actions taken by individuals based on a common understanding and sharing of the same mental model, the result of their interactions is an adaptation to environmental changes via organizational structure and/or ethos modifications[24]. Hence, it must be possible to identify evident links connecting these theories with self-organizing processes in social systems (communities): Espejo et al (1996) explained how the organizational learning loops are associated with autonomy and ultimately, with spontaneous coordination of activities due to the shared mental model inside the organization.

The application of these principles (mental models, organizational learning – Model II – task recognition, information management) is evident in the V-P visualization and the planning loops, where elements of Model II are introduced, as will be described in the following sections of this chapter.

To conclude, considering that SO is related with communications and the creation of a shared mental model of the organization, the hypotheses of this research is reformulated and presented as:

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[24] The sharing of mental models also requires the models to be made explicit (Espejo et al 1996). There are some difficulties to making mental models explicit; some of them can be in the transduction, transducers, and channel capacity. The most efficient solution to avoid/solve such problems is related with the change in the structure – creation of effective structures – of the organization, particularly inducing the reduction of the distance among the individuals involved, making redundant the transmission of information and amplifying the capacity of the channels (Beer 1979).

To transcend the nature of reactive response of the self-organizing processes, the articulation of internal/mental models and efficient organizational structure is necessary, being noticeable through the capacity to articulate collectively (through emergent organizational structures) a perdurable (viable) task model.

4.3.1 The Visualizing Loop.

The purpose of the visualizing loop is to unify the understanding of the organizational structure in the intervened organization, through the creation of a shared mental model of the organization. To do so, the VSM is presented as the most complete language capable to cope with the description of the organizational complexity (the activities and structural changes) of one community. This loop consists of four steps (figure 4) where different tools and techniques are used, as will be next explained in detail.

The first step in this loop corresponds to the complete description of the organizational structure to be generated through the introduction of the VSM and its subsequent use in the organizational diagnosis – to be done by the members of the observed community with the support of a VSM external advisor(s). These activities (VSM introduction and diagnosis) constitute the core elements of individual and collective (organizational) learning; as they demand the acquisition of a new descriptive and unified language (VSM) and the application of such new jargon to individually reflect, and collectively, describe – and self-reflect about – the organization. This is an iterative process where the external advisor facilitates both individual and collective learning. In its most advanced form after the introduction of VSM basic concepts, this iterative open and participative process of dialog allows the expression of the plurality and richness of perceptions that the community may have of itself. The main goal of each iteration is to produce at the end a co-created unified model of their organization – ultimately constituting their shared mental model.

Throughout this process, a set of descriptive documents were produced by the community, to facilitate the individual and collective acquisition of the VSM concepts, some of them can be appropriations of the VSM concepts, others may constitute the first descriptions of the organization and finally (ideally) the creation of a VSM manual that describes the VSM in their own terms.
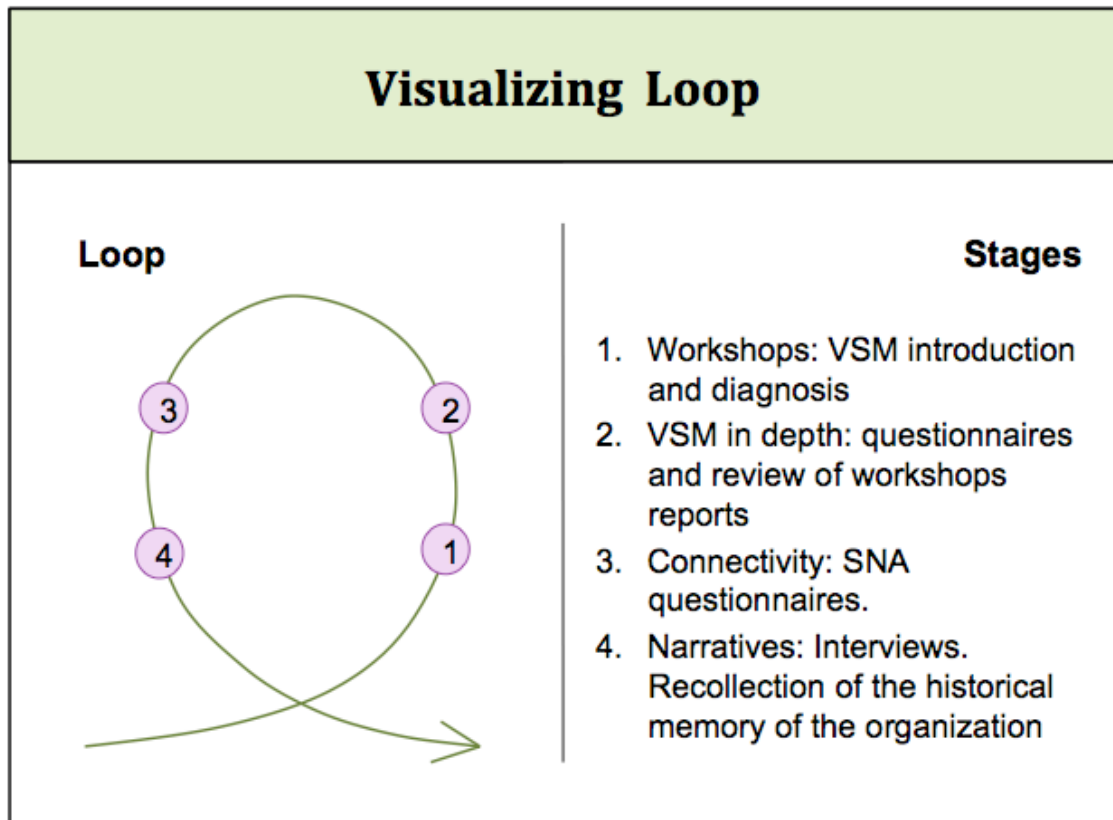
Figure 4. The Visualization Loop

To introduce the VSM[25], the manual produced by Walker (2006) was used as a text for reference and supportive material in all the workshops. The manual summarizes the physiological foundations in which the VSM was inspired, while explaining how the VSM is an abstraction of the human neural system focusing on the components that ensure viability and effective coordination for the principal functions of the body (described as operations).

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[25]   See appendix 6

With regard to the concept of viability (as the ultimate function of an organization) Beer (1985) explains that a viable organization is one that can survive as a separate – and at some extent, autonomous – entity in a particular sort of environment. The separated existence is never independent of other existences, as the organization maintains ties with other organizations and the environment; therefore, the separated existence that provides viability also requires elements that preserve the individual character and help to establish the boundaries of the organization (its identity). In consequence, one of the first and most relevant issues to attend in the design of a viable organization is the definition (and/or recognition) of the identity of the organization[26].

When transferring the structures from the neural system to organizations, the components of the neural system and their functions[27] are listed as the environment, the operations (S1) and the meta-system functions (S2 – conflict resolution and stability; S3 – internal regulation, synergy; S4 – adaptation, future planning, strategy; and S5 – policy and identity). The role of the meta-system function is to provide support (services) to the operational units in the form of interconnections aimed to facilitate the coordination, optimization and future planning. These functions are aimed to ensure that the organization as a whole will be able to adapt to a changing environment and to ensure all the various parts are working within the same basic ground rules.

Beer (1985) describes the (existence of these) supportive activities, their interconnections and links with the operative units as invariant and archetypal for all viable organizations. He also affirms that it is the viability that differentiates the primary from the secondary activities, since each primary activity (S1) is defined as a viable system itself, being contained into another viable system. From this

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[26]   Notice that the definition of identity (boundaries and purpose of the organization) is the first step in the diagnostic methodology and the first issue of the introduction to the VSM. The systemic closure is achieved as the last VSM system (S5) defines and preserves the identity of the organization.

[27]   The cortex – S5: higher brain functions; the diencephalon – S4: input from senses and future planning; the base brain and medulla – S3: internal regulation and optimization; the sympathetic nervous system – S2: stabilize the function of organs and muscles; and muscles and organs – S1: operations, primary activities

description the concept of recursion is presented as inside the primary activities, secondary activities are presented showing the same invariable pattern of interconnections described for the system in which they are contained (revisit appendix 6).

Next, the meta-system functions are introduced taking in consideration, that to provide its services to the operative units (S1) the meta-system creates a model of the organization. The creation of this model demands the discrimination of two different categories of information: 1) The internal view of the organization, composed of data describing the interconnections, functioning and performance of all the operative groups. This information is used to get them to work together in mutually beneficial ways and to resolve conflicts (synthesized as the "here and now" and performed by the S2 and S3). 2) The external view is the collection of information from the external environment, used to assess the threats and opportunities and make plans to ensure that the organization can react and adapt to fit with the external environment and remain viable (defined as the "there and then" and performed by the S4). Hence, the planning and risk assessment is possible by the comparison and contrast of the actualized status of the organization (the here and now) against the information of the external environment (the there and then), producing as a result, a complete representation of the organization and its environment[28]. Finally, the identity of the organization is preserved through the establishment of common principles, values and rules that define the ultimate mechanism of control for the activities of the community.

To conclude the introduction of the VSM, the (ideal) connections amongst the different functional groups (operations and supportive activities) are explained as follows:

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[28]   At this point the organization has created a model of itself. This representation has implications with organizational learning process and the steps described by Argyris and Schon (1978) in their Intervention strategy. To some extent the exercise of strategic planning can be suggested as an intervention, as it involves the creation of a model, testing the model running different scenarios, identifying gaps and finally, making a decision and implement change – steps that will be developed further in this framework.

The operative groups (S1) are connected with their immediate external environment. These operative groups (or some of them) are also interconnected as they might perform sequential or interdependent activities – therefore they will need to share operative information. To coordinate the general activity of all the operative groups, they should be connected to S2, which is the structure that centralizes their activity, reports and regulates the flow of information amongst them, in order to resolve or avoid conflict and optimizes efficiency by providing administrative support (e.g. S2 can generate timetables to plan the use of shared facilities).

Each operative group is also connected with S3, which function is to administrate and allocate resources efficiently, synchronize the activities, transmit operational instructions derived from the strategic planning, to each group and do the accountability of task completion and corporate norms and procedures by monitoring the interaction of S1 and S2 (It implies that S2 is also connected with S3).

S3 does the consolidation of the operational activity and creates a picture of the actual situation of the organization. This representation of the "here and now" is transferred to S4, to be used as referral to filter external information and detect relevant information coming from the external environment. The interaction of the S3 and S4, generates the strategic plan and produces the instructions needed to react, adapt and fit with the changing external environment (therefore S3 and S4 should be connected). To ensure that the decisions and analysis drawn by S3 and S4 are in concordance with the values, ruling principles and identity of the organization, their interaction is monitored by S5, via the connection with S4.

Once the introduction of the VSM is complete, the diagnosis is carried out. In this case following as a guide, the methodology suggested by Espejo et al (1996, 1999) described as follows:

- The VIPLAN (VSM diagnostic) methodology

Following Espejo, Bowling & Hoverstadt (1999), the VSM will be used as a tool to model an organization's structure. To do the diagnostic of the organization different sequential steps are considered:

1. Establishing the organizational identity.
2. Modelling structural activities.
3. Unfolding complexity: Modelling structural levels.
4. Modelling distribution of discretion.
5. Modelling the organizational structure: study, diagnosis and design of regulatory mechanisms (adaptation and cohesion).

To explore the first element (organizational identity) the identification of what the organization does is necessary, in the form of a highly descriptive statement of the organization as a total system. It is feasible to explain these issues as such:

- Transformation: What input is converted into what output?
- Actors: Who is involved in carrying out the activities entailed by the transformation?
- Suppliers: Who are the suppliers of the inputs to the transformation?
- Customers: Who are the ones receiving the outputs of the transformation?
- Owners: Who in the system has an overview of its transformation?
- Interveners: Who, from the outside is defining the context of the system information?

Concerning the structural modelling, its purpose is to start to examine the propositions or hypotheses of the way the organization is managing all of its operations. The intention is to create a model of how the organization relates to the complexity of its operations and its environment; it allows us to view the organization's complexity in different ways and to break down that complexity from different perspectives.

The next step – unfolding complexity – in organizational terms, refers to the business processes, where its large complexity suggests the need for autonomous units responsible for each of the processes or activities, with the possible benefit of autonomous management. Then, the recognition of autonomous units operating within autonomous units is necessary. To cope with complex tasks, people interact with each other and new units may emerge. These emergent or constituted autonomous units in the VSM are called primary activities or system(s) 1. Therefore, a given primary activity may have primary activities or divisions within itself, and these primary activities may have primary activities – strategic business units – or division within itself and so on so forth, until arriving at the individual, the indivisible operational unit in the organization. Applying this procedure, the result is a model of the recursive structure of the organization.

The distribution of discretion refers to the discretionary resources and functions within each primary activity; it can be modelled using a table or recursions against functions. The intension is to identify if each recursion has discretion over a minimum number of systemically required functions.

To create a model of the organizational structure, a template of the VSM is used mapping out the primary activities, the supportive activities and the resources and communication channels, with emphasis in: interaction between primary activities, interactions with the environment of the primary activities, corporate intervention, resources bargaining, monitoring, and co-ordination.

This diagnosis can take several interactions within the organization, varying from workshops to the inspection of files and archives where evidence of organizational change can be found. From the identification of gaps, between the observed and the theoretical VSM model (Beer 1979) an interpretation of the organizational structure and its influence in the facilitation of self-organizing behaviour can be carried out, with the use of the principles of self-organization described in the

theoretical framework of this research[29].

 The second step corresponds to the exploration in depth, of the organizational structures – to complement the VSM diagnosis – present in the different stages of evolution of the organization since its early beginnings and up to the moment when the VSM facilitation starts[30]. The data used to create these first representation of the organizational structure, is collected with the use of questionnaires[31], and a close inspection of the reports generated in the different workshops realized throughout the VSM facilitation sessions.

Step three is dedicated to the collection of information for the Social Network Analysis (SNA) which main characteristics are described as follows:
The social structure according to Freeman (1998) and Hammer (1999/80), make reference to patterning in social relationships that tend to persist during a period of time. Therefore, organizations can be understood as a group of individuals interconnected as members of social networks interpreting, creating, sharing and acting on information and knowledge exchange.

This network approach allows us to define organizational structure as a form of repetitive pattern of connections and interdependencies amongst the members in any given organization. These patterns of connection and interdependencies may evolve through links, that may reflect the formal organization defined by authority links (who reports to whom), or the informal organization defined by actual communication and information exchange (who communicates with whom); it also reflects the structuring and flow of work (who depends on whom), or the social

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[29]   Note: The items in *Italics* in the list of steps of the VIPLAN methodology are the ones preferred to identify elements of SO in this framework. The matrix to model the distribution of discretion is presented in the analysis of SO in the next chapter.
[30]   The intention of this practice is to have an idea of the evolution and drift of the organizational structure up to the moment of the intervention and make accountable the possible variations that the introduction of the VSM can induce in terms of changes in the trends of the existing organizational drift. It also can provides insights of path-dependence and co-evolving behaviour in the structural changes.
[31] The questionnaires used in this research were designed to collect information about the VSM structure and the network structure of the organization. They were applied at the moment of the in-house advisory and tutoring (Appendix 9).

relationships (who likes whom, etc) (Galbrait, 1973; O'Reilly & Roberts, 1977; Tichy, Tushman & Fombrun, 1979).

The SNA has been tested as a relevant tool for describing organizations and for measuring the effects of organization systems. The way in which the social network is represented is based on Graphs theory, representing relations as nodes and links; where, depending on the level of analysis the nodes may represent entities such as people, technology, groups, or firms (Zack, 2000). O'Reilly & Roberts (1977), and Tichy, Turshman & Fombrun (1979) affirm that SNA is central to the field of structural enquiry, and represents an adequate method for guiding data collection and analysis of groups (inside organizations) when the focus is the variance of patterns of interaction over time.

About the analytical possibilities of the SNA, Burt (1991) describes two main perspectives to be addressed by SNA: Boundaries and Positional. Boundaries referring to how individuals are clustered, based on their patterns of relationship with two major views or traditions, the relational and the positional, described in table 3.

The relational approach suggests that organizational systems may affect the ability of people in the organization to connect and communicate with one another, implicating that greater connectivity and communication will improve organizational performance.

The positional approach clusters those who have similar patterns of relations with others, even if those people do not have direct relations with each other. A person's pattern of relations is called a 'role set'. For instance, this line of analysis will put together department chiefs, not because they interact with each other, but because they share similar patterns of interaction with similar others; that is, they share similar positions or roles.

	Boundaries in Social Structures	
	Relational	Positional
Clusters based on:	Cohesion	Structural similarity
Key measure:	Tie strength and density	Tie similarity
Belief sharing based on:	Interaction with similar others creates shared beliefs among the cluster members	Playing similar roles creates shared beliefs among those in the same role position
Key implication for organizational systems:	-Impact of technology on the ability to connect and communicate with others -Impact of the technology on quality, distribution, nature etc. of existing ties -Impact of beliefs about a system on the use of technology to make connections -Impact of existing relations of using technology for making new connections	-Impact of the technology on the function of existing social and communication roles -Impact on the technology on the distribution and structure of existing social and communication roles -Impact of existing beliefs on using technology to change roles -Impact of existing beliefs on using technology to change role structures

Table 3. Analytical perspectives of SNA analysis. Modified from Burt (1991).

To gain in the understanding of the different expressions of structure in a network, the most common approach is the use of descriptive indices that quantify the presence or absence of a particular structural feature. Butts (2008), grouped these indices as they may describe either the structure that is local to a particular entity (the node level indices), or may measure structural features of the network as a whole (the Graph level indices). Hanneman and Riddle (2005) explain the most commonly used indices as follows:

Node-level indices:
- Centrality indices: These are descriptive indices designed to capture the extent to which one node occupies a more central position than another. The four most commonly used centrality measures are:
  • Degree: This measure indicates the size of the neighbourhood of the focal node; in other words, the number of nodes connected to one particular node. This can indicate the level of their exposure to what is flowing through the network
  • Betweeness: Quantifies the extent to which the focal node lies on a large number of shortest paths between various third parties; thus, high-betweeness nodes tend to act as 'boundary spanners', bridging groups that are otherwise distantly connected, if at all. It can be interpreted as the index

of potential for a node to play the role of gatekeeper, broker or flow controller and can also indicate the potential of a node to unite or separate entire sections of the network.

- Closeness describes the extent to which the focal node has short paths to all other nodes within the graph. It can be understood as one indicator of the expected time until arrival, to whatever flows through the network of a given node.

- Eigenvector Centrality: This index describes how a well-connected node is connected to other well-connected nodes. It tends to identify contacts amongst large subgroups or cliques.

- Graph Indices: They quantify structural properties of the network as a whole, describing many different features of the network. One of these categories of indices is the sub-graph census statistics, which are defined generically as the number of induced sub-graphs of size *n* contained within the graph. Among these indices are:

  - Density: This describes the degree of dyadic connections in one population.

  - Transitivity: Describes the degree of triads in one population. There are four possible types of triadic relations (no ties, one tie, two ties, or all three ties). The index counts of the relative prevalence of these four types of relations across all possible triples (that is a "triad census"), can give a good sense of the extent to which a population is characterized by "isolation," "couples only," "structural holes" (i.e. where one actor is connected to two others, who are not connected to each other), or "clusters."

  Those measuring hierarchy and symmetry compose a different group of graph indices. Hierarchy is based in the concept of asymmetry (it is the expression of directed connections where the links tend to flow mainly in one direction); as such, hierarchy is defined within a directed context. When considering local structure (e.g. dyadic), hierarchy is identified as the inverse concept of reciprocity. Therefore, the most used index to calculate this property is reciprocity:

  - Reciprocity: Is calculated with the use of a directed dyadic data and describes

four possible relations: the nodes A and B are not connected, A sends to B, B sends to A, or A and B send to each other. What is interesting to observe, is the extent to which ties are reciprocated or not, as it may indicate hierarchies and concentration of flows or information and power.

For Freeman (1979), and Freeman, Roeder & Mulholland (1980) a dominant concept of SNA is centrality. Actors are more central, to the extent they have more relations with more members of the network, play a role that is more connected to other roles, are higher in the hierarchy, have a greater range of ties, and are more tied to non-connected others. In accordance with their description, a network is more centralized to the extent that the distribution of individual actor centrality is skewed towards a small number of individual members. If all members of a network are well connected (to one another), then the network is totally decentralized and the relations of power and control more distributed in the network.

The purpose of the SNA in this framework is to identify key actors, as they may induce alterations to the global structure of the network and consequently, affect the cohesion and viability of the organization. To do it, this framework will use preferentially the measurements of degree centrality (with observations on the in-degree and out degree to detect concentration in the flows of information) and betweeness, as suggested by Freeman (1977) and Bogatti (2006). In addition, Ortiz-Arrollo & Hussein (2008), and Cheliotis (2010) suggest also the measurement of eigenvector centrality and closeness, and global indices of reciprocity and density to estimate changes through time in the structure of the network.

The data needed to do the SNA is collected using questionnaires designed to track the connections between supportive and operational functions. These questionnaires are applied to all the persons related with the administration of operations and/or decision-making roles in each of the existing functional groups (VSM S1-S5). To extend the scope of the SNA analysis, these questionnaires are modified to collect information about the network structure at three different

moments, the time previous to the introduction of the VSM, at the moment of the in-house coaching, and six months after the in-house advisory and tutoring.

The fourth step corresponds to the collection of narratives via interviews applied to key persons in the community during the last intervention stage. These key persons are selected based on their knowledge and participation in the creation of the organizational structure of the organization. The method to be used to select the interviewees should follow a cascade model where an initial key person (the original promoter of the organization's project), subsequent to being interviewed, suggests the name(s) of the next possible interviewee(s) based on his appreciation of the suggested interview candidate(s) about his participation in, and knowledge of critical events that affected the evolution of the organization's structure.

The process is repeated with every interviewee until most of the names of the possible interview candidates are referred repeatedly, indicating that all - or almost all – the persons with deep knowledge and relevant information were included in the survey. The interviews are transcribed to be used in a further analytical stage. The main application of this information is to provide context for the interpretation of the VSM diagnosis and SNA. Following Snowden (2001), the narrative analysis will provide insights about key issues affecting the structure and culture of the organization; allow identifying key actors, and revealing behavioural patterns (path-dependence, co-evolution).

4.4.2 The Planning Loop

The planning loop acts as a continuation of the visualizing loop. Revisiting the data collected in the previous stage, analytic techniques are applied to reveal the information contained in the data. Whenever this first attempt to analyze data is done partially with/by the community, it generates awareness in the community of their own organizational structures and processes. This awakening is facilitated through the workshop reports. These documents make explicit the outcomes of the VSM diagnosis; inducing the community to reflect about the concepts transferred to them in the workshops and the identified problems and possible solutions

concluding with suggestions for organizational changes required to develop a viable structure.

A double nature exists in some of the analytical techniques introduced in each step of this loop. Initially, from the researcher's perspective, these analytical techniques operate purely as research-external observational and interpretive procedures. Whereas, from the community perspective some of these analytical techniques operate as instruments for introspection, which consequence might affect the SO dynamic of the organization. A detailed description of each of the four steps and the – dual – nature of the analytical techniques applied is presented next (figure 5).

The first step – carried out at the second and the final intervention stages of this study – corresponds to the appropriation of the VSM by the organization members. Here the facilitators-researchers act as observers of the self-diagnosing capacity of the community, evaluating the appropriation of concepts by the community and the existence (or not) of a common/unified set of conventions (language) in this process, identifying and providing insights to solve the difficulties and necessities of new training or additional information. The measurability of this step is provided by the self-created interpretations of the VSM by the community – and their initial diagnostics. The creation of these documents are consensual processes, in which the definition of the details, content, scope and format in which the description (model of themselves) is presented implies that the community should agree with 1) the model created, 2) the terms and format used to make the description, and 3) the meaning of the information presented in the model/description. The achievement of these multiple agreements comes from a process in which the community should revisit, reformulate and finally arrive at a unified basic understanding of themselves as an organization, which is also the expression of the assisted (because the external advisors) development of an indigenous method of organizational abstraction that is going to be useful in more elaborated stages of the V-P and ultimately, a source of future organizational autonomy.

Planning Loop

Loop	Stages
(diagram)	1. VSM Appropriation 2. SNA: identification of communities. Measurement of centrality (degree and betweeness) 3. Articulation of the SNA with the narrative analysis. Use of Holland, Klabbers and Arcaute et al principles of SO 4. Adaptation: Creation of adaptive structures to cope with identified problems. Self-organization in action.

Figure 5. The Planning Loop

In step 2 – carried out in the final intervention stage – the data collected is classified and organized to run the analytical routines of the SNA (with the use of UCINET). The selected analytical routines are run to identify groups, key actors and to describe centrality properties (such as degree, betweeness, eigen centrality) of the social network in the different network times analyzed (pre, during and post intervention) and presented as graphs and matrices of data.

The third step – performed in the last intervention stage – captures the outcomes of the second step and for each analytical perspective an interpretive analysis can be done. From the observer's point of view, the description of connectivity provided by the SNA can be enriched with the use of Latane's principles of self-organization and stabilization of social networks (that is, the understanding of the role of key actors and their level of influence in the network). The outcome is contextualized within the narrative explaining the evolution of the organizational structure of the organization. Here for instance, the measurement of centrality properties (e.g.

measurement of betweeness and degree), and its persistence over time may evidence stability of network configurations.

From the community perspective, the contextualization of results coming from analytical routines using the narratives validates (or not) the community's perception of key actors in the critical moments of the organization. The quantitative analyses can make evident and describe in detail the position and level of influence of key players in the network. This descriptive and quantitative representation may present gaps and coincidences with the key players reported in the narratives, and a similar situation may occur with the conformation of groups, as perceived by the community and the communities detected by the SNA inside the network. These differences and/or coincidences may initiate reflective processes and expand both the individual and group comprehension of the affiliations existing in the community, its possible evolving causes and their functionality. They may also point out opportunities for more focal explorations that will help to explain how the organization reacts to environmental challenges. This step in conjunction with the first one offers to the community the opportunity to build a contextualized model of their organization and explore different alternatives to cope with detected structural deficiencies.

The forth step corresponds to the evaluation (for possible introduction) of new organizational arrangements, the application of selected strategies to enhance SO and the introduction or elimination of regulatory measures to affect the social dynamic of the community. As a continuation of the previous step, this stage is an invitation to share with the community the conclusions and ideas emerging from the previous analysis, allowing them to create logical links with these ideas and their knowledge, gained from the application of the introduced tools in these visualizing and planning loops. The final step then is, the creation of responsive mechanisms (organizational structures) by the community, with the recommended use of elements coming from the VSM. The measurable elements of this step are the number of emergent structures and actions taken autonomously by the organization, to achieve a more stable organizational structure.

The visualization and the planning loops are not discrete, but simultaneous and interdependent events. Therefore, the adequate representation of the process is one where the diagnostic and data collection practices are embodied into the analytical and interpretive procedures. Consequently, the graphic that better describes the relationship of these two loops is presented next (figure 6).
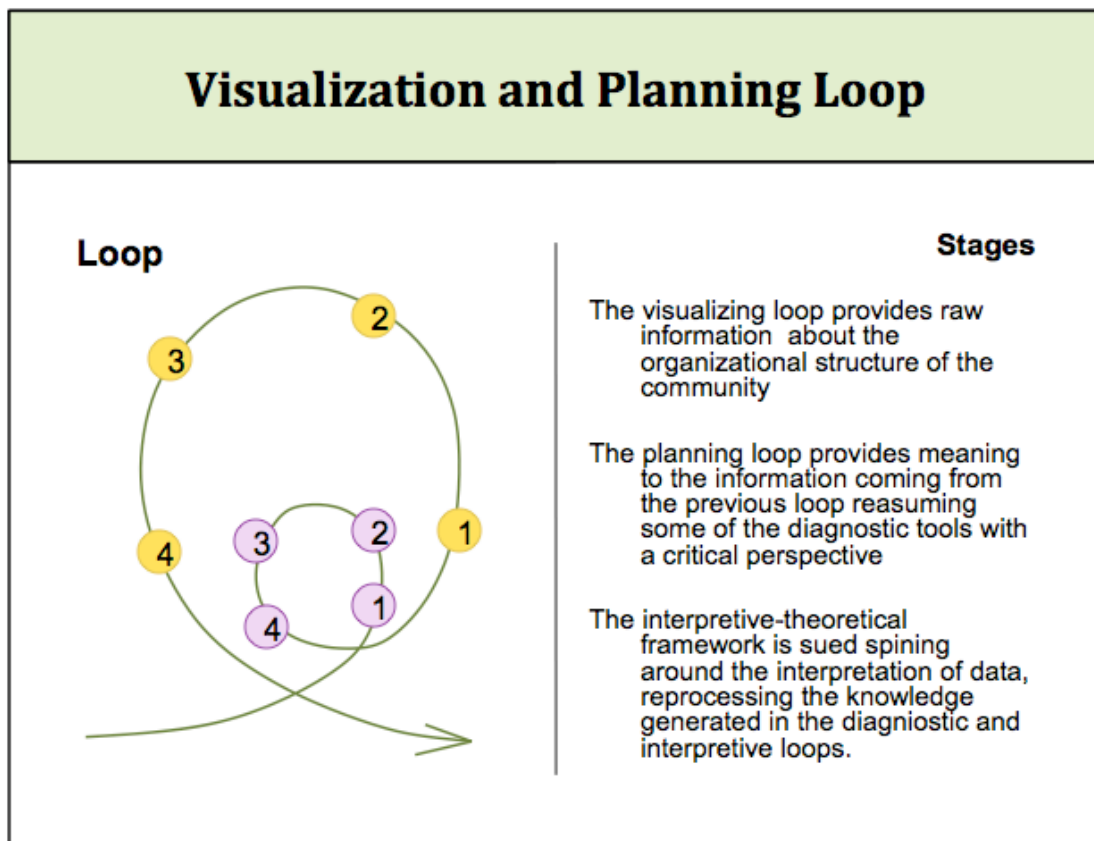
Figure 6. Integration of the visualization and planning loops.

4.4.3 The Reflective – Critical Loop

The reflective-critical loop corresponds to the creation of the CS report. The results are presented following the linear narrative describing the history of the organization, with emphasis on the evolution of their organizational structure. The stages of this loop are presented graphically in figure 7 and explained next.

The first stage is the creation of the narrative produced and is the consolidation of all the interviews, observations and archive data collected during the in-house coaching. The collection of information encourages the interviewees to think back to the episodes in which they participated and the situations that shaped the evolution of the structure of the community. In the consolidation of these experiences, the existence of cross references with regard to particular events are valued, as they have the potential to confirm and validate the factual content of the different narratives. These stories can be completed and contextualized in time with historic records originating from files in the organization, to make the linear description as accurate as possible.

In the second stage, the results of the VSM and SNA diagnostics are integrated and incorporated upon the narrative, presented graphically and adding the necessary explanations and descriptions in detail as part of the main historical narrative. The integration of the VSM with the results coming from the observations of centrality (SNA. e.g. eigenvector centrality, degree and betweeness) facilitate the allocation of the key actors of the SNA network, within the network of roles and functions described by the VSM. This is done by listing the identified key actors with the use of SNA – and their different values of centrality indices – and placing them in the different functional groups reported by the community as operative or supportive in their VSM description of the organization.

This superposition of SNA key actors with the players of relevant roles and functions in the VSM, allows the identification of coincidences and gaps in the description of the structure of the organization and ultimately, gaps in the perception of flows of communications and control. The values of the different centrality indices for the individual and group concentration of control in the flows of information when contextualized in the VSM, may identify dysfunctional ties (e.g. lack of connections, misallocation of centrality, excessive concentration of flux of information in a particular role – ultimately, concentration of power) and/or assertive configurations of the network that provides (or not) viability to the

community (e.g. good distribution of control, good interconnection of all the functional groups as described by the VSM).

The changes over time in the values of centrality for the network can reflect improvements in the distribution of power (e.g. fewer individuals with high connectivity in the SNA coinciding with a better distribution of group values of centrality in the different functional groups in the VSM) and provide insights into the impact of the use of the VSM to facilitate SO. Therefore, it can be argued that the introduction of the principles of SO – through the use of the VSM – and the creation of a shared mental model, generates a better distribution of information and a better recognition of tasks – with its consequent improved distribution of resources and increments in efficiency – that can be evidenced by the coincidences between the identification of subgroups (from the SNA) with the groups within the structure of the VSM. Ergo, the combined use of the VSM and SNA offers the possibility to create parallelisms with the ants' model and validate (or not) the application of the basic suppositions of the ants' model (Arcaute et al, 2008) in human societies.

Reflective Loop

Loop

Stages

1. Creation of the narrative
2. Inclusion and contextualization of the VSM and SNA
3. Self-organization interpretation: evaluation of each stage using the principles of Self-organization described in the framework
4. Socialization of results. Critical analysis of the research (new beginning?)…
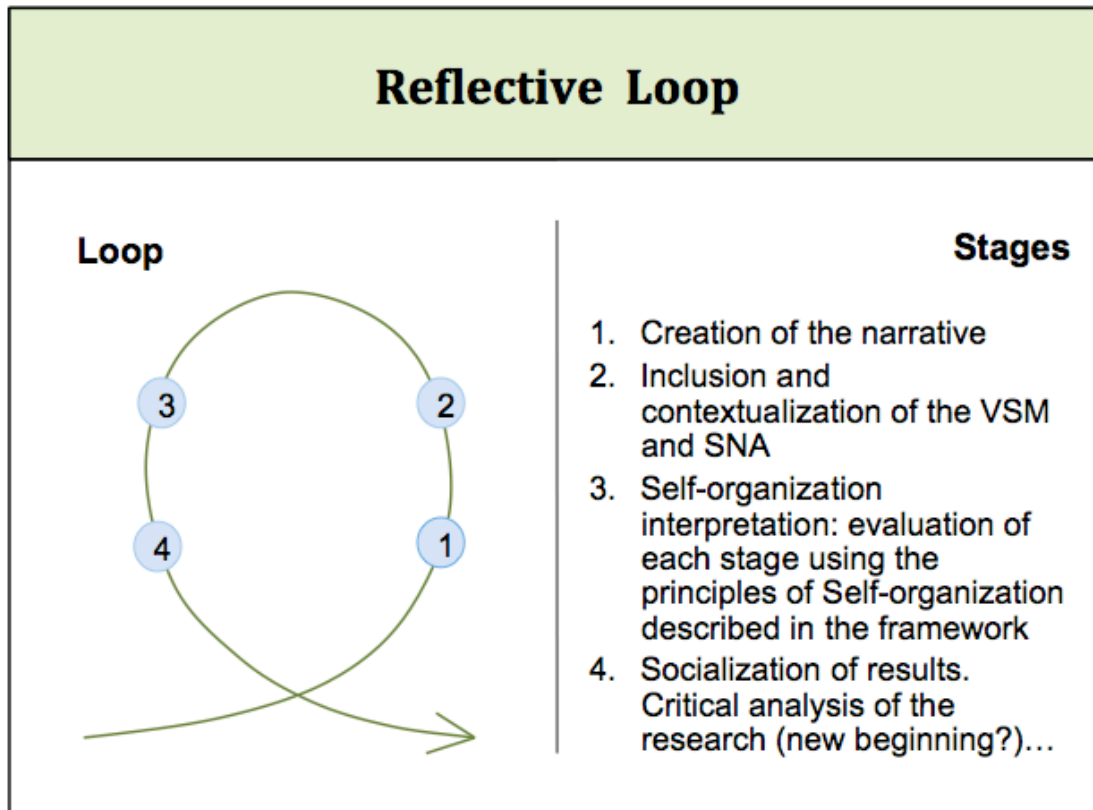
Figure 7. The reflective loop.

The inclusion of the analysis of self-organization is presented supported by evidence, such as findings in the data analysis (e.g. improvements in the distribution of centrality in the network) or changes in the structure and behaviour of the organization (e.g. modifications in the connections, position roles and functions of the functional groups). The critical analysis of the results are performed through the comparison and contrast of these, with the principles, theories and methodologies for SO described in the literature review and the conceptual framework of this research, which is the third stage in this loop.

The final stage corresponds to the socialization of results, to be done initially through the presentation of the transcriptions of the interviews to each person interviewed, followed by the exposition of the CS to the members of the organization – following the protocols described for this purpose in AR and CS – and finally through the publication of academic products (e.g. posters, papers) to

be presented to a wider audience. Therefore, the final configuration of the V-P toolset is presented in the next figure (figure 8).

Visualization and Planning Toolset

Visualization Loop | Planning Loop | Reflective Loop
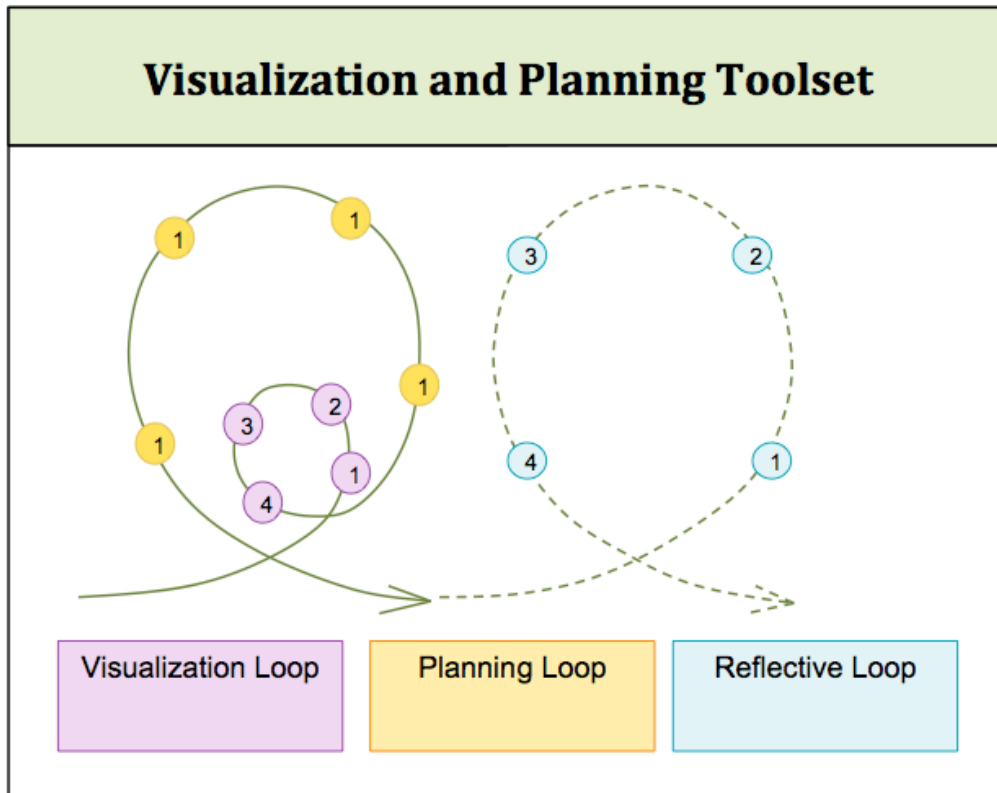
Figure 8. The visualization and planning toolset.

4.4 SUMMARY

Throughout this chapter the theoretical foundations supporting the V-P toolset were presented, explaining how they are articulated and showing the sequence of their application to observe and analyze self-organization in one community.

The theoretical framework brings together a collection of SO principles identified by different authors and presents them in the form of the V-P: a systematic sequence of actions and procedures where the SO principles are used to enhance self-organizing behaviour of one community and to guide the observation and analysis of such behaviour. To do so, this chapter introduced the combined use of SNA,

VSM and linear analysis to induce self-reflection in the community, increase organizational self-awareness and facilitate the emergence and construction of a shared mental model.

Finally, this chapter explained how the combined use of SNA and VSM offers the opportunity to validate (or not) via basic quantitative measures, the perceptions of control on flows of information and power in the different roles and functions described by the VSM. The chapter concludes with a detailed description of the different loops of the V-P toolset, and how this tool facilitates SO and the analysis if such behaviour.

The following chapter presents the application of the V-P toolset in the context of an independent rural regeneration initiative, created by a local community and formalized as a private non-for-profit entrepreneurship presented in this work as the XOOP.

CHAPTER 5

THE CASE STUDY

5.1   <u>INTRODUCTION</u>

This research adopted the AR procedures described by Coghlan & Brannik (2005). In this context, a case study (CS) was built on the data collected with the use of different techniques following the CS protocol suggested by Yin (1994).

The present CS shows the organizational transitions inside a community-based organization, legally registered as a charity in Ireland and defined as a consensual, participative and structurally non-hierarchical/flat organization (referred to as XOOP in this case study). This not-for-profit organization (XOOP) was set up in 1996 – and had been running for more than 12 years at the time of writing – with focus on education/experimentation for sustainable lifestyles; its most important initiative has been the development of a sustainable environment (eco-village) for its members. The planned environment comprised fully serviced sites on which to build eco-houses, as well as green areas and spaces to develop organic agriculture, woodland and communal buildings.

The eco-village project finally materialized five years ago with the acquisition of the land and the beginning of the works to provide the fully-serviced sites to the XOOP members; the eco-houses development thus started in the form of a collaborative housing scheme to create an intentional neighbourhood characterised by fully equipped private dwellings distributed in clusters, with extensive common facilities designed and managed by the residents. A detailed description of the evolution of the project and the academic research interventions is described in three stages: the early years; growing and defining the project; and the critical transition. For each of these stages an analysis of self-organization, VSM and SNA were carried out using the theoretical framework presented in the previous chapter.

5.2 DESCRIPTION

5.2.1 The early years (1996-1999)

The eco-village project began as a family project in 1996 led by **A,** who was looking for an affordable housing solution for himself and some members of his family. Because of the economic circumstances at the time, he reasoned that it would only be possible if they took on the role of self-developers. Soon, the people involved in this initiative found not only that more people and resources would be needed to make the project viable, but also that it could be enriched and complemented by the incorporation of sustainable development principles[31].

Following this path, **A** educated himself about some initiatives related to self-building, and, in this way, discovered the eco-village concept and met **B,** a well-recognized environmental activist with a particular interest in the development of eco-villages. They instantly recognized their mutual interests and the synergies of their individual initiatives and skills (**A** with experience in business management, **B** with experience in marketing and media). The natural outcome was the creation of a partnership between **A** and **B** to create a more ambitious project with the aim of empowering people to develop a sustainable community (eco-village) in which the members would be able to build affordable houses according to environmental principles of design and to adopt an environmentally friendly lifestyle. Consequently, they started to seek out the materials and knowledge they needed to formalize such entrepreneurship.

Their mutual interest in environmental activism had driven them to work in the same place, the Food Coop (Dublin) – a cooperative promoting fair trade and local food production and consumption – where they both were board members. **A** and **B** took the organizational structure and formal constitution of the Food Coop as templates for the creation of the formal documentation they needed in the constitution of their own enterprise (the XOOP). Additionally, they borrowed the model of management, of shareholding, and the idea of a consensual,

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[31]   Interview with **A**; see Appendix 10, quote 1.

democratic and egalitarian decision-making process (even while being aware that it was not functional at the Food Coop).[32]

To complete the formal structure of the new venture, and to succeed in the registration and further marketing of the business idea, they recruited (invited to be a board member and/or to join panel of advisors) a well-recognized developer with experience in eco-housing (**EA**), a prestigious solicitor, a member of the green party, and some other personalities whose participation at this stage of the project was purely nominal. The venture was eventually registered as a not-for-profit organization (charity) with an emphasis on education.

In 1999, the final outcome was the creation and presentation of the XOOP's prospectus and the start of a marketing and promotion campaign to recruit new members (investors).[33] The first members to join the company were approached either through the Food Coop (73%)[34] or within the A and B's circles of close friends (27%), starting with seven and growing to fifteen members.

At this early stage, the activity was focused on planning to achieve the three major goals defined for this period: (1) find the land, (2) acquire funds to buy the land and (3) carry out the works to provide serviced sites to the members of the project. To do so, planning meetings were scheduled monthly – initially in the Food Coop's facilities, and then in a small independent office – with the participation of all the members at that time, except for the "nominal" ones (those recruited to formalize the existence of XOOP). The tasks were self-assigned on a voluntary basis, and a sort of salary or financial recognition was granted just to **B,** who was the one (with the close support of **A**) driving the whole process of registration and creation of the business proposal. At this point, most of the decision-making was concentrated in **B** (and **A**) despite the extended use of consensual procedures.[35] This situation caused discomfort among the rest of the members who felt that it contravened the basic tenets of the organization[36].

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[32]   Interviews with **A, D** and **B**; see Appendix 10, quotes 2, 3 and 4.
[33]   Interviews with **A, B** and **D**; see Appendix 10, quotes 5, 6, 7 and 8.
XOOP members with background in the Food Coop and environmental activism: **A, B, C, D, E, F, G, H, I, K** and **L**).
[35]   Interview with **D** and **A**; see Appendix 10, quote 7 and 13.
[36]   Interviews with **B, C** and **D**; see Appendix 10, quotes 9, 10, 11 and 12.

5.2.2 Growing and defining the project (1999-2006)

This stage of the project's evolution extends from the last quarter of 1999 – corresponding to the official presentation of XOOP's prospectus – to the first quarter of 2006.

Until a decision could be made about the location of the project and the proper acquisition of the land (finally concretized in 2005), the dynamic of the project – defined by elements such as its structure, its size and, ultimately, its cost – could not be clearly determined because of the fluctuation of these parameters. Indeed, the following graphic (figure 9) illustrates the evolution of the number of members (actual versus expected) and the variation in the maximum cost of the sites from the presentation of the project to the public to the time when the final design was defined and reported as completely sold out (first quarter of 2006).
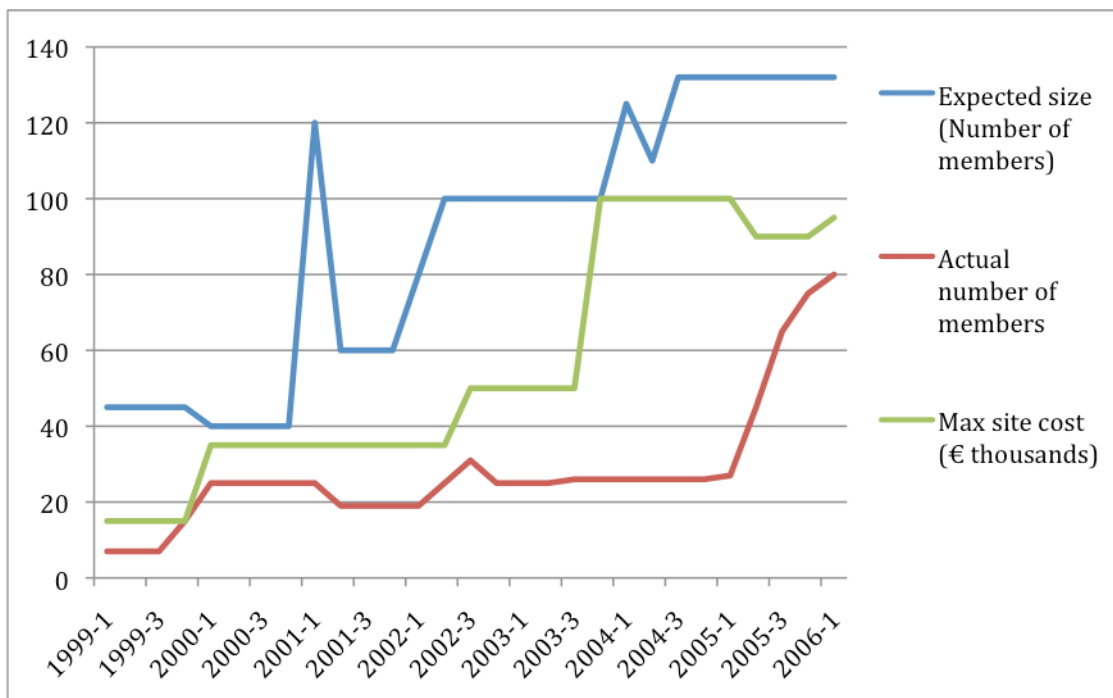
Figure 9. Expected –vs.- effective number of members 1999-2006. In general, the number of members (houses to be built in the project) was increasing as the cost of the project increased due the cost of the land and administrative expenses. The size of the project and its cost was finally set when XOOP purchased the land.). Source: XOOP's files.

Between the public release in the last quarter of 1999 and the second quarter of 2001, the number of members went up from seven to twenty-five, increasing the complexity of operations under a consensual decision-making model, but without introducing a substantial change in the activities of the organization.[37]

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[37]   Interview with **D**, **N** and **E**; see Appendix 10, quotes 11, 51 and 59.

During this period, a set of specifications for the final location was defined, among which were: the existence of public transportation facilities; short distance to a main city; proximity to an existing village/town; land to support a sustainable lifestyle for sixty-five families – no less than 100Ha with its own source of water and a rural regeneration profile.

At this stage, most of the resources and time of the project were invested in the growing activity of designing programmes to be executed once the eco-village had been established (theoretical/speculative design).[38] The effective search for a suitable place began with an inquiry to all the counties about their willingness to receive and support the construction of an eco-village in their jurisdiction. From this first exercise, a couple of counties were identified as promising. To do the final selection some funds were needed so that they could start visiting different possible locations for the project, requiring an (extra) financial commitment that led to the first loss of members (reducing the number from twenty-five to nineteen members).[39]

Subsequently, during the second and third quarter of 2001, the organization developed a more defined structure: key-activities were identified and different committees were formed and allocated oversight of specific activities. Among the identified activities, there were press and media relations, marketing, fund raising, land search, site/project design (e.g. outline plans, permaculture), and research into building regulations relevant to the ethos of the project (e.g. eco-building & old-fashioned Irish rural architecture).

Meantime, **B** was still carrying out the general direction/management of the project, with the close assistance of **A**. By the end of 2001, twelve new people had joined the project, increasing the total membership to thirty-one. At the end of the first quarter of 2002, the first consensual decision-making failure occurred concerning the final selection of the county in which the project should be located. Irreconcilable differences developed between those who wanted to develop the project by the sea and those wanting it to be developed inland The final decision to proceed with the land acquisition inland caused a further loss of

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[38]   Interview with **A** and **E**; see Appendix 10, quotes 16, 17 and 59.
[39]   Interview with **A;** see Appendix 10, quote 18.

members, with the number of members falling from thirty-one to twenty-five.[40]

After this episode, the promotion of the values of the organization, advertised as a democratic, participative and flat structure, attracted new members who were interested in this aspect of the project in addition to the intention to build an eco-community. These new members modified the relations of power in the consensual decision-making mechanism by pointing out that centralized control in the hands of **B** (and secondarily **A**) was not appropriate, and that the nature of the management and the dynamics of the project were now on a different – more complex – scale, demanding de-centralization (autonomy) to the operational groups (among them the finance, legal issues, planning, IT and building groups), and necessitating a strong cohesive element – ethos, identity – above and beyond mere environmental activism (but attached to the idea of developing an eco-village).

In 2003, the complexity of the project escalated with the final decision about the location (Town X). At this time some XOOP members (**E, A, L, C, M**) decided to move their residence to Town X to keep track of negotiations and start the integration of the project with the local community (e.g. consultation with local residents about the impact of the project on the future of Town X). Elements such as negotiations with the landowner (including strategic design of the negotiation, legal issues, follow-up activities on the negotiation and payment processes)[41]; the application to get planning permission and negotiations with the banks.   Legal differences emerged in negotiations with the landowner, which affected the acquisition process and the individual (additional) financial commitment demanded of all members drove the organization to instability.

This is evidenced by the report of a critical issue related to lack of confidence in the centralized management and its divergence from the consensual decision-making process. The decision made was to strengthen the role of the board as the ultimate instrument of control and validation of administrative decisions. This served to constrain **B**'s autonomy and tendency to make unilateral decisions. At a personal level, different circumstances were affecting **B**'s

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[40]   Interviews with **A, B** and **D**; see Appendix 10, quotes 19, 20, 21, 22 and 23.
[41]   Interview with **N** and **E**; see Appendix 10, quote 52 and 59.

performance, thus introducing a further element of stress and increasing project members' lack of trust in his ability to lead this new and more complex stage of the project. [42]

Finally, in 2005, the acquisition process was completed and planning permission for the development was granted. As a direct consequence, the decision was made to move the project's office from the capital to Town X; more members also decided to move to Town X (**N, BE, Y, AD**).[43]

The same year the difficult decision was made not to renew B's contract at the beginning of the following year. This drove the organization to a stressful (and expensive) episode of conciliation. This became more critical when **A** decided to step back from his position as manager and take time off for six months the following year (2006). These structural changes moved the organization onto a new stage where none of the members with deep knowledge of the dynamics, evolution and administrative procedures in use by XOOP were directly involved in its management.[44]

A new administration was established delegating the role of manager to **Z** with the assistance of **N**. **L** was the new director of sales & marketing charged with implementing a new sales strategy, which included a bonus if a certain number of sales were achieved during a specified period of time. **M** introduced the principles of Gaia democracy (not successfully) with the intention of improving the consensual decision-making mechanism while the number of (new) members was increasing, reaching the maximum number of sales at the end of the first quarter of 2006.[45] He also assumed some functions of general coordination by centralizing information about the activity of the operative groups. During this period a new wave of members moved to Town X, among them were **U, S, R, AL, BK, BM, EP** and **DT**.

To address the new circumstances surrounding the project at this time, some important decisions were required relating to contracts with external companies to put in place the basic infrastructure for the sites (under the supervision of **AD,**

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[42]   Interview with **B**; see Appendix 10, quote 24.
[43]   Interview with **N**; see Appendix 10, quote 53.
[44]   Interviews with **A, C, B, D** and **N**; see Appendix 10, quotes 25, 26, 27, 28, 29, 30 and 57.
[45]   Interviews with **A** and **N**; see Appendix 10, quotes 31, 32, 33 and 55.

who had no expertise in engineering). At the management level, tensions and a lack of coordination were developing due to poorly defined roles, functions, responsibilities and jurisdiction of management for those in charge of the project at this time.

The outcome of this situation was an intense friction between **N** and **Z**. Because of the volatile management structure, the coordination activities performed by **M** became crucial. Much of the operational information and eventually advice (and sometimes the ultimate decisions) on decision-making processes were centred on him. This lack of (formal) general management consumed important time and resources.[46]

5.2.3   The critical transition (2006-2009)

From the end of the first quarter of 2006 to the end of the second quarter of 2007 some critical changes occurred in XOOP as a consequence of a climax in the evolution of the project's complexity. Changes in the external circumstances surrounding the project added to the internal instability of XOOP management, deeply affecting all members and inducing changes in the organizational structure – as will be described next. The following figure (figure 10) illustrates the changes in the number of members and the price of the sites during this period.

Despite poor coordination and weak management, the sales-marketing group was able to sell (apparently) all the project's sites under the direction of **L,** who dropped out of the position after presenting a report indicating that the project was fully sold, thus generating a good mood and high expectations for XOOP's future development.

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[46]   Interview with **C** and N; see Appendix 10, quotes 34, 35 and 54.

Figure 10. Expected vs. actual number of members 2006 - 2007. The dotted line indicates the number of full members between 2006-2 and 2006-4. Notice that as the number of members decreased, the cost of the sites was increased to cope with the financial obligations of the project. Source: files and minutes of XOOP.

The immediate consequence was the cancellation of all applications to buy from the waiting list, and a public notification (using the media and national press) indicating that XOOP had sold all the eco-village sites, with no space to admit new members, and that the works to build the project as presented in the prospectus (some years ago) would begin soon.

Soon, the facts underpinning this apparent success came to light: not all the "sales" were completed, most of them consisting of only a small initial deposit on a site; and not all the facts surrounding this investment had been clearly explained to the prospective members. This motivated a chain of serious complaints, the withdrawal of applications and the reimbursement of a significant amount of money to those deciding to leave the project. The immediate consequence of this was to damage the credibility of XOOP's financial management and the project in general[47] in the eyes of the lending banks and financial institutions supporting this venture.

After the withdrawal of almost fifty-seven members, those who remained were determined to achieve the three main goals defined for XOOP since its inception. To do so, and to stimulate the engagement of members with the

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[47] Interviews with **C, D, A**, **H** and **I**; see Appendix 10, quotes 36, 37, 38, 39 and 60.

project, they facilitated the emergence of numerous operational groups (up to twenty-five groups).

Subsequent to this episode, **M** produced a set of guidelines and a definition of functions and rules of interaction to provide order to the management activities. As part of these recommendations, he suggested that XOOP employ a (General) Coordinator (with a job description that specifically excluded the exercise of managerial powers). He also suggested the formalization of the process group, with the aim of facilitating the coordination of groups and the (formal recognition) of the financial manager position. In addition, he indicated that the financial manager should be the administration of existing resources, to ensure that each task/operational groups accomplished their goals and to monitor and control the practices of contractors and external advisors.

To solve the problem of detachment and lack of commitment in most of the critical managerial positions in hand of volunteers, a decision to appoint as staff (and under contractual terms) the owners of such responsibilities was done.
The crucial positions identified were: General Coordinator, Sales and Marketing Manager, Financial Manager, plus administrative and secretarial support for the managers, the sales group and the legal group. This decision coincided with the return of **A** from his stay abroad and his appointment as Financial Manager in substitution of **N** and **Z**.

Simultaneously, **Q** was hired as General Coordinator; the establishment of the administrative base-line showed that up to this date there had been no record or standardized form of any kind for collecting information and/or facilitating control of the management activities and/or the functions of the operative groups. As a consequence, one of **Q**'s main tasks was the creation of standardized forms and procedures to collect information and to acquire control and knowledge about what was going on in the project, how the resources were being used and how the available resources should be distributed. This aspect of the role generated discomfort in many of the operative groups who felt that the board and the Coordinator were impinging on their autonomy.[48]

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[48] Interview with **C**; see Appendix 10, quote 40.

At the end o f the second quarter of 2006, the report of the works performed by external contractors after the visit of the planning officers showed that some mistakes were made in the contracted works due to a lack of expertise in the monitoring and auditing of these kind of contracts (e.g. the distance between the water pipelines and electric installation was not according the norms). After an intense, expensive and time-consuming negotiation with the planning officers, some of these works needed to be redone, which had an enormous impact on the overall const of the project. At the same time, the cost of the district heating plant was included in the global cost of the engineering work, affecting the price of the sites – the final increment in the sites price was of sixty-five to eighty-five percent – generating a massive withdrawal of members (up to twenty) who could not afford the new financial terms of the project. As these members withdrew and received a reimbursement, the finances of the project were badly affected and the lending banks started to lose confidence in the financial management of XOOP.

At this time **O** and **V**, with expertise in project management and supervision of contractors joined the project and took control of the planning group and monitoring of the development activities. A new coordinator to restart the sales and marketing activities was also selected at that time (**BE**). There was seen to be an urgent need to develop a strategic plan for dealing with all the adverse circumstances besetting the project, and **B** was commissioned to write one strategic plan at **M**'s suggestion. **M** also put forward for consideration the adoption of VSM as a mechanism to preserve the autonomy of the operational groups and provide coherence to the project's management.[49]

At this stage, most of the operative groups were not reporting any activity to the General Manager and the attention of the administration of the project was on the finances and building related activities (get the planning permission and delays in getting the infrastructure right). Under these stressful conditions the strategic plan prepared by **B** was presented but was found to be quite unsatisfactory by most of the members. This report suggested the consolidation of several operative groups with representation on the board, and did not

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[49]   Interviews with **A, C, B** and **D**; see Appendix 10, quotes 41, 42, 43, 44 and 45.

provide clear guidance on the next steps to be carried out to solve the critical situation of the project.

At the end of 2006 important changes were introduced to the organizational structure and mechanisms of control of XOOP. Among them the proliferation of operational groups was now evident – with twenty-five working groups – each of them with a representative on the board as suggested in the strategic plan, despite the fact that most of them were inactive. Poor mechanisms of administrative control were implemented despite the creation of corrective measures such as rules for autonomous work (created by **M**). In consequence, the lack of information about the activity of the working groups drove the board to interfere in every activity in order to keep control and be informed about what was going on in the project. Externally, the signs of a financial crisis started to be evident, the inflation reached historical peaks for the last two decades and real state and development prices where among some of the most expensive in the European Union, particularly for rural areas – notice that these variables could indicate the proximity of a declining phase in a cyclical market as it is construction. These variables affected the financial projections on which XOOP had based its funding structure.

The evaluation of the changes that had been introduced was not favourable at the end of 2006, beginning of 2007. A decision was made to cancel both the general coordinator's position (**Q**) and the Finance Manager's position (**A**). The duties and responsibilities of these positions were then combined in the job description of the new post of General Manager, to which **A** was appointed. The financial situation of the project was not optimal and the sales-marketing group didn't report any positive progress.[50]Despite these adverse circumstances, more members moved to Town X, among them **H, I, AB, AO, BV, BW, CP, DL, DN, DQ, DU, EC,** and **EO.**

Surrounded by a feeling of organizational failure and under difficult economic conditions affecting the project and its immediate viability, the decision to get external advice was made. **M** suggested contacting experts on VSM to help

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[50]   Interviews with **C** and **D**; see Appendix 10, quotes 46, 47, 48 and 49.

solve the organizational issues. He assumed responsibility for establishing contact with the VSM experts, and **A** was commissioned to talk with the lending banks to get expert advice on the finances of XOOP. As a result of this initiative of getting external advice, two experts in VSM were contacted and booked to provide the first of a series of visits in summer 2007. Also, professional accountants were appointed to provide financial advice on a regular basis in order to improve the financial management of the project.

In summer 2007 the first visit of the VSM experts was carried out in the form of a voluntary academic consultancy assignment. The main commitment was (and has been since then) coaching XOOP in the application of VSM to support their transformation into a more effective organization.

As a result of the first interaction with XOOP a diagnostic report was generated highlighting the fact that the XOOP developed at the time of its formal registration an Eco-charter: a statement of (environmental) commitments, values and rules to be followed by the members and XOOP in its future development as a business. The diagnostic recognized this document as central for the definition of the XOOP's identity. Simultaneously the process group assumed the challenge to learn about VSM, promulgate an understanding of its structure across XOOP, explain the report to all the members and explore the implementation of some changes suggested in this report. Internally, signs of cultural resistance to the adoption of a new and unknown managerial model were expressed (and continue to exist).[51]

The report pointed out that the board had a high level of intervention in all the activities of the project and that there was an elevated number of groups/activities in which resources were dispersed. In detail, the report described the lack of management functions such as monitoring; forecasting; planning; external environment scanning; groups/tasks coordination and conflict resolution; and deficiencies in the definition and implementation of policy and identity inside the organization.

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[51] Interview with **A**; see Appendix 10, quote 41.

The VSM also determined that out of the twenty-five operational groups, just a few of them reported their activity periodically to the general coordinator/management and had a supportive internal organization (e.g. land use, planning, energy-water-waste, sales, legal, building, communication). An examination of the internal functioning of working groups suggested that almost all were unaware of environmental issues and none of them presented a coherent and standardized protocol for informing the general management of the status of their respective tasks on regular basis; moreover, none of them were being monitored by the general coordinator/management.

Analysis of the planning inside the groups revealed that at this stage none of the operative groups were clearly defined in terms of flow of activities, goals, and accountability with the exception of the building-planning groups. Other groups presented some potential to gain autonomy but at that time they were found to lack an explicit location/relation within the big picture of the project. Some of these were the Car-sharing/transportation scheme, the Solar Park and district heating plant as communal facilities (EWW), the ORGFARM initiative (land use) and education (VERT)[52].

As a consequence it was not clear what the resource allocation all over the project was and mechanisms to perceive or anticipate environmental changes affecting the whole project were therefore, inexistent.

Externally, the environment was demanding some rapid decisions (e.g. hiring contractors, prepare the individual planning permission submission, negotiation with lending banks) and the consensual decision-making mechanism was not diligent and responsive enough[53].

The report ends with a suggestion to reduce the number of working groups to a maximum of nine in order to make more efficient use of the – now scarce – financial resources and to encourage concentration on priority activities. It also indicated some improvements that could be made to communication channels and ways in which general coordination could be made more efficient. The

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[52]   Interview with **N**; see Appendix 10, quote 56.
[53]   Interview with **H** and **I**; see Appendix 10, quote 61.

report finally pointed out the need for clear rules of interaction between general management/coordination and the groups and the need for status reports from the working groups to the General Manager to facilitate the decision-making process and resource distribution. The VSM experts made a couple of additional visits during the second half of this year to accelerate the acquisition of VSM by the process group (and extended to all of XOOP)[54], and to explain the report and support the implementation of some of the suggested measures to solve the organizational issues threatening the survival of the project.

The second set of systemic (cybernetic) academic consultancy assignments performed by the VSM experts was carried out during summer - winter, 2008. These visits focused in the provision of advice, and the reinforcement of the conceptual domain of VSM by the different task groups working in the project with emphasis on those involved in supporting activities (planning strategic and tactical outlining, etc). At this time, the number of activities was reduced to the seven relevant to the site's development by combining some of the original groups and eliminating others.

The VSM management/coordination functions were implemented into the organizational structure and a clearer definition of roles, functions and responsibilities increased the autonomy of the operational groups. To rectify the lack of monitoring, rules and procedures, deficient coordination among autonomous groups, and an inefficient resources allocation, XOOP decided to formalize regular meetings by the working groups' co-ordinator and to implement basic standardized reporting procedures from working groups to the General Coordinator and establish a bidding procedure to ascertain and prioritize the groups' resources requirements.

At this time the project was facing a deadline for submission of the individual planning permissions and the delay in completion of the infrastructure, particularly the position of the electrical conduits – with the potential to make postpone the building works for an additional year. This task was in the hands

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[54]   Evidence of this process of appropriation of the VSM as the language –code to describe their own organization is the document produced by **J** in the process group, and later distributed to all the members via the e-mail list. A copy of this document can be found in the Appendix 11.

of the planning group, which at that at that time reported problems obtaining applications from the members.

The external variable of greatest concern affecting the project was the critical deceleration of the economy. The reaction of the financial sector was the imposition of constrains for the acquisition of credits and investments in real estate and a substantial increment in the interest rates. This deteriorating situation affected the project since the sales group, despite the multiple activities realized could not recruit any new member (sale a site).

With regard to the possible development of some business ideas related to the facilities to be built in the project (e.g. the solar array and the district heating system), a socio-technical analysis indicated poor viability for plans to extend the system to sell energy and heat to the surrounding community. As a consequence, these business initiatives were going to be implemented only inside the XOOP development[55]. Additionally, the land use group suffered a significant cut to its budget, a circumstance that added to the poor voluntary participation of XOOP members and triggered the resignation of the land use group coordinator[56]. At this time, the building operation started to increase its complexity with the addition of external contractors and advisors to prepare the foundations for the first houses to be built.

Independent to XOOP, the local community through networking tools (mail list and website) started an informal transport-sharing scheme and independent business started to flourish in Town x, related to the arrival of new residents – members of XOOP (e.g. the bicycle coop, the café and the events management office).

The last set of visits by the VSM experts took place during Winter 2008 and Spring 2009[57] in the form of one *in-house academic advisory session* targeted

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[55]   Interview with N; see Appendix 10, quote 56.
[56]   Interview with H & I; see Appendix 10 quote 62.
[57]   The author of this document realized this last in-field work after closely following the development of the previous interventions, its reports and subsequent generation of corrective measures and their implementation. To do so, the author was working as research assistant with the two VSM experts (Dr. Angela Espinosa & Dr. Jon Walker). Along this last intervention all the activities realized were coordinated with the two VSM experts to complement their work in the XOOP.

at reinforcing and pushing forward the full implementation of VSM in all the groups/tasks and supporting activities, and exploring the self-organizing processes occurring in the community. At this stage the cost of the sites was fixed and the number of members present for the last two years were significantly different from the expected numbers, making the financial viability of the project fragile (see figure 11).
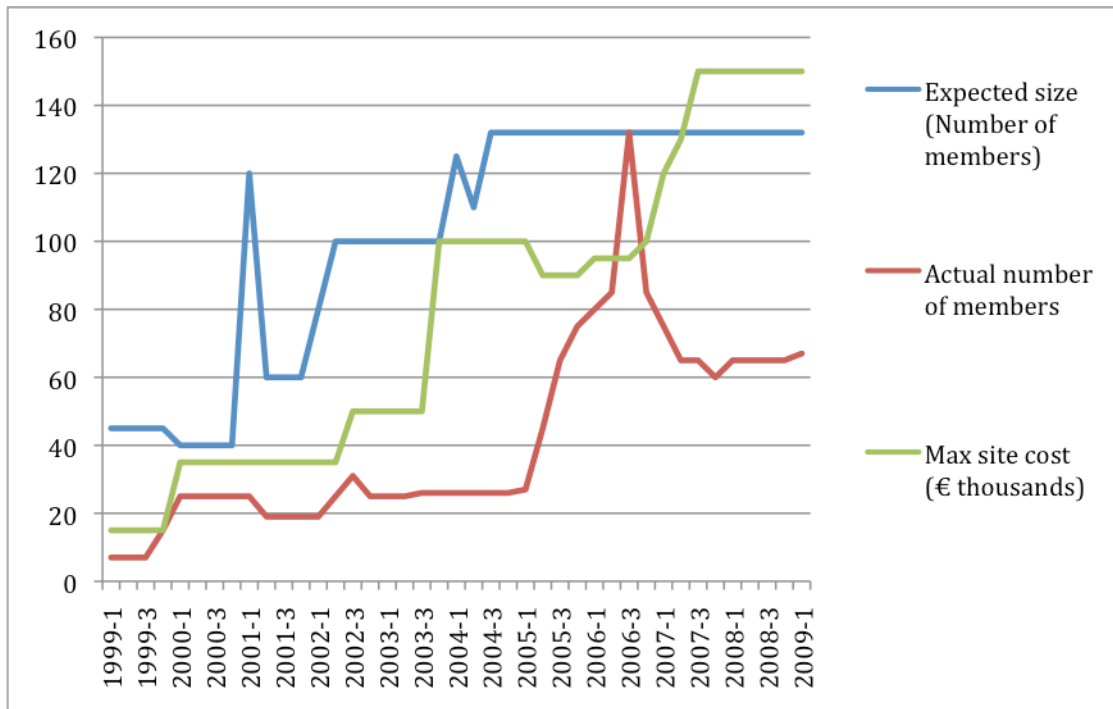
Figure 11: The final big picture. The cost of the sites was constantly increased until the final size of the project was defined. The economic environment and the withdrawal of members influenced the subsequent modifications in site prices.

The observations of this period paint a picture where the organization presents monitoring and coordination procedures among all the operative activities, also showing that the management functions were nearly all present and integrating their functions. Despite these improvements, unfortunately, sales had slumped, and some XOOP members had started to suffer the consequences of the economic downturn, and to consider withdrawing from the project. Additionally, 75% of the planning permission applications were rejected during this period, meaning that house building was postponed for those refused. The absence of a forecasting and external environment scanning mechanism became painfully evident since a year earlier (winter 2007), a warning about the forthcoming

economic downturn and the need for a contingency plan was issued by **B**[58] –
and ignored by the XOOP assembly. It was evident that the project had
problems in long and short term strategic planning, and a lack of contingency
plans to support those members with financial difficulties. The situation also
highlighted the fact that most of the planning in key areas such as finances,
sales and development was done reactively.[59]

Externally, the government officially announced that the state was in an
economic crisis and the banking sector became reluctant to provide credit and
support investments in real estate related business. Prices in the real estate
market were in free-fall, and due to its dependency on site sales to cover its
existing financial commitments, XOOP could not adjust its site prices, making
the project one of the most expensive housing developments in the county.

In response, to solve the lack of planning, a task force group (closely associated
with the education group) was assembled to outline a strategic plan for the short
mid and long-term, initiating also the formalization of a centralized function of
external environment scanning.

Simultaneously, to simplify the management and cope with the increasing
complexity of the works in the field, building activities were transferred to a new
venture (BILDCO, building company – a subsidiary of XOOP). Following the
same trend, the farming initiative moved most of its productive capacity to a
bigger local external farm, opening the door to the participation of none XOOP
members under a model of organic food for subscription provided by a new
independent firm (ORGFARM) led by I, becoming the first successfully
implemented communal farm scheme in the country.

Some members affected by the financial crisis were moving towards a co-
housing scheme (Frisk, 2007) to get their houses built, and to ensure financial
viability in the short term, XOOP started to contemplate a model of house
leasing considering the admission of non-XOOP members into the project by
decoupling property development from participation in the construction of a

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[58]   Interview with **C**; see Appendix 10, quote 47
[59]   Interview with **H** and **I**; see Appendix 10 quote 63.

sustainable community.

In addition, the service company (SERVCO) was created as a subsidiary of XOOP to manage the forthcoming demand for heating, maintenance, energy and waste management from the XOOP development. At the same time, a communications company (COMINT) was established as an independent contractor business to provide telephone and Internet connection to the XOOP residents (and eventually to expand to the local community and the region). Simultaneously, the education group reported financial independence from the XOOP budget, indicating full autonomy; it also started to study the possibility of splitting off from XOOP and working as a subsidiary business.

At this time, XOOP was concentrating its resources on just three identified critical activities (sales, building and general coordination/management) and decided that at this stage its priority was to finish the development of the sites. Also, they defined their identity as tthat of a development company, which is a fundamental part of, but not the final phase in the creation of the desired sustainable community. Therefore they envisioned the need in the future for a further definition of new policies and project's identity. Despite this realization, no historical records on the evolution of the organization since it was created exist to be used as a reference for the definition of identity or prospective planning/analysis.

At the end of this intervention, the sales group had an internal crisis where conflict between the paid staff and the sales group coordinator and group members (volunteers) arose, making it evident that there were problems of communication and definition of functions inside the group and a lack of knowledge in marketing and sales among all those involved with such a critical activity. The final outcome was the resignation of the coordinator (**Y,** who was substituted by **U**) and the decision to get professional training in sales from a local university.

At the same time, there was a strong disturbance when a task force (education group related) presented the draft of the strategic plan they had been working

on over a period of time. In general, the comments inside the different communication channels of the community (website, forum, pub chats, etc) were that this work was far from containing the minimum elements that a strategic plan should have. In general, most XOOP members considered this report to be just as a set of ideas – coming from a specific group of people – and was not connected in any way with the reality and actual (financial and administrative) circumstances affecting XOOP, or offering a pathway to sort out the difficulties affecting the project in the present.[60]

As an outcome of this strong criticism, a new task group (related to the process group) was assembled as a permanent body that would scan the environment, analyze the current state of XOOP and provide advice to the board to facilitate decisions considering multiple scenarios in which XOOP may be developed in the future. Its immediate assignment was the creation of a consistent strategic plan for the short, mid and long term that preserved the participatory nature of the project. As a parallel activity, some (former) members of the sales and process group participated in the creation of a VSM handbook in an exercise that implied multiple modifications and editions.

By the end of 2009 the construction of the first tranche of twenty houses had started and the first family had moved into their new home in the XOOP development. Also, the number of members increased to seventy-five but despite these advances, the project's finances remained uncertain. This critical situation was noticeable when the board took the decision to suggest reducing the operative groups to the three most relevant (sales, building and management). Also accompanying this suggestion was an executive order to re-evaluate all the staff contracts. As a result of this measure, only the General Manager, the Sales and Marketing Manager and an Administrator remain as part time staff. All the other positions were re-assigned on a voluntary basis.

By the end of the first quarter of 2010, almost all the operative groups had a new coordinator, but only a few of them reported activity (building and marketing). New businesses were now in the town; some of them created by

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[60]   Interview with **D**; see Appendix 10, see quote 64.

members moving to Town X (e.g. SUSTAINABLE EDUCATION COMPANY, ALTERNATIVE THERAPIES COMPANY, THE BAKERY) and some others generated as subsidiaries (THE ECO-ENTERPRISE CENTER) and co-owned business (THE ECO-HOSTEL) by XOOP.

In September 2010, the final academic visit was made to present the results of this research and to receive feedback from the community about this intervention, closing the Action Research process and the last loop of the theoretical framework guiding this study.

During this last visit we found that 20 houses had been built and were now occupied; 20 more (including the Eco-Hostel) were under construction. XOOP continued to suffer severe financial constraints, and a new task force group had been assembled to work on the definition of the new identity that the project needed to filter information and facilitate the design of strategic plans to face the challenges that would come into play once the development phase ends in 2011. During this visit, a picture (figure 12) of how they perceive XOOP's relationship with other entities was presented by members of the identity group, making evident the development of their own language to describe and understand the structure of their organization, and the ability to create their own mechanisms to cope with complex and diverse information and reduce it to a more understandable and manageable format to facilitate decision making processes. (Checkland & Scholes, 1999; Checkland, 1999).

In addition, the communal buildings group, due to the cuts in budget, was exploring the possibility of building the communal facilities financed by the EU. To qualify, these facilities needed to be for the use of the whole local community so partnerships with other local organizations were being formed. A movement that, as in the case of ORGFARM, is bringing the project to a situation where it has to decouple the concept of property ownership from participation in the construction of a sustainable community, and is opening the door for the inclusion of local people external to the XOOP project.

In general, the comment at this time was that the introduction of VSM had been

positive (including administrative staff who had been sceptical throughout the process of the academic intervention). The groups perceived their activity as more independent and organized and the general perception was that the whole organization now operated more professionally [61].

*Figure 12. Representation of the XOOP's relationship with other entities. The complete explanation of the picture created by the identity group is presented in appendix 12. Source: **AB**. Member of the identity group, 2010 – Edited.*

The new challenges exposed were the difficulties in administration of a conglomerate of businesses related and/or associated with XOOP, the definition of a new identity valid and strong enough to provide cohesion and operational guidance to all the new activities emerging, and the problems related with voluntary participation and conflict resolution.

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[61] References: feedback provided by **J, AC**, and **AH**. Quotes 65, 66 and 67 respectively.

5.3 **VSM ANALYSIS**

5.3.1 The early years (1996-1999)

The first element to consider in this analysis is the nature and purpose of the system under study. As described in the narrative (page 124, second paragraph) the purpose since the conception of the project has been *to develop en eco-village* (following some elements of design such as environmental principles for building and the desire to be a flat, participative, consensual and non-hierarchical organization)*.*

Since the moment when the formal organizational structure was officially registered as a not-for-profit business, the image of two separated structures has become obvious. On one side the legal structure with a board of founding members, the existence of which is merely formal (virtual) and does not participate in the activities involving the development of the project. On the other side a growing group of members (from 7 to 15) with a clear differentiation in their minds between the two roles and their functions: Two members assuming the management role and the rest of the group assuming the operative functions. The operative functions and their coordination, as well as the general coordination of the project, were defined through consensual and participative mechanisms (general meetings, specific topic-group meetings). The next figure represents the structure at this time (figure 13).
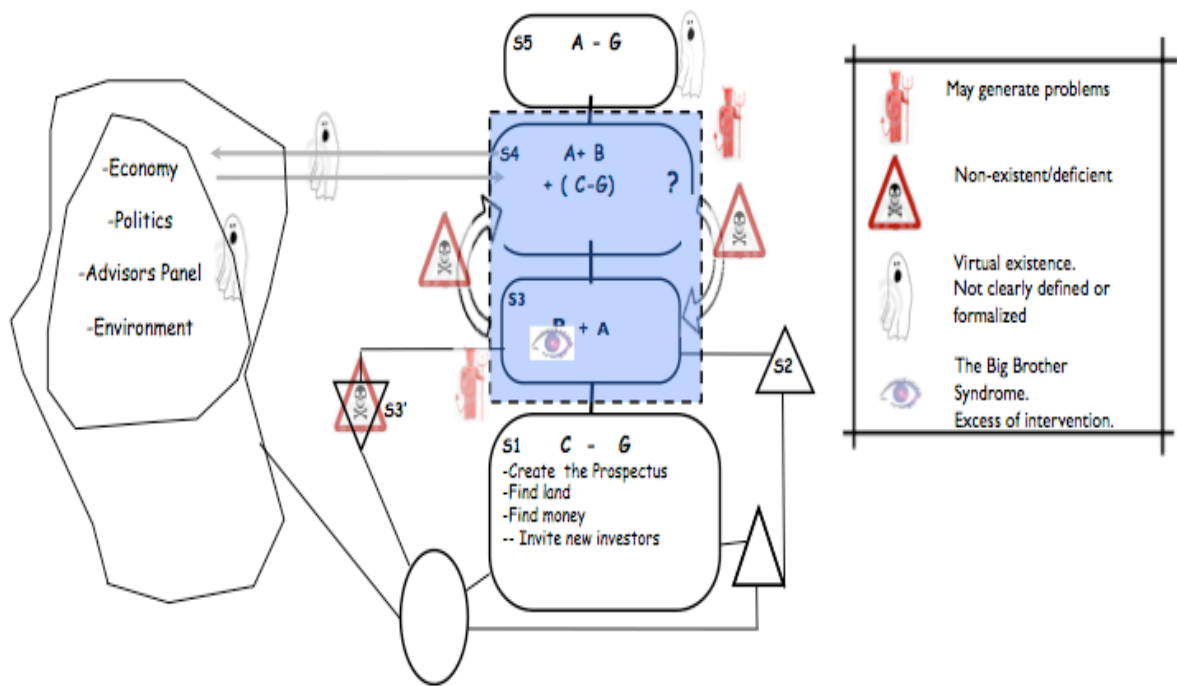
Figure 13. VSM of the initial period. The functions of management and environmental scanning to make decisions were centralized in two persons. Also, there were no clear mechanisms of accountability (S3')

With regard to identity, at this time in the life of the project the members were mainly environmental activists recruited via the Food Coop and friends, all of them attracted by the idea of building their own houses in an environmentally friendly fashion. The details of this structure are presented in Table 4 and complemented with a description of VSM systems next:

Transformation	To establish a community-based company (XOOP) with the aim of developing an eco-village
Actors	The founding members, the board of experts and external advisors.
Suppliers	The founding members.
Customers	The founding members and the potential new members.
Owners	**A** and **B**
Interveners	Potential new members, landowners Regional and local development offices.

Table 4. TASCOI of the initial period.

S1: Mainly **C, D, E, F and G**. All the members were aware of the status of all the tasks. The tasks, once identified, were self-assigned (e.g. merchandising, planning of the prospectus presentation, media contacts

and political lobbying, among others).

S2: Coordination via weekly meetings with a prevalence of informal communications (almost daily at the workplace – the Food Coop).

S3 & S4:[62] Control and strategy in the hands of **B** (mainly) and **A** deciding how to use the resources to achieve the immediate goals. They also receive and evaluate the reports of activities coming from all the S1s. The evaluation is done according to the completeness of the task assigned, without recourse to a standardized mechanism to evaluate performance.[63]

With regard to S4 functions, some participation by the other members was evident, but the final decisions on strategic issues and interpretation of environmental signs were made by **A** and **B**. Surprisingly, neither the panel of advisors nor the high profile founding members were used to perform S4 functions. Consequently, there was a risk that the a unique vision about how to cope with the external circumstances would be imposed on the project by the dominant character of **B**. During this stage, the lack of (technical) knowledge related to building and development regulations was critical and the consequences of it would be noticeable in the future.[64]

S5: All the members. They participated via consensual decision-making mechanisms to determine the policies and identity of the project. At this level, none of the registered members of the board of directors had active participation. The characteristic providing strong cohesion to the group and defining their identity was their common determination to develop an eco-village and the fact that almost all were environmental activists and were working in the Food Coop, from which they took most of their organizational model and the template to create their prospectus. Also, they borrowed from the Food Coop some of their weaknesses such

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[62]   Note that the S3 and S4 are not separated because at this stage these functions were not clearly delimited and were performed by the same people.
[63]   Interview with **A**; see Appendix 10, quote 14.
[64]   Interview with **A**; see Appendix 10, quote 15.

as the lack of clear mechanisms of control, the drawn-out consensual decision-making procedures and the lack of procedures and protocols for the formulation of strategies and planning and effective decision-making.[65]

5.3.2 Growing and defining the project (1999-2006)

The purpose of the organization in this phase was still to develop an eco-village. During the first part of this period (1999-2004), despite the promotion of a flat, participative and democratic organizational structure, it was evident that decision-making was centralized in the roles of **B** (mainly) and **A**. The addition of new members during this period modified the balance of power, challenging the authority and autonomy of **B** and changing the internal dynamic of the organization. Events (e.g. land acquisition) determined the beginning of a new stage in the project, modifying its nature – from an idealistic and planning phase to a real development project. To cope with these new challenges, a new arrangement in the general structure of the organization was necessary where a more decentralized design took place. From this sequence of changes two stages are identifiable, and are described in VSM terms as follows:

From 1999 to 2004: A period characterized by relatively small fluctuations in the slowing growth in membership and strong variations in the definition of the size of the project. In general the size tended to grow to cope with the cost of the project, as the community was more aware of the real economic implications of the intended development. Table 5 describes the general characteristics driving the management in this period, and a description of the VSM systems is presented next.

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[65]   Interview with **E**; see Appendix 10, quote 3

Transformation	To define the ultimate shape of the project by the final selection of the place where XOOP is going to settle down and the establishment of new activities.
Actors	The current and potential new members.
Suppliers	Current members and landowner.
Customers	The current and potential new members.
Owners	**A, B**, Board.
Interveners	Landowner regional and local development and planning officers; XOOP; the regional court and the high court; contractors; external advisors.

Table 5. TASCOI 1999 – 2004. Notice the change in the transformation with respect to the previous stage, insinuating changes in the boundaries of the system and eventually its identity.

S1: Several activities are identifiable, as marketing, land search, land acquisition – negotiation, legal issues, fund-raising, land use (permaculture, etc), development design (outline of the project, planning permission application), political lobbying and the early process group. These activity groups were not clearly delineated in terms of scope, the definition of individual goals, or resources. They emerged to cope with the increasing complexity of the project and the need to attend to new tasks inherent to the realization of the development idea (e.g. land acquisition, application for planning permission, solving legal issues). Some of them worked in association with other groups providing technical support (e.g. legal and planning associated with sales and acquisition)

S2: No changes in the existing mechanism. The weekly meeting was still in place as a general scenario to expose the status of the project. Some activities, due to legal implications, start to consume more time and demand close monitoring. The increasing variety of topics and time limitations made this coordination mechanism time consuming and ineffective.

S3-S4: The centralized control and decision-making became evident. In this period the authority of this role was questioned and finally am executive decision was made to replace the person performing this role

and put a new team in place. The lack of a formal mechanism for S4 had the potential to generate problems in the future, as effectively happened later with the planning permission and the legal issues related to the changes in the management that were not foreseen. Also, technical issues related to supervision of the contractors were in the list of problems forthcoming.

S5: A board consisting of all members. A strong ethos is in place related to the reinforcement of democratic decision-making, a flat and democratic organizational structure, and the autonomy of the committees (operational groups). Despite the strong commitment of the members, an independent study reveals that they did not share the same motivations to join XOOP, making evident a problem of identity (beyond the common interest in environmental activism and the development of an eco-village, now more orientated towards the desire to create an example of ecological rural development) and eventually a weakness in the cohesion of the group.[66] The graphic representation of this structure is presented next (figure 14).

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[66]   Longwill (2001) indicates that the members do not share the same values and motivations to join XOOP. Different categories of members were identified in her study, ranging from those who joined the project with a strong commitment to environmental causes and the ideology on which XOOP was founded to the ones who just want a healthy space in which to raise a family or who just want a nice countryside house with nice neighbours.
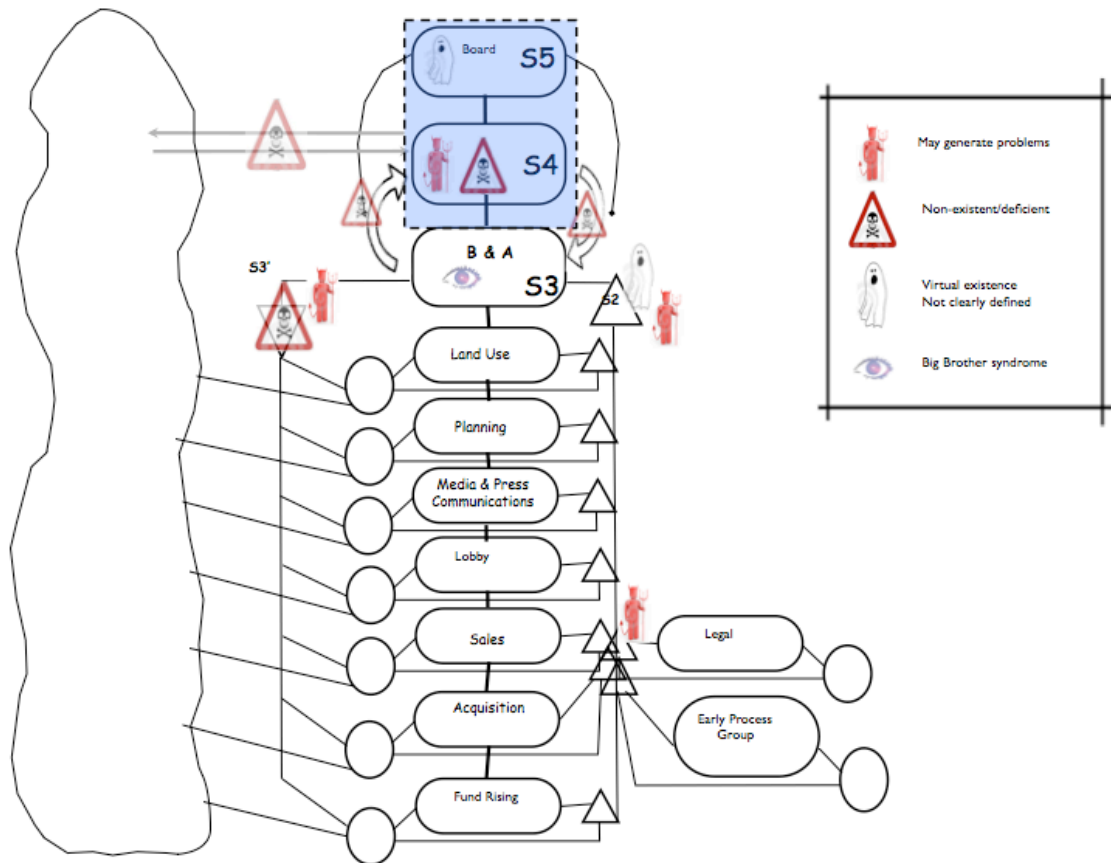
Figure 14. VSM representation of XOOP 1999-2004. Notice that the S3 and S4 functions are still concentrated in 2 individuals. Compared with the previous period, the number of groups has increased and some functions of coordination and management support are identified as operative groups (Legal and process groups).

From 2004 to 2006, some changes are noticeable in the organizational structure, related to the introduction of a new management team and the increasing complexity of the project. The purpose of the system under study is still to develop an eco-village.

Table 6 shows the aspects of the project in which management was based in this period. Notice the difference in the goal of the management (transformation) with respect to the previous periods. The main challenge at this time is to shift from a designing and planning mindset stage to an operative and practical stage demanding a different attitude, more focused management and better use of resources and accountability.

A description of the VSM systems is presented as follows:

Transformation	To initiate the site development and establish the eco-village
Actors	The current and potential new members, contractors, local community, local planning and development officers
Suppliers	Current members
Customers	The current and potential new members
Owners	Board, S2, S3
Interveners	Contractors, local residents, local development and planning officers

Table 6. TASCOI 2004-2006

S1: The role of coordinators can be identified in all the groups, providing evidence of clear leadership and organization inside almost all of them (e.g. sales, legal, finances, building). The legal issues group is under the direction of **M** and **D**, but still not clearly located as a supportive management function while it is operating closely with the sales and acquisition groups. Increasing autonomy has been granted to each operational group, but no monitoring mechanism has been put in place by the general coordination-control (S3').

S2: Coordination is not evident among the operational groups, and eventually the general meeting collapsed as a mechanism of coordination. No centralized information existed to relate the activities and performances of each committee (operational group), and this situation was becoming more critical with the committees claiming autonomy, but without clear rules of interaction or agreed performance measurements or indicators. Around this time, **M** established an informal network to collect information about all the operational groups.

S3: Initially carried out by **A;** subsequently, two persons (**N** and **Z) were** responsible for this role. There was clear interaction between them so their roles became dysfunctional.

S4: Absent

S5: The board, under the direction of **P,** and then under the direction of **AD.** The board was in charge of monitoring the activities of all the operative groups and implementing strict policies to avoid risk in all the

decisions to be made at all levels (micromanagement). The consensual mechanism was time consuming and there was no clear coordination/procedure to drive this mode of operation effectively towards diligent decision-making.

The graphic description of the VSM structure at the end of this period is presented next (figure 15).

Figure 15. *VSM at the beginning of 2006. Notice that the supportive groups (Legal and process groups) assumed many of the functions of a problematic S3. Accountability is still inexistent for all the project (S3') and the external provision of information to update the planning and decision-making process is not functional (S4).*

5.3.3 The critical transition (2006-2009)

During this period, critical events affected the project such as the massive withdrawal of members and the introduction of VSM as a language to unify the understanding of XOOP members about what is happening in the organization.

At this stage of the project, the emergence of self-organization was observed as new operative groups formed to adapt to the evolving changes suffered by the project in response to internal and external shifting circumstances. Also, at this point the project's identity was defined as a development and real estate firm driven by environmental principles (with the aim of building an eco-village, as the final end of all their activities). In addition, the first hints of a forthcoming change in the identity of XOOP and its activities at the end of the development phase were induced through a reflective process via the VSM academic intervention. The different phases in which these changes occurred are presented as follows:

2006. This was a year of stabilization in management. The return of **A** to the management of the project, the creation of the first basic protocols to regulate the administrative functions (introduced by **M)** and the creation of one strategic plan (commissioned to **B**) provided a new environment for the development of the organizational structure of the project. The drivers providing direction to the administrative functions this year are presented in Table 7, followed by the description of the VSM systems.

Transformation	To advance the site development and sell the remaining available sites.
Actors	The current and potential new members, contractors and consultants.
Suppliers	The current and potential new members, contractors and lending banks.
Customers	Current members.
Owners	S3, Board, S2, legal and process groups.
Interveners	Financial market operators (lending banks), new potential members.

Table 7. TASCOI 2006-2009

S1: Up to 25 operational groups existed at that time, most of them without any activity and/or no reporting activity to the general manager. The planning-building activities became critical at the time when their malfunction dramatically impacted on the cost and the future viability of the project.

S2: The coordination function was still not formalized. This function had been assumed by the incipient process group centralizing most of the information about the activity of the operational groups, and creating mechanisms and procedures to facilitate the function of the general management. Problems with the implementation of these mechanisms and procedures emerged when they were perceived as imposing constraints on the autonomy of the operational groups.

S3: In a period of experimentation, two people were in charge of the functions of this sub-system. This trial didn't work as expected and the role and functions were not functional. Some of these coordination activities were assumed by **M** who suggested that these management features should be under the control of a single person invested with a high level of responsibility but with their authority and autonomy regulated by the board.

S4: Absent. The creation of one strategic plan with the use of VSM was strongly recommended by the process group and commissioned to an inactive member of XOOP, but the report did not satisfy the expectations of the members and did not provide clear indications on the next steps to be taken to solve XOOP's current problems.

S5: A significant increase in the number of board members was suggested in the strategic plan (and implemented) to guarantee the representation of the interests of each existing operational group. No suggestion regarding the mechanisms to be used to coordinate or facilitate the decision-making was provided. Consequently, the board become not only an elephantine decision-making body but also an interfering one.

The VSM representation of the organization at that time is presented in the next figure.
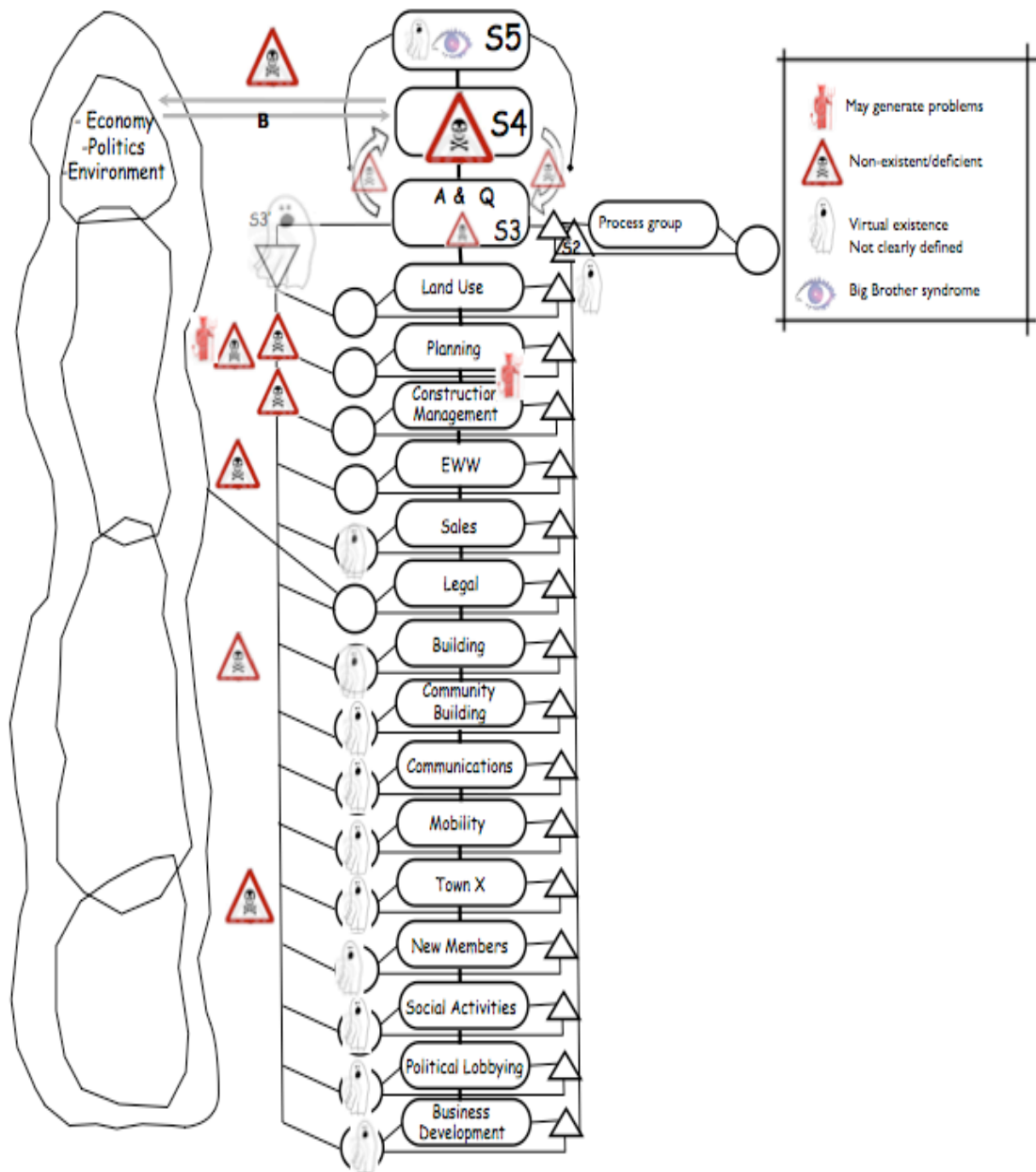
Figure 16. The VSM at the beginning of 2007. Notice the changes in the position of the supportive groups (Legal and Planning) with respect to the previous periods. Also, note the increase in operative groups and the presence of the management function (S3). The function of accountability is still not effective and most of the operative groups seem to be inactive.

5.3.3.1 The introduction of VSM – the systemic/cybernetic interventions (2007 – 2009)

With the use of a participatory process (workshops) in which VSM was explained to the XOOP members, a diagnosis of the organization was carried out, allowing the participants (mainly group coordinators, and members of the process group) to identify for themselves – with the close guidance of the VSM experts – the elements threatening their viability as an organization. During the

workshops the community described the purpose of the organization as to develop an eco-village, formally constituted as an educational not-for-profit non-hierarchical organization. The report summarizing these findings was presented to the community by the VSM experts at the end of 2007, and graphically represented as follows (figure 17):
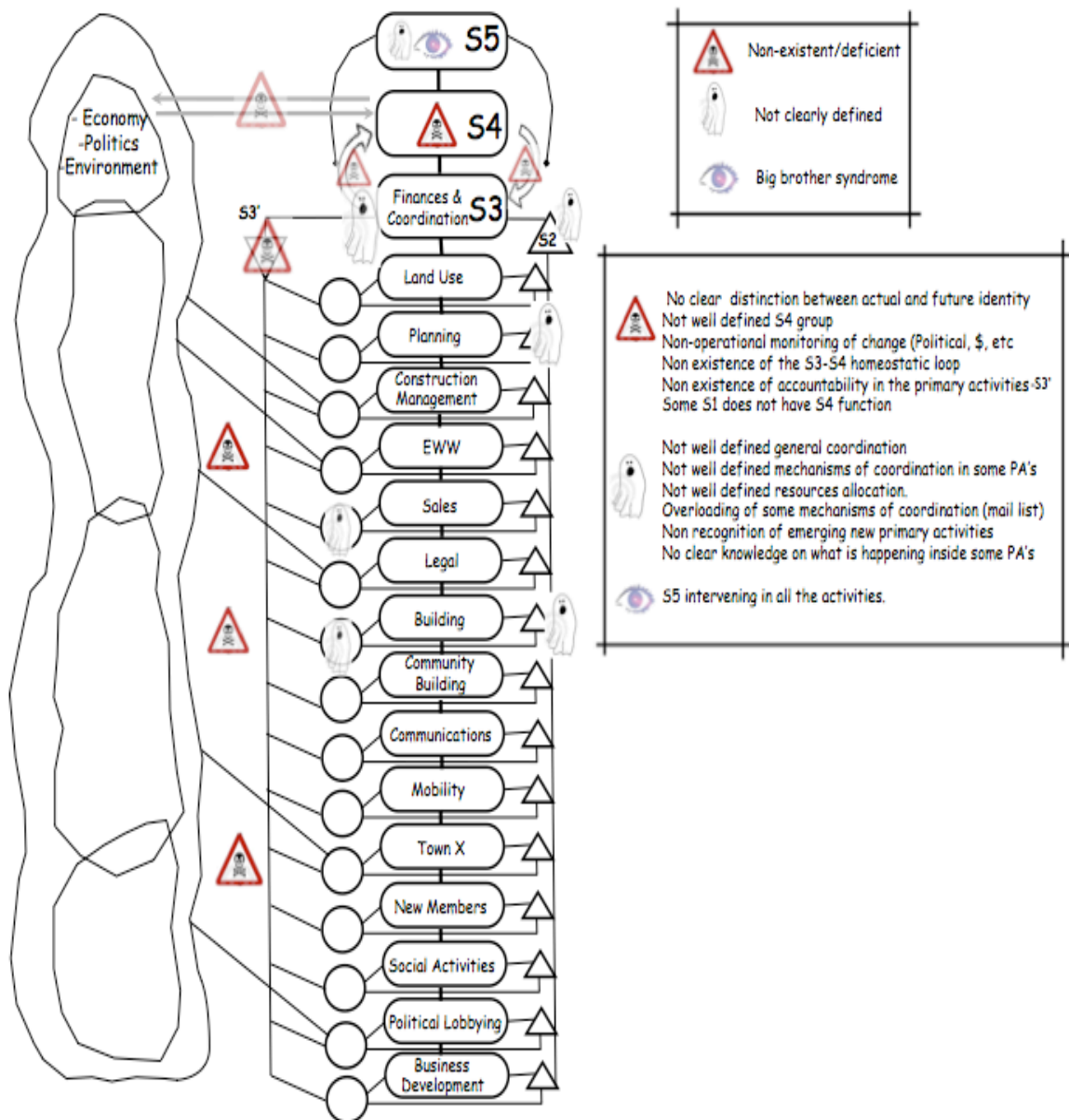
Figure 17. Diagnostic VSM at the first academic intervention (Summer 2007). Notice that most of the groups are inactive and some of them (e.g. legal, new members, social activities) are not primary but supportive activities.

The Table 8 describes the elements providing direction to the management at the beginning of the academic intervention. At this time the community was in a

critical situation due to weak management and the economic situation, demanding a re-definition of their organizational structure. The description of the VSM systems produced by the community at that moment is presented as follows:

| Transformation	To establish an efficient organizational structure to keep control and push forwards the development of the eco-village.
Actors	Current members, staff, contractors, local planning and development officers.
Suppliers	The current and potential new members, contractors.
Customers	The current and potential new members.
Owners	Planning group, process group, and board, S3.
Interveners	Contractors, local planning and development officers, lending banks.

Table 8. TASCOI Summer 2007. Notice that despite the definition of the size and main activity of the project – build an eco-village – the internal arrangement of roles, functions and administrative procedures is still not clearly defined:.

S1: Most of the operational groups were not active and existed only nominally. Some of the active groups experienced critical problems of communication with the rest of XOOP, and in general coordination of the operative groups was not efficient. During the diagnosis it was recommended that the number of groups be reduced to the ones that are relevant to the actual aims of the project, and a reclassification of the groups was suggested as some of them fit more as supporting activities.

S2: The format of the way in which XOOP was coordinating the function of the operative groups was overloaded and inefficient. The process group was assuming most of the S2 functions, but the absence of information was generating tension in the organization. It was suggested that the regulatory process should take place through coordinators meetings following a clear agenda every month.

S3: Without monitoring procedures and reports of activity coming from the operative groups, the resource allocation was not clear. It was suggested that there was a need to implement a mechanism of monitoring and the implementation of an informational system to receive

a clear report of the operative groups' activities.

S4: It was not noticeable.

S5: Suffering from Big Brother syndrome. The board was intervening directly in all the operative groups to keep control of the organization (micromanagement). The number of members on the board was excessive and, consequently, the decision-making process was tedious and ineffective. It was suggested that the number of board members needed to be reduced and board membership rotated so that there would always be no fewer than 30% of members who had served in the previous period. It was further suggested that a protocol be adopted for the meetings in order to make them more effective. Also, as XOOP identified inconsistencies with their identity they brought forward the Eco-charter(a declaration of principles ruling XOOP that was presented and validated by all the members in a general meeting) as a guide for the definition of their organizational identity.

After a year receiving guidance and support from the VSM experts, most of the recommendations were implemented. The changes in the variables affecting the management (Table 9) and the activity and structure of the organization – in VSM terms – can be summarized as:

Transformation	To improve the administrative performance by reducing the number of operational groups.
Actors	Current members.
Suppliers	The current members, the VSM experts, contractors, external advisors.
Customers	The current members.
Owners	The board, the process group, S3.
Interveners	Lending banks, external advisers, and VSM experts.

Table 9. TASCOI Summer 2008. In this period the organization is assessing its boundaries while recognizing and reducing the number of effective functional groups.

S1: The number of operative groups was reduced to seven. They reported their activities (or lack of activity) on a regular basis to the general coordinator/. A few of them presented problems in some specific

aspects of their operation (e.g. the education group had not built relationships with external partners, had no publications, etc.).

S2: The coordinators' meeting was implemented successfully. The reports were presented on time following a unified format and the meetings became not just time effective but also efficient in the generation of synergies and avoiding duplication of actions.

S3: The reception of information from the operative groups improved, but it was still not clear what the mechanism of resource allocation and monitoring was. Also, the management was incapable of being proactive since there was no mechanism to forecast and scan the external environment affecting XOOP (S4).

S4: It was not noticeable.

S5: Significant improvements were made to the board. The number of members was reduced and a meeting protocol was established. A clear delimitation of functions and responsibilities was also set out, allowing this decision-making body to concentrate on relevant issues and delegate the complexity of management of the project to different task-force groups, releasing pressure from the general coordinator/manager.

The next figure presents graphically the VSM configuration at this time.
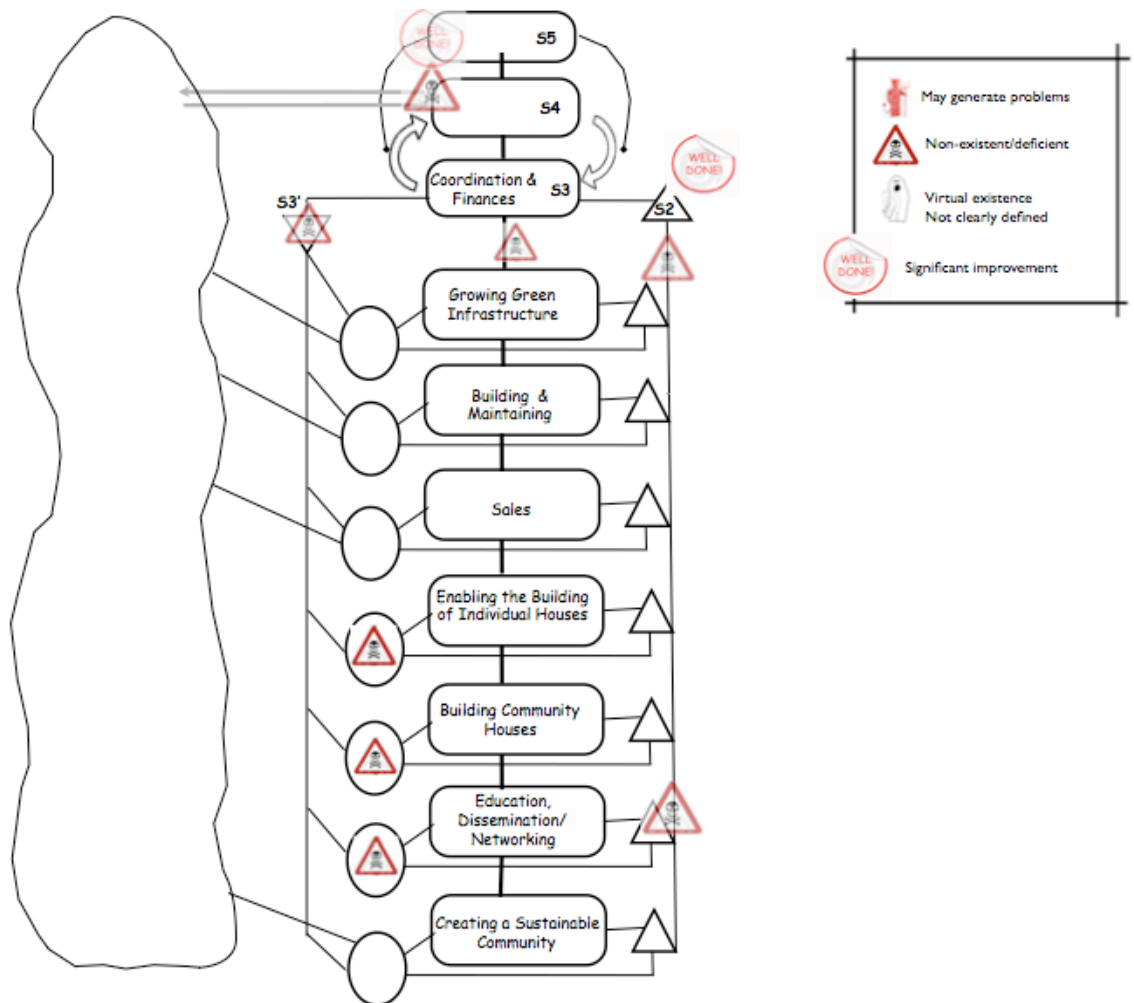
Figure 18. VSM after the second academic intervention (Summer 2008). Notice the reduction in the number of operative groups and the improvements in the coordination of their activity (S2).

Following the suggestion from the VSM experts and after the in-house academic advisory session during the first quarter of 2009, the organization skills started evolving to cope with the changes in the dynamic of the project.[67] Some operative groups evolved into independent business units, some others – to simplify the management – were formed into subsidiary firms under the control of XOOP, whose main purpose remained the development of the eco-village. The financial circumstances were highlighting the urgent necessity to create a mechanism to scan the environment and forecast external threats and opportunities to provide the material on which to base strategic planning. These changes affecting the orientation of the management (Table 10) and the organizational structure are described as follows:

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[67] Note: During this period the researcher doing the in-house academic advice session participated actively in the land use group, sustainable community group and sales group. Also assisted with some of the regular meetings of the process group. During the visit he identified and suggested some ideas and theoretical principles of SO to **I, AB, CO**, and **R,** persons who presented relatively high values of centrality (degree) and influence in the social network of XOOP.

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Transformation	To complete the development phase of the project and integrate XOOP into the local economy and community
Actors	Local community, external advisors, members and potential new members.
Suppliers	The current members and potential new members, external advisors, contractors.
Customers	The current members and potential new members, local community, public.
Owners	S3, board, process group, S4.
Interveners	Lending banks, local planning and development officers.

Table 10. TASCOI Spring 2009. It should be noted that at this stage a redefinition of the boundaries was being carried out, indicating a new change in the scope and eventually, the identity of the project while its main activity and objective was still the same – to build an eco-village.

S1: Almost all the groups were working and presenting positive reports. Sales had problems in its management and performance, and the lack of resources drove the community building and the land use groups to virtual non-existence. The sustainable community group had no management due to the lack of a well-defined purpose and function. The education group, working with the eco-education company, started to make alliances with universities and contacts with relevant international networks. Some companies emerged under the umbrella of XOOP to take over some critical activities (building, services) and professionalize their execution.

S2: The mechanisms implemented in the meetings are improving, now including the participation of a wider number of members (not only coordinators) in concentric circles of advisers and observers with the coordinators having the meeting in the centre. The unified forms to present information allows the production of a better picture of what is happening in the project and facilitates the identification of new opportunities to solve problems, reduce duplication and redundancies and to take advantage of synergies.

S3: Monitoring procedures had been implemented, establishing clear rules of intervention. Despite the improvements in financial management,

the critical economic situation obliged the General Manager to cut the budget for all the operative groups. The emergence of the subsidiary firms (BILCO, SERVCO) simplified the general management of the project by transferring much of the monitoring function of these activities (Building, Energy-Water-Waste) to the XOOP board (S5).

S4: The group assembled to perform this activity came from one operative group (education). It partially solved the problem, but introduced a new risk: the interpretation of the environment from a single perspective with a single interpretation of the variables affecting XOOP (coming from a group of people with a particular set of beliefs and views of the environment, deeply associated with environmental activism).

S5: Despite the professionalization of its activity, the new risk is located in the emergence of new operative groups and business units, in particular the ones operating as subsidiaries of XOOP. The major problem is the lack of a clear formal relation of ownership and the consequent distribution or responsibility between XOOP and its subsidiaries (BILCO, SERVCO).

The VSM representation of this stage is presented in the next figure.
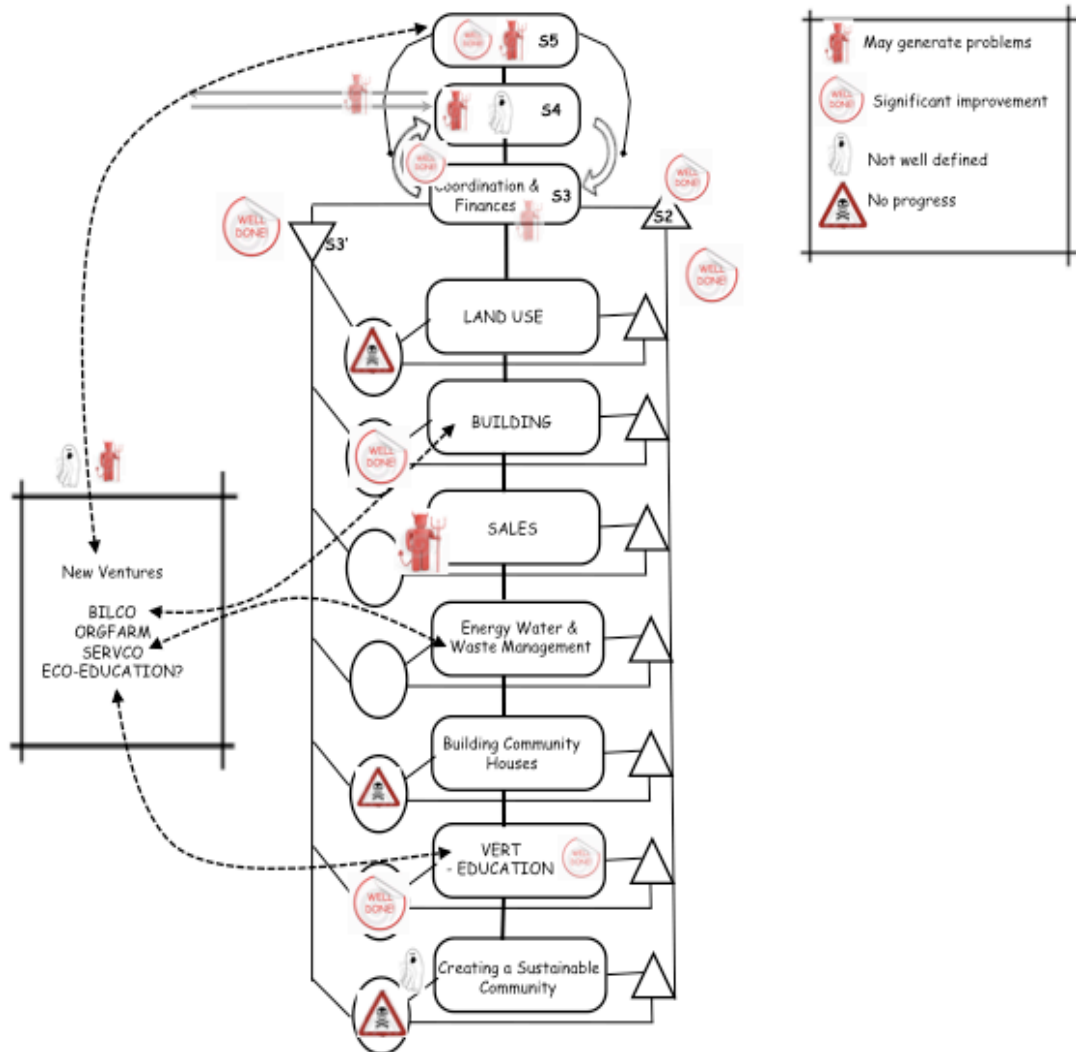
Figure 19. VSM after the third academic (Spring 2009) visit. Notice the improvements in accountability (S3'). Some of the operative groups are gaining in autonomy and being transformed into independent firms, co-owned or subsidiaries of XOOP, suggesting the emergence of a recursive structure in XOOP. Note: To simplify this diagram the environment (amoeba-shaped figure at the left in the previous VSM diagrams) was omitted.

5.3.4 The post academic intervention (2009-2010)

At the end of the summer in 2009 the organization was suffering the full impact of the economic recession. Just a few sales were reported in almost two years, which was damaging the financial viability of the project and drastic measures had been taken; among them the suspension of all the staff contracts just preserving the general manager and sales and marketing manager as part-time home-based employees. Despite such adverse situation, the number of houses being built on the site was increasing. Families without enough resources to hire a contractor opted for self-construction and the community found the way to make real the building of some of the communal facilities as the ECO-HOSTEL

and the ECO-ENTERPRISE CENTER. New businesses moved to the town (brought by members) such as the bakery, the alternative therapies company and the Eco-education company that offers services to and on behalf of XOOP through its close relationship with the education group. The description of these changes affecting the variables of management (Table 11) and the structure of the organizations in VSM terms is presented next.

Transformation	To make the transition from a development project to the consolidation of a sustainable community (in the form of a fully operational eco-village).
Actors	XOOP members, the local community and the business partners, contractors
Suppliers	Business partners, XOOP members.
Customers	XOOP members, the local community.
Owners	The XOOP board, S3, S4, The boards of the new ventures.
Interveners	Lending banks, national funding agencies, Local-regional universities and International programs promoting sustainability.

Table 11. TASCOI 2010. Notice again that the scope and boundaries of the project are being redefined. It The construction of the eco-village is still it most important activity, but new related businesses are emerging, suggesting the need to modify the structure of management of the project and revisit the values and administrative procedures and principles that provide cohesion to XOOP.

S1: The education group was working in a close relationship with the ECO-EDUCATION COMPANY, a firm that has been working in education for sustainability and had developed strategic alliances with international programmes supporting sustainable lifestyles. It also developed strategic alliances on behalf of XOOP with local-regional universities. It enhanced the autonomous work of the education group, but doesn't clarify the relationship of ownership with XOOP. A similar situation occurred with the ORGFARM, created by some XOOP members but operating independently.

To operate and use part of XOOP's land, the ORGFARM asked permission to present an application to the land use administration office using XOOP legal representation. In response, XOOP demanded an important amount of the administrative control of the ORGFARM. At this time these tensions are in the process of being resolved and ORGFARM remains an independent business. The building activity is under private contractors with the participation of BILCO. The results of its activity are encouraging the exploration of the option to create a new company to sell

their hard-won construction skills and experience in this kind of project nationwide (probably under the legal structure of a cooperative). The SERVICE COMPANY took over the activity of the WWE and was embarking on its learning curve in the provision of services to the first residents. Some problems were emerging, since its scope of responsibility had not been clearly defined with the XOOP administration.   The Community Buildings group suggested the creation of a new enterprise with mixed funds (public funds and XOOP) to build the communal buildings, a motion that is now under analysis by the board and the general members meeting. Soon, the activities performed by the subsidiary companies will either come to an end or will not be understood as subsystems of XOOP as they will be part of a new recursive level[68] (as is intimated in figure 20).

S2: The process group has developed an efficient mechanism to coordinate and share information with the different groups. Now the challenge is to replicate such experience within the new ventures, a function that has been carried out by the board through ownership and representation on the boards of the new ventures. At the time of the last visit there was no evidence of the use of VSM in any of these subsidiaries and associated enterprises, but the process group was running sessions of internal training in VSM and the management of self-organizing groups to the subsidiary and co-owned enterprises[69].

S3: Reduced in time and budget to operate. It is now concentrated just on finishing the development phase. A new manager is foreseen as running the next stage of the project since the current one is planning to retire and build his own house and start the ECO-ENTERPRISE CENTRE.

S4: A group including a diverse set of peoples and skills is now in charge of monitoring the environment and providing advice and relevant

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[68]   Note: Notice that the groups that are evolving to independent business units and in transition to the creation a new recursive level are the ones that can be classified as proper S1 (following the definition provided by Beer, 1985) as are the ones that produce profits. Not the case of groups such as creating a sustainable community, defined as S1 by the community.

[69]   In many of these VSM training sessions the VSM manual generated during the realization of this research was used.

information to the board and S3. At the moment it is overloaded with information and the task is to develop a mechanism to filter and select the relevant information to produce the strategic plan for the short and medium term. To do so, the IDENTITY group was assembled, but most of its work is just to assist the membership in formulating policies and to act as a monitor to make sure that all the groups (including the board) act in accordance with SPIL policies (therefore, its location should be in S5, but it is a matter of discussion in XOOP at the moment).

S5: They have professionalized its operation with the use of rigorous procedures. Also has representation in the board of the new ventures and the challenge now is how to define the relation of ownership with the emergent business subsidiaries of XOOP and the independent ones operating as associated, which is an ongoing discussion at the moment.

The VSM representation of this stage is presented in the next figures (figure 20 and figure 21).
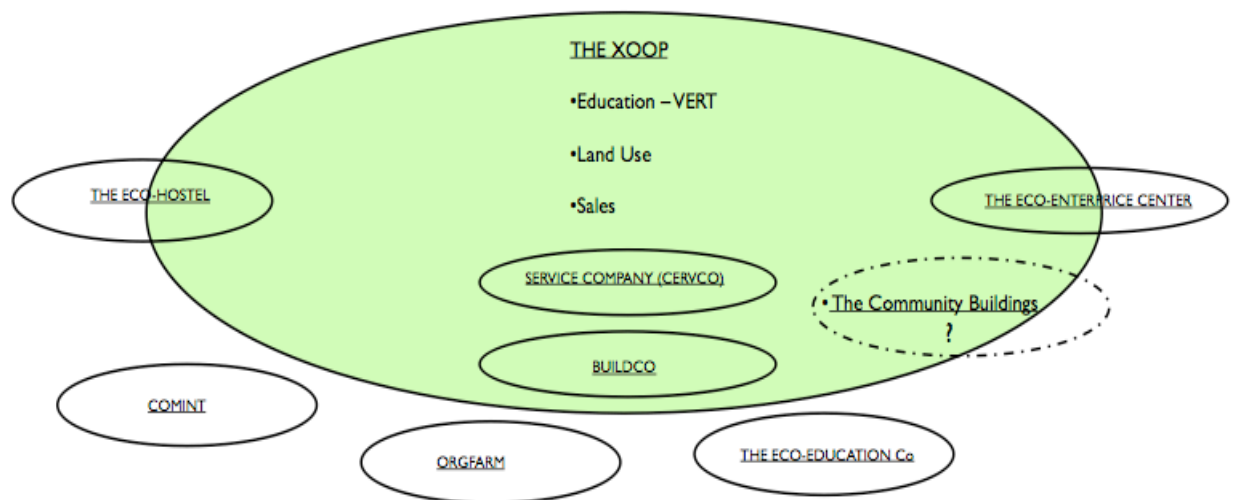
Figure 20. Unfolding Complexity: XOOP at the beginning of the third quarter 2010.
Note that XOOP (represented by the green oval) is still defined as an organization aimed at developing an eco-village. In the process, new opportunities to develop related environmentally friendly ventures emerged. Some of these emerging businesses are owned and others co-owned by XOOP (represented by the small ovals inside or sharing areas with XOOP). Also, some independent businesses found it appealing to operate associated with XOOP (they are presented as small ovals close to but not in contact with XOOP). The dotted oval represents new ventures in the process of emerging, whose future relationship with XOOP has not been defined yet.
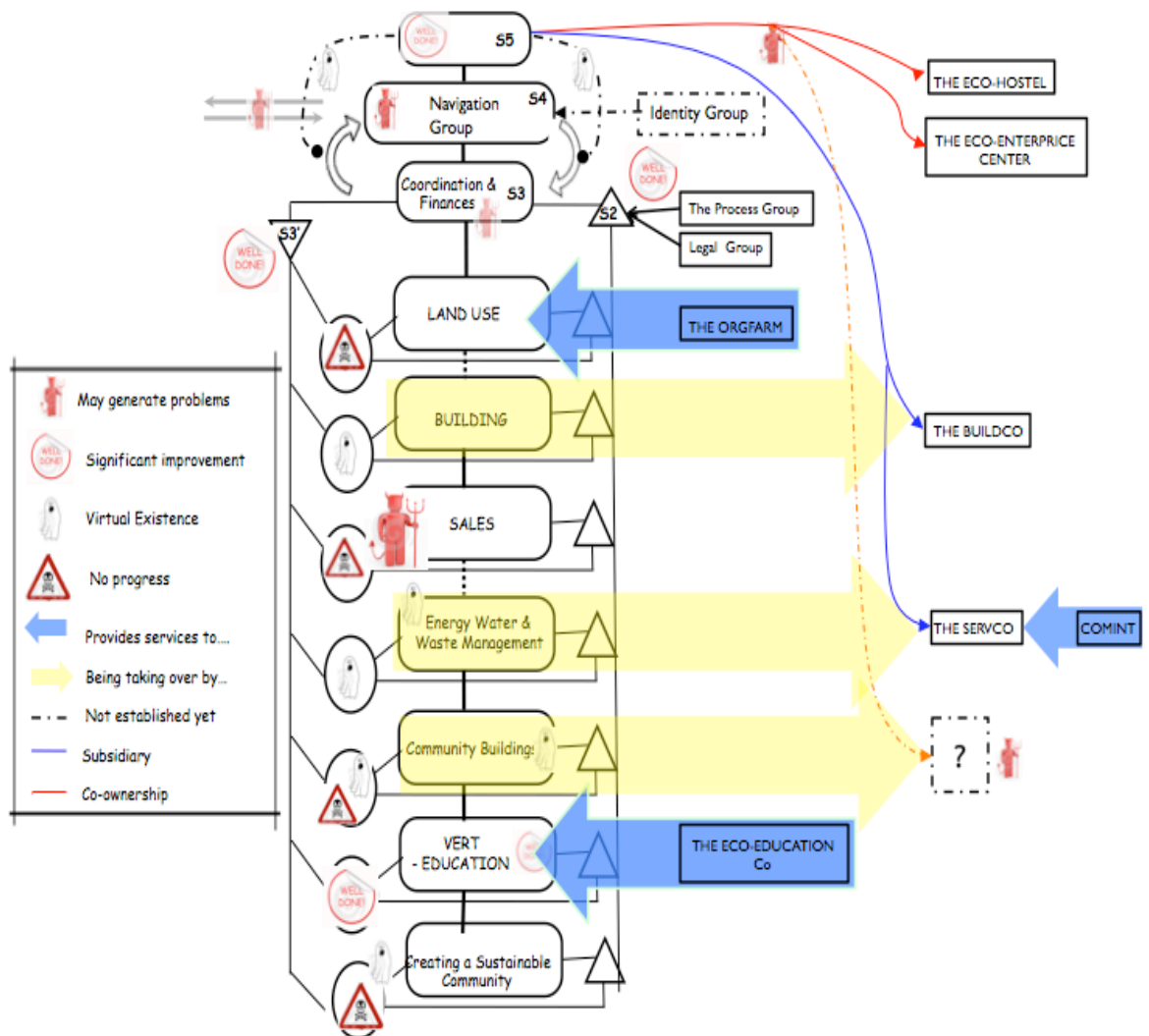
Figure 21. VSM at the beginning of the third quarter 2010.
Note: To simplify this diagram the environment (amoeba-shaped figure at the left in the previous VSM diagrams) was omitted.

5.4   SELF-ORGANIZATION FACTS

5.4.1. From the early years (1996-1999) to Growing and defining the project (1999-2006)

With regard to the necessary properties and mechanism for SO, XOOP has shown the capacity of aggregation as described by Holland (1994) and Klabbers (1996). This is evidenced by the assembling of a consistent group of (core/funding) members that has not changed substantially over time (e.g. of the first fifteen members, twelve are still in the project), united around the achievement of a particular goal (to develop an eco-village).   Additionally, they

split into different subgroups linked to particular (specialized) tasks that changed – as the project evolved and became more complex – either in their composition or in their nature and permanence (e.g. The education group became specialized and comprised mainly of academics; the land search group was disbanded once they made the choice of Town X).

Consequently, the tagging (delimitation of boundaries, scope of action and sense of belonging to each subgroup) was a dynamic process that started to become clearer when they defined the location for the project (e.g. defining their identity as that of an environmental education organization *based inland in the Town X* with the aim of developing an eco-village using alternative construction methods), which denotes its occurrence. It is also noticeable that membership of a particular group is closely related to practical requirements and ideological motivations (e.g. land use: farming with environmental principles; building & planning: engineering and architecture oriented to eco-design).

The social network analysis (SNA) of task affiliation (figure 22) shows how at the end of this period the process, land use and building groups have a high level of centrality (expressed as degree). It occurs because the most important activities at that time were the ones associated with the start of the development phase. The opposite occurs with the task of fund raising, which was important at the very beginning of the project and eventually disappeared once the acquisition of the land had been completed.

Figure 22. SNA of reported affiliation to tasks at 2006. The blue squares represent the tasks and the red circles people. The size in both cases denotes the value of their degree as a measure of connectivity – centrality that can be defined as the number of ties to other actors in the network.

However, the analytic route to identify communities in the SNA (figure 23) presents twenty-one subgroups; it coincides with the number of groups-tasks at the end of this period, but the (members) composition of these subgroups rarely matched the affiliation to the tasks (systems 1 to 5 in the VSM description) reported at that time.

Thus, since the identification of communities is based on the reported connectivity, the mismatch in the composition of the groups could be explained by the differences in the nature of the data. The tasks graph represents the reported affiliation to a particular task group whereas the community detection extracts relationships from the real communication network. It means that what they reported as a formal affiliation to a group was not necessarily reflected in their communications. Therefore, it may suggest problems in the definition of the boundaries, scope and identity that could also be related with the transition

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from a relatively safe intellectual/speculative work to a project of real development with measurable risks demanding specific – and in some cases – specialized actions, many of them unknown by the members of XOOP (e.g. planning and building). This could be the case, if we consider the existence of duplication of activities (e.g. communication, political lobbying and education groups dealing with public relations; and social housing and community buildings looking toward the construction of the communal facilities) and the fact that most of these tasks were inactive and were disbanded or had been integrated into another task.
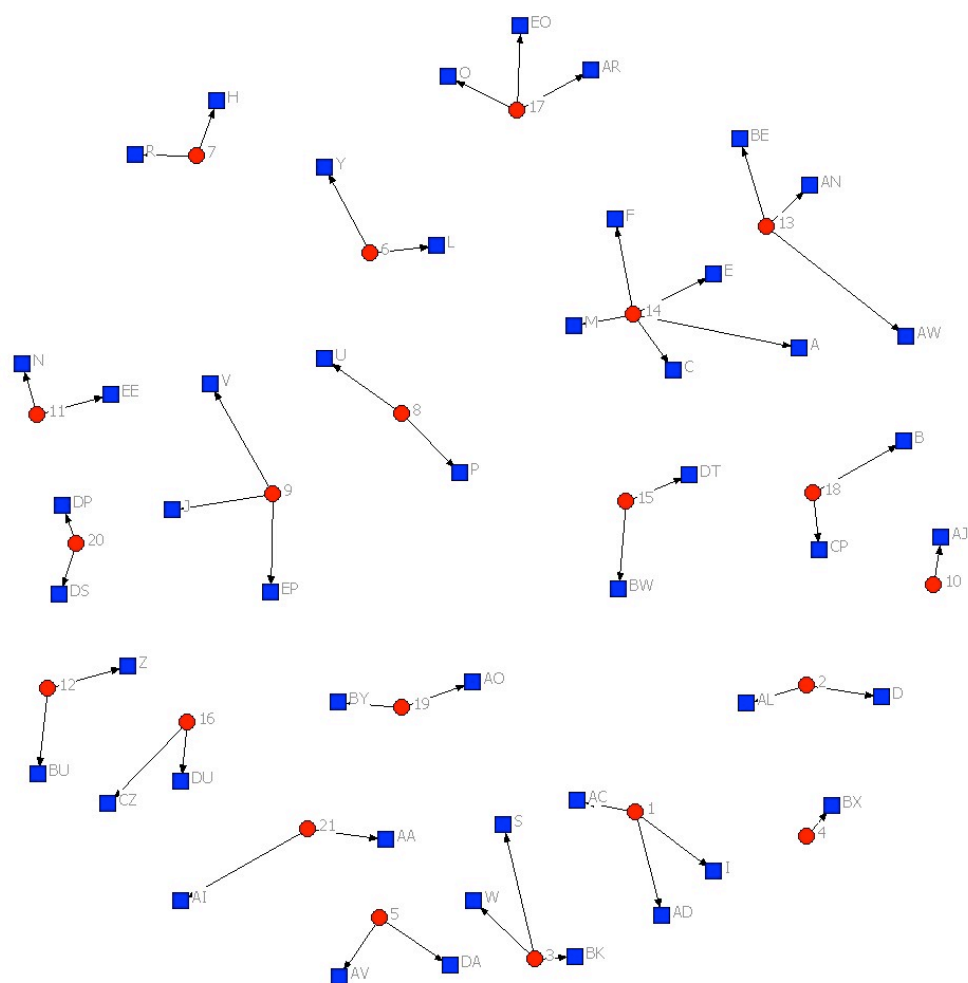
Figure 23. SNA detection of communities 2006. UCINET. The routine of detection of communities identified 21 groups. The blue nodes represent people and the red nodes represent the (unknown) attractor.

The analysis of flow of information in XOOP – presented through the graphic representation of the degree in the figure 24 – also allows us to identify key players (nodes) in the network (e.g. **I, M, J, F, BE**).

These nodes, when transposed to the VSM showed that the highest values in

communication were located in a few roles and functions (tasks and supportive activities such as land use and sales – S1 – and process group – S2), confirming the previous argument exposing poor communication and flow of information (inactivity?) in many tasks.
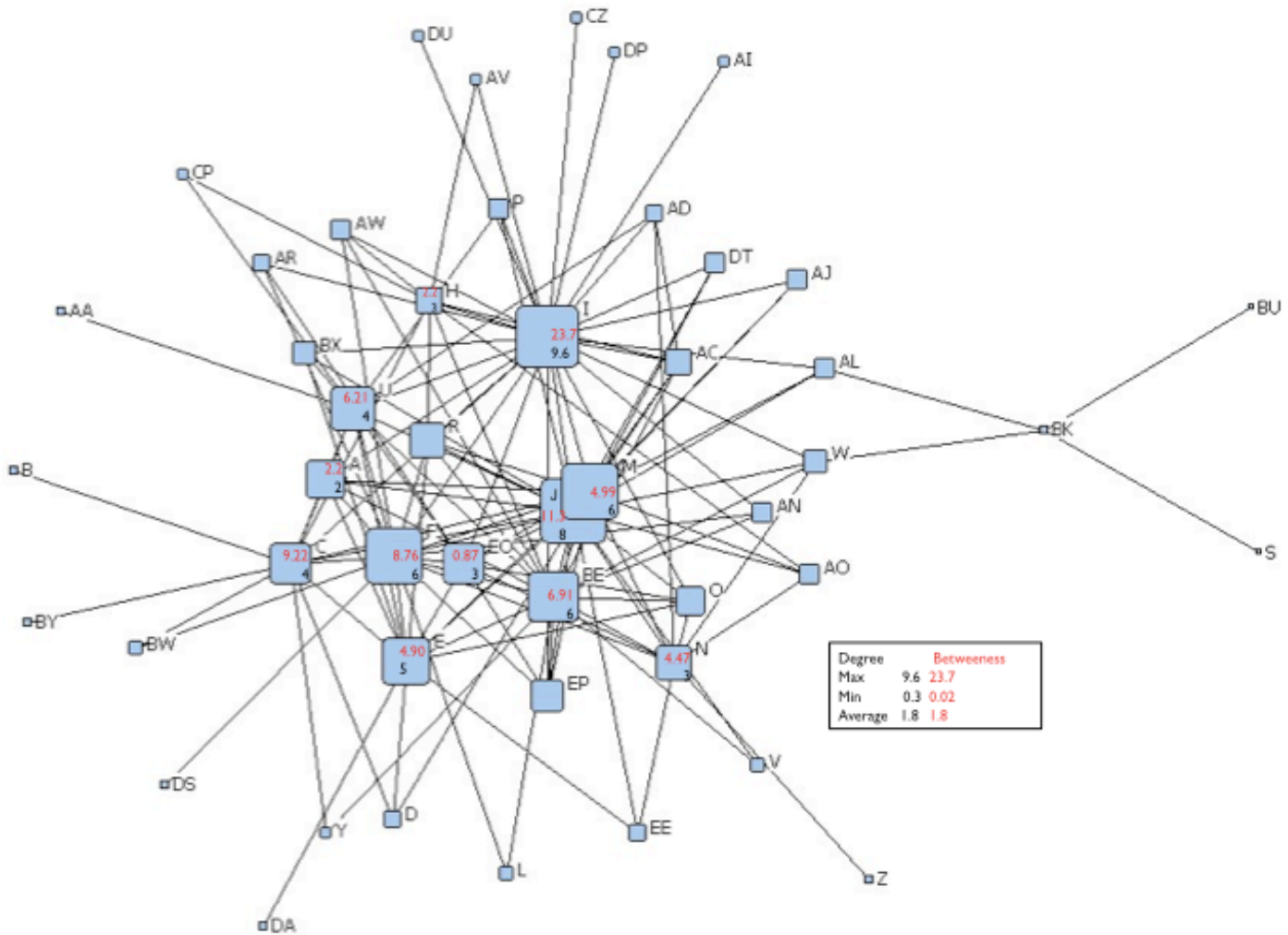
*Figure 24. SNA – Degree (2006). The node size represents the value of degree. Inside the nodes are the values of degree and betweeness of the identified key actors – Those whose high values of centrality (degree, betweeness) indicate that they could have influence and control in the flows of Information in this network. Notice the cases of **M, J, I, F, BE, N** and **U.***

Also, it might explain why XOOP found it difficult to develop a coherent internal model of the project. Systems 5 and 4 were apparently not well connected and not influential (noticeable in boxes without colour or empty) as presented in figure 25.   The absence of high values of centrality in these systems is critical since these are where the mechanisms for scanning the external environment, self-reference, self-conscisiousness, abstraction and the creation of identity are located, affecting the capacity for SO as these functions are crucial for these

phenomena according to Beer (1979), Espejo et al (1996), Klabbers (1996), and Holland (1994).

This figure also shows how system 2 presents high centrality represented by the values of degree and betweeness of the process group, which holds the development of information systems within its functions. These information systems provide the necessary knowledge that the members and functional groups need in order to operate the other mechanisms for SO (abstraction and self-reference). As described in the interviews, the system used favoured face-to-face communications (e.g. group meetings and direct one-to-one verbal communication), which was described frequently as tedious and inefficient.

During the fieldwork we found that there were poor or no files recording information about the groups from the official creation of XOOP to the end of this period (1999-2006). Additionally, other information systems created were a forum and mailing list on XOOP's website, which was used just to distribute general information and usually ignored by most XOOP members[70].

These observations confirm the lack of mechanisms to facilitate SO – particularly affecting the S4 functions – and are corroborated by the findings of the matrix of the distribution of discretion –VIPLAN (table 12).

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[70]   The general manager indicated that he does not use the forums. Other members described the forums as scenarios to extend the endless discussions of the meetings, becoming not just user-unfriendly but inefficient and useless for the decision-making process. The mailing list was used just to distribute minutes and general information. Note: The records of the mailing list and its backups were deleted during a general maintenance of the website just a few weeks before a request was made for permission to access the database and XOOP documentation. As a consequence, this made it impossible to run a more complete SNA.
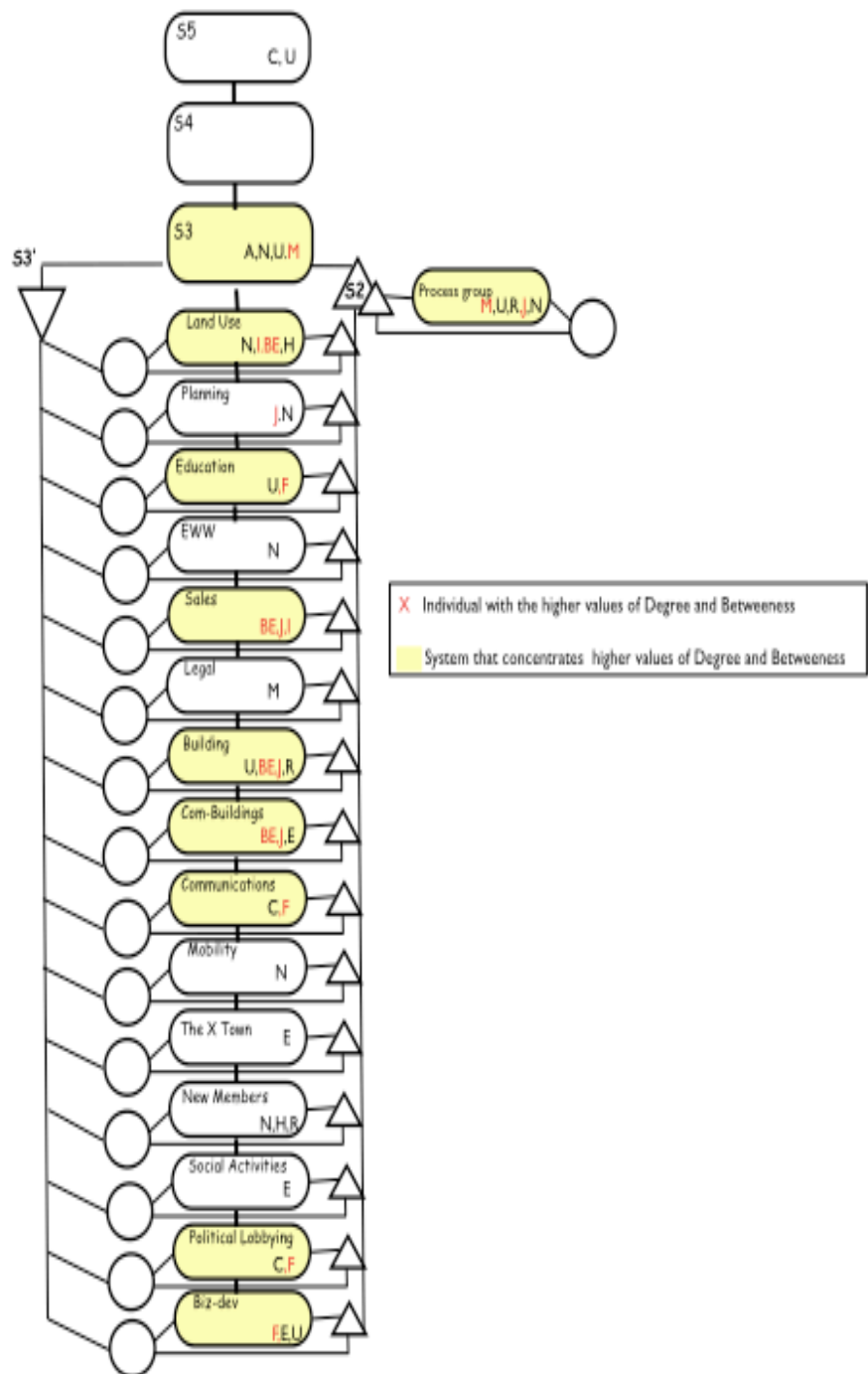
Figure 25. VSM and SNA 2006. The sum of the values of degree and betweeness of the systems/tasks were considered (using the ego-network routine - UCINET). In the figure the individuals with the highest values of connectivity are identified in the systems/tasks. Notice that some individuals are present in more than one system. To simplify this diagram, the environment (amoeba-shaped figure at the left in the previous VSM diagrams) was omitted.

In this matrix, it is noticeable that the functions of S3, 4 and 5 are not connected with most of the functional groups. It is also evident that the lack of monitoring and communication with the board was making it difficult to develop global awareness and a clear perspective about what was happening in the project, again affecting their capacity for self-awareness and the development of a

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cohesive shared mental model of the organization.

Functional groups. Primary Activities (VSM S 1) / Supporting activities (VSM S2-5)	S 2				S 3				3 *	S 4				S 5
	General meeting	Weekly meeting	Budget management	Website	Norms & procedures	Financial	HRM	Resources allocation	Monitoring	Strategic Planning	Expert consultation	Lobbing	Media & Press	Monthly meeting
SALES	X	X		X	X	X	X						X	X
LAND USE	X	X	X			X		X		X	X			
LEGAL		X		X	X		X		X		X			X
COM-BUILD	X			X										
THE-X-TOWN	X	X		X										
MOBILITY	X			X										
FUND RISING	X			X	X						X			
PLANNING *	X			X	X	X	X			X		X		X
EDUCATION	X	X		X		X						X	X	X
EWW	X		X			X					X			X
BUILDING	X	X	X	X	X	X	X	X			X			X
NEW MEMBERS	X	X		X										
SOCIAL-ACTIVITY	X	X		X										
POLITICAL LOBBING	X			X								X	X	
BIZ-DEV	X	X		X	X									X
COMMUNICATION	X	X	X	X			X							

Table 12. Matrix of distribution of discretion in XOOP 2006. Note:(*) The planning group is concerned with building and is in charge of acquiring planning permission, not with strategic planning.

5.4.2   The critical transition (2006-2009)

During this period some changes affected XOOP's capacity for SO, in particular the property of aggregation and the mechanism of tagging. One of the most influential of these events was the massive recruitment of members – up to the completion of the maximum designed membership for the project – that occurred during a precarious time in XOOP's management. Subsequently, in a

short period of time, a series of different circumstances drove many of the members (51%) to withdraw from the project. As a consequence of these changes, not just economically but also in terms of human resources, the maintenance of the numerous existing groups and the formation of new functional groups to cope with the urgent tasks became difficult.

To rectify this situation external advice was solicited, resulting in the introduction of VSM. The early outcomes at the beginning of the VSM (academic) intervention were the adoption of the Eco-chart[71]as guiding document to define the identity of the XOOP and the recognition of this stage of the project as a real estate development phase, the self-diagnosis of the organizational structure, the creation of the first shared mental model of the organization using VSM language and the later redefinition of functional groups.

Therefore, the aggregation was influenced by a more specific and clearer understanding of the nature of this stage of the project in which primary activities were defined as more real estate development-related. The effect of this clearer view of the project helped to bring about the reduction in the number of groups – but by creating more specialized and more stable groups – with fewer redundancies and less duplication of functions. This change promoted a better distribution of resources (including community members); in consequence, it generated a better distribution of communication and influence, as illustrated by the more homogeneous values of degree – if compared with the previous stage – as shown in the next figure (figure 26).

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[71]   The Eco-Charter is a document that states the basic building rules of XOOP. **N** describes it as: "a set of norms mainly suggested by the external architect who made the original design of the project, that were supposed to guide the design and construction of the individual houses but that in reality, were too abstract and almost impossible to implement".
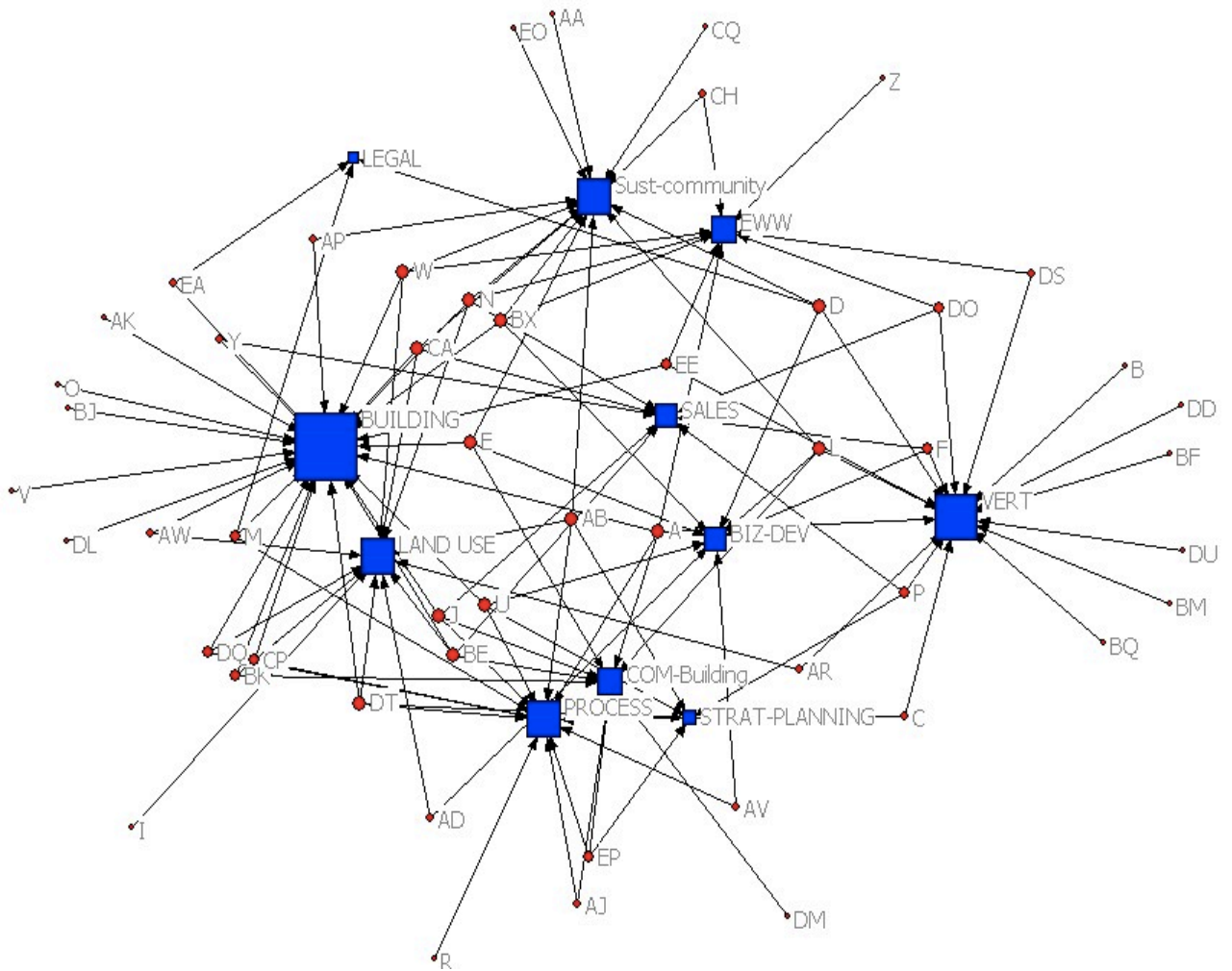
Figure 26. SNA of reported affiliation to tasks at 2006 -2009. The blue squares represent tasks and the red circles people. The size in both cases denotes the value of degree.

This more uniform distribution of members is also presented by the SNA when detecting communities while presenting almost all the groups comprising at least six (figure 27). In addition, the number of communities detected coincided with the number of existing systems in the VSM (seven S1, and S2, S3, S4, S5; eleven subsystems in total) described by XOOP, but despite this coincidence, the formation of these identified communities did not match with the report of affiliation to any of the VSM groups (systems 1 to 5). It could suggest a mismatch between the records of communication and interactions among members and the nominal formation of these groups[72].

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[72] Note: the analytical method to reveal communities in SNA using UCINET has a limitation that is discussed in chapter 6. Despite this, the SNA confirms the existence of a number of groups similar to the ones described by the community performing the roles and functions (the systems 1 to 5) suggested by VSM.
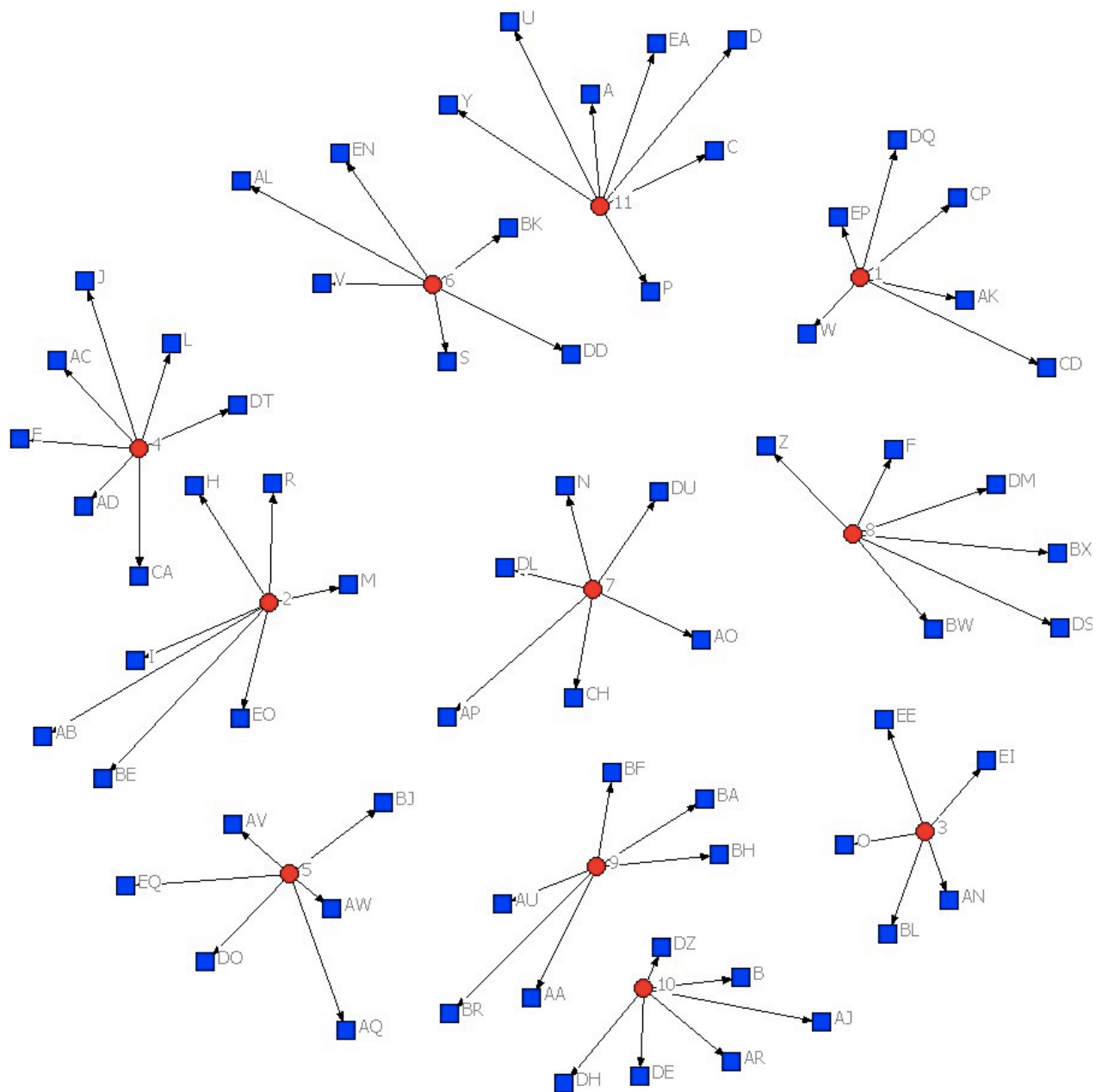
Figure 27. SNA detection of communities 2006 -2009. UCINET. The rmethodof detection of communities identified 11 groups coinciding with the number of VSM subsystems in operation at this time (Seven S1, S2, S3, S4 and S5). The blue nodes represent people and the red nodes represent the (unknown) attractor.

The redefinition of the nature of the project also implied a variation in the tagging. Now, with more specific – and in many cases more technical – assignments, the ideal of open and voluntary membership was not viable in all the task groups (e.g. the building and Energy-Water-Waste management groups were ruled by engineers with expertise in these areas; VERT – former education group – was comprised mainly of academics). Additionally, the use and appropriation of VSM as a language to describe their perception of the

project allowed them to improve and generate an explicit shared mental model of what the project was and what its current condition was[73].

In addition to an improved distribution of tasks, the development of a shared mental model of the organization using a common language (VSM) enhanced the flow of information between all the operational groups, where the SNA presented more individuals with high values of connectivity (figure 28) distributed along almost all the working groups taking care of the different organizational roles and functions described by VSM, as it can be observed in the figure 29.
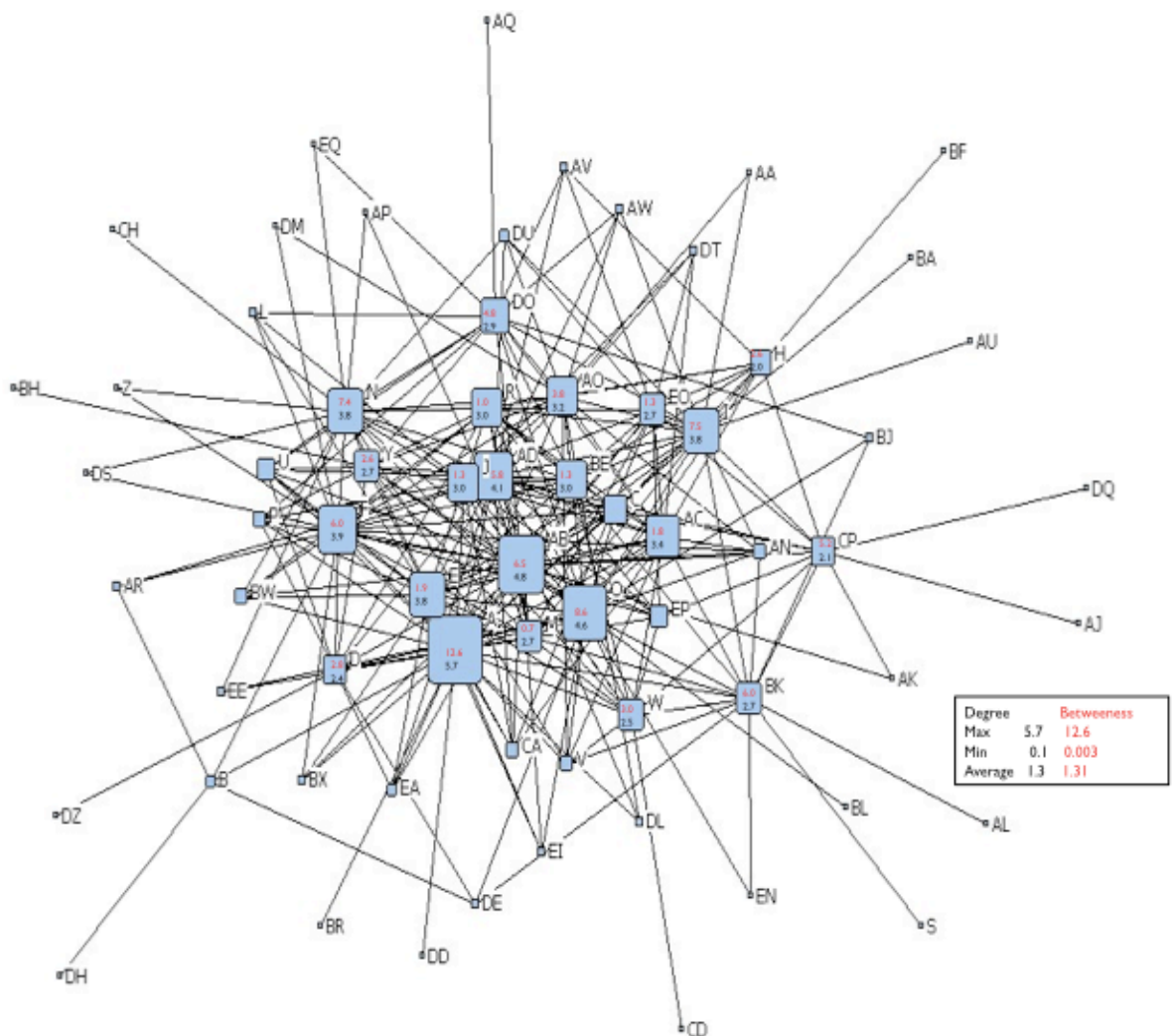
Figure 28. SNA - Degree 2009. The node size represents the value of degree. Inside the nodes are the values of degree and betweeness of the identified key actors – Those with high values of centrality-connectivity indicate they could have influence and control in the flow of information in this network. Note the cases of A, AB, O, I, AC, AD, R, N, F, J and BE and their variation with respect to the previous period

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[73]   Evidence of this appropriation of VSM language is the bicycle document, produced by **J** (inside the process group) and circulated to all XOOP members. A copy if this document can be found in Appendix 12.
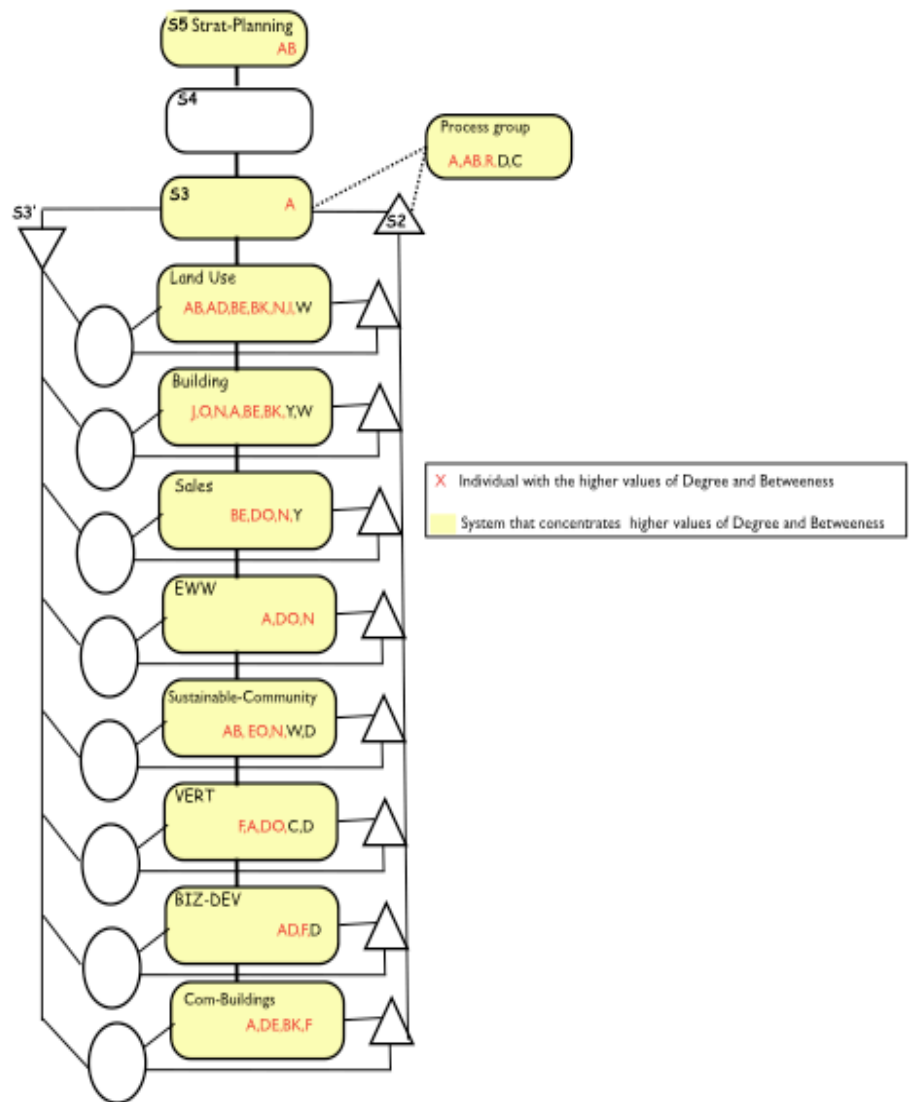
Figure 29. VSM and SNA 2009. The sum of the values of degree and betweeness of the systems/tasks were considered (using the ego-network routine UCINET). In the figure, the individuals with the highest values of connectivity are identified in the systems/tasks. Note that some individuals are present in more than one system. To simplify this diagram, the environment (amoeba-shaped figure at the left in the previous VSM diagrams) was omitted.

During this period some changes were introduced in the information systems. In essence, these were the same (meetings, mailing list, web forum) but the protocols were modified, becoming more business-oriented (e.g. they started to use agendas for meetings, and introduced stricter management of time and more order in the interventions).

Also, participation in the meetings was more regulated, limiting participation just to members directly involved in the issues or activities calling for the meeting (e.g. board meeting limited to board members and invited observers and

speakers; group coordinators meeting open to all as observers but only coordinators can speak; task group meetings open just to group members and invited observers and speakers).

The distribution of discretion for the XOOP also improved, as the groups (VSM roles and functions) were better defined and the communications were more effective. The interactions among the primary (S1) and supportive activities S2 – S5) inside the XOOP enhanced global awareness by facilitating the exchange and flow of information about the status of XOOP and consequently the development of a shared mental model of the organization. Despite these improvements, the function of self-awareness (VSM - S4) was still not well developed at the end of this period, a condition that generated problems for management as the lack of both adequate external information and a mechanism to compare and contrast such information with the (internal) description of the organization made strategic planning difficult. The interactions of the primary and supportive activities are presented in the next table (table 13).

Supporting activities (VSM S2-5) / Functional groups. Primary Activities (VSM S 1)	S 2				S 3				3*	S 4				S 5
	General meeting	Weekly meeting	Budget management	Website	Norms & procedures	Financial	HRM	Resources allocation	Monitoring	Strategic Planning	Expert consultation	Lobbing	Media & Press	Monthly meeting
SALES	X	X		X	X	X	X	X	X		X		X	X
LAND USE	X	X	X		X		X	X			X			X
COM-BUILD	X													X
VERT	X	X		X	X	X		X	X	X		X	X	X
EWW	X		X		X		X	X	X		X			X
BUILDING	X	X	X	X	X	X	X	X	X	X	X			X
BIZ-DEV	X	X	X	X	X				X					X
Sust-Community	X	X		X										

Table 13. Matrix of distribution of discretion in XOOP 2009.
Notice that the almost inactive primary activities present few interactions with supportive activities (Com-build & Sus-community). The land-use and sales groups present poor interaction with roles and functions related to accountability and strategic planning (S3, S3* and S4).

5.4.3 Evolution post-intervention (2009–2010)

After the intervention and nearing the end of the first phase of the   project's development, some members moved to Town X and new groups emerged to take over some of the activities requiring special attention (e.g. Service company, Building company, Eco-enterprise centre, COMINT).   These new groups were created as independent specialized business units and, in some cases, they demanded specific skills from the members; this was a change from the open and voluntary oriented enrolment to groups toward a kind of shareholding – usually conditioned to – investment and a stronger commitment (e.g. Building-BILCO, Eco-enterprise centre). Simultaneously, many members quit their participation in groups to attend the construction of their own houses, generating scarcity of volunteers to cover these vacancies.

As a consequence, these changes impacted on the properties and mechanisms of aggregation and tagging (e.g. migration patterns among groups: from open and voluntary to selective focus-oriented and problem-solving expert groups; restrictive elements of tagging: participation via shareholding-investment), increasing participation of members in multiple tasks.

Additionally, in response to the external variables that were more dramatically affecting the viability of the project, XOOP assembled – after a couple of failed attempts – a permanent think tank body (Navigation group) to create a strategic plan and suggest the contingent measures needed to sort out the (financial) difficulties at this time. The effect of these changes can be seen in the graph of affiliation to working groups in figure 30. This figure reflects the concentration at that time on developing strategic plans for all the activities (land use, vert, etc) that were starting to operate more independently, either as XOOP subsidiaries or as co-owned independent businesses. The Navigation group held the remit for developing strategy, and many of its members had previously been active in other groups.

It also shows that the emergence of new groups affected the values of degree of some of the existing groups. This reduction in the number of connections to these tasks could be explained as a lack of members to attend to the activities in process, or a deficiency of information about the composition of some of the

tasks as some of these emerging tasks were being performed with the participation of external actors who were not included in the questionnaire survey used to collect the information about the network (e.g. ORGFARM, building).

Figure 30. SNA of reported affiliation to tasks at 2010. The blue squares represent tasks and the red circles people. The size in both cases denotes the value of degree.

With respect to the verification of functional groups, the SNA routine for community detection reported the existence of fourteen communities. In this case, the number of detected communities did not coincides with the number of roles and functions reported in the VSM, but it does coincide with the number of working groups reported in figure 30. Moreover, he composition of these communities did not match with the reported affiliation of members to the VSM systems or to any of the existing working groups (figure 31). Notice the reduction in the homogeneous distribution of members in the identified communities compared to the previous period.
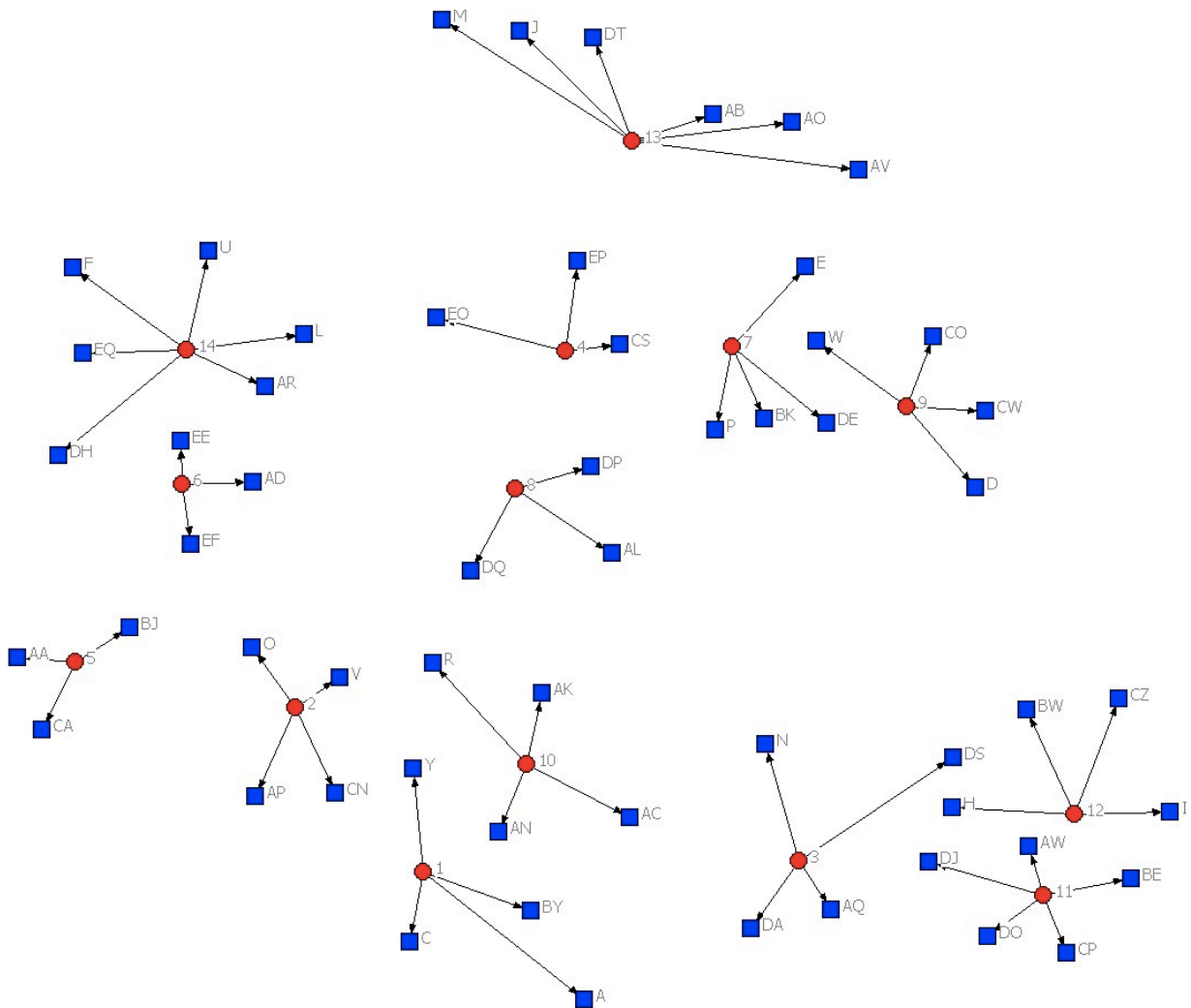
Figure 31. SNA detection of communities 2010. The routine of detection of communities identified 14 groups. The blue nodes represent people and the red nodes represent the (unknown) attractor.

A possible explanation for the mismatch in the composition of the identified communities, the discordances with the VSM placement of members and the reduction of homogeneity in their distribution could be attributed to: 1) the relocation of members to cover the vacancies in the emerging new groups; 2) the fact that some of these detected communities could represent emerging groups about which the network information is incomplete as they include externals members; and 3) the fact that some of these emerging groups have not been recognized yet in the VSM description of the organization (e.g. eco-enterprise is not included in the list of primary or supportive activities in the VSM at this stage).

The changes in aggregation and tagging also affected the flow of information. This is evident in the variation of degree and betweeness of the members with

respect to the previous period analyzed, and is particularly noticeable in the value of centrality of members in managerial positions. The analysis of degree and betweeness also reveals variations in the key people in the network, suggesting the beginning of a period of transition in the management of XOOP (e.g. **A**, manager who in the previous period had a high value of degree and betweeness but has a substantially reduced centrality in this stage; and **U,** whose centrality increased with respect to the previous period, coinciding with his more active participation and more influential role at this time). The graph representing the connections in the network and the values of centrality used to identify key people is presented next (figure 32).

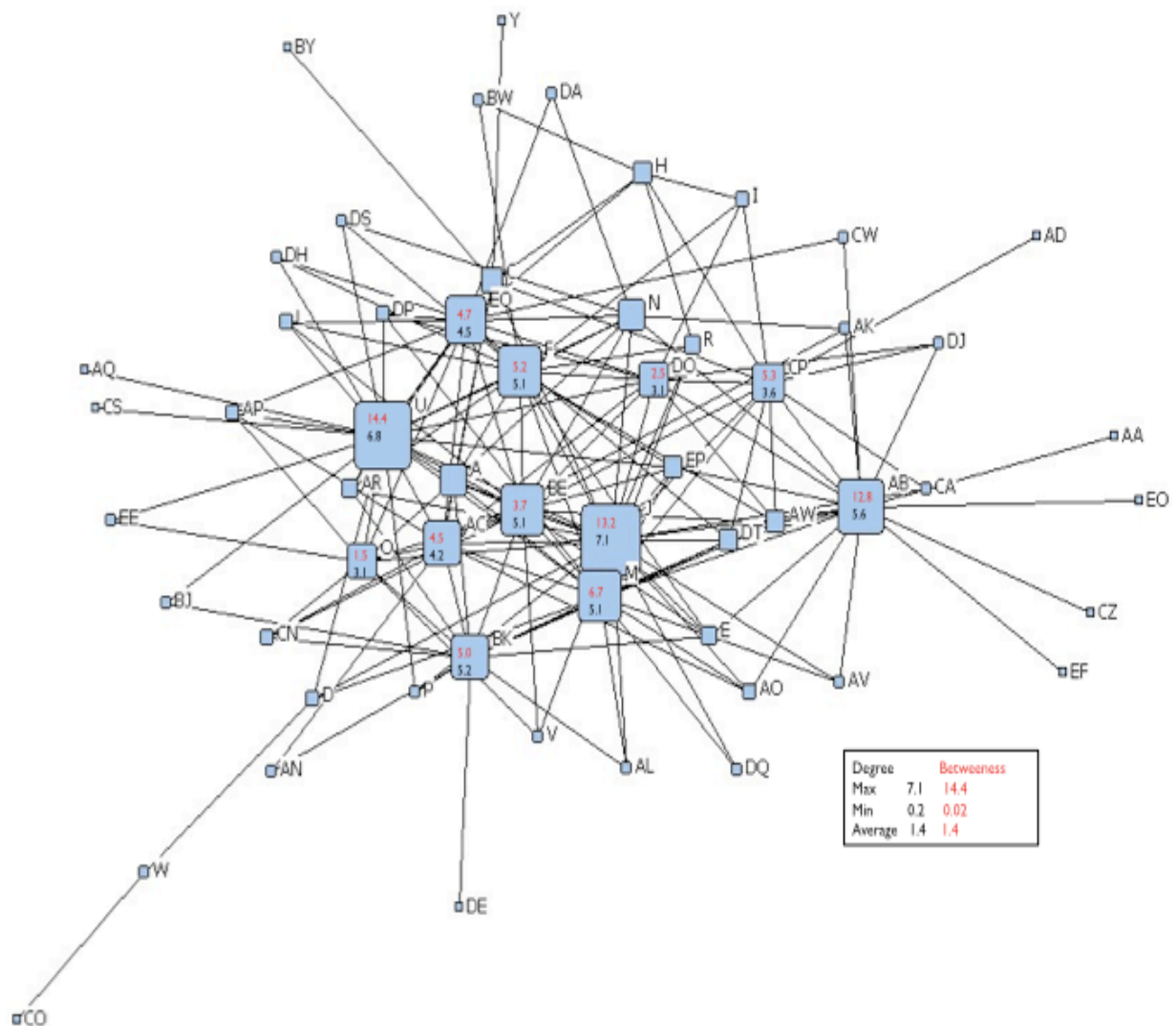*Figure 32. SNA - Degree at 2010. The node size represents the value of degree. Inside the nodes are the values of degree and betweeness of the identified key actors – Those with high values of centrality indicate that they could have influence and control in the flow of information in this network. Note the variation with respect to previous periods in the cases of **J, U, F, AB, BE, O, AO** and **A**.*

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The figure 33 illustrates how at this stage the activity concentrating the communications and connections of XOOP' members was the one concerned with the planning and preparation of contingency measures in response to the (financial) adverse environment threatening the survival of the project. As some of these contingency measures consisted in the creation of business units independent of XOOP – to reduce XOOP's financial and legal risks in a given economic worst-case scenario – the communications were concentrated in the functions of abstraction, self-awareness and self-reference (VSM-S4) and in the functional groups in the process of, or already, being taken over by subsidiary or external enterprises related to XOOP (e.g. the land use by the ORGFARM; the community buildings – studying the possibility of being transformed into an independent co-owned firm).

The distribution of discretion (see table 14) also reflects how at this stage most of the activity is concentrated in the function of abstraction and self-reference (the Navigation group in charge of planning, VSM-S4). The apparent inactivity of some groups in this period, reflected by the poor interaction with the supportive activities (S2 and S3 mainly – compare with the previous stage in table 13), may be related to the partial or total transference of these functions to an external independent organization. This was the case with the land use group, which transferred some of its responsibilities to the ORGFARM; the Service Company absorbed the whole of EWW's functions; and the community buildings group was investigating a possible partnership with the local council. This table makes evident how the emergence of new operational units – and eventually a new recursive level – modified the dynamic and structure of the administrative mechanisms of support (meta-systemic functions).

This stage of the analysis illustrates the transition of XOOP as a system in focus to a more complex organization with multiple levels of recursion as it unfolds emergent business units. These changes suggest the need in the near future to use recursive levels of description to cope with the increasing organizational complexity of XOOP. The recursive levels will provide a more clear view of the multiple relations that XOOP will develop with the new business units, also providing a description of the functioning of the new (independent) subsidiaries

and related businesses.
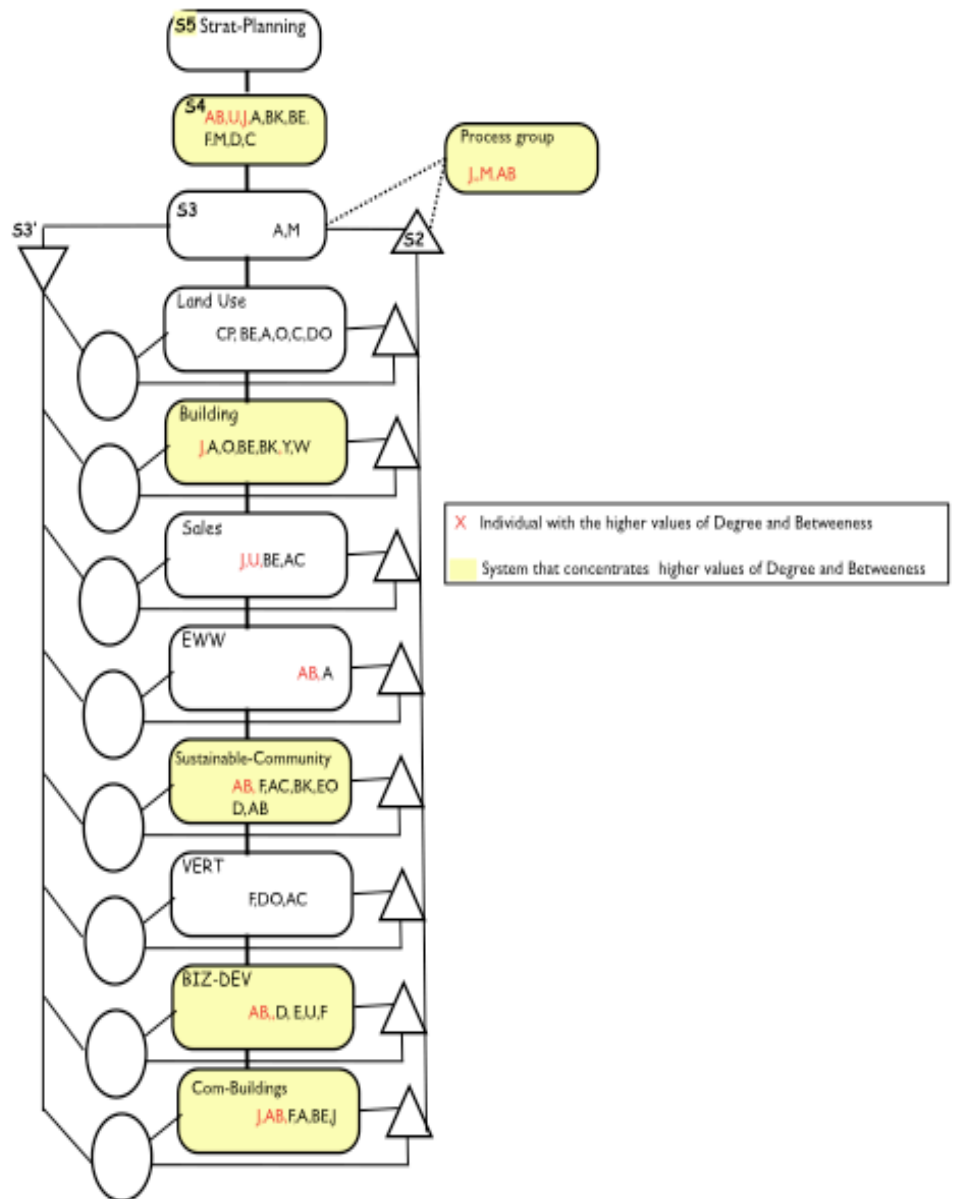
Figure 33. VSM and SNA 2010.The sum of the values of degree and betweeness of the systems/tasks were considered (using the ego-network routine UCINET). In the figure the individuals with the highest values of connectivity are identified in the systems/tasks in red. Note that some individuals are present in more than one system. To simplify this diagram the environment (amoeba-shaped figure at the left in the previous VSM diagrams) was omitted.

Supporting activities (VSM S2-5) / Functional groups. Primary Activities (VSM S 1)	S 2				S 3				3 *	S 4				S 5
	General meeting	Weekly meeting	Budget magnet	Web Comes	Norms & procedures	Financial	HRM	Resources allocation	Monitoring	Strategic Planning	Expert consultation	Lobbing	Media & Press	Monthly meeting
SALES	X	X		X	X	X		X	X	X	X		X	X
LAND USE *	X	X			X		X	X			X			X
COM-BUILD **	X									X		X		X
VERT **	X	X		X	X	X		X	X	X		X	X	X
EWW***	X				X				X	X	X			X
BUILDING***	X	X	X	X	X	X		X	X	X	X			X
BIZ-DEV**	X	X		X						X	X	X		X
Sust-Community	X	X		X						X	X			

Table 14. Matrix of distribution of discretion in XOOP 2010.
The grey-green areas represent functional groups, which functions are being or were plan to be executed by an external business unit. The (*) indicates that some of the functions are partially provided by an external independent organization. (**) Indicates that the creation of an independent business unit to perform the functions of this group is being planned or is in the process of execution. (***) Identifies groups whose functions have already been transferred to a XOOP subsidiary firm.

To summarize, the results presenting the concentration of centrality of the different systems of the VSM (figures 25, 29 and 33) were corroborated with additional tests in which the symmetrised information exchange was used to calculate the connectance[74] within the network. The overlap of these values with the VSM groups describes how the intervention induced an improvement in the connectedness of all the VSM systems, the most noticeable dramatic change being in S4, which had been non-existent in previous periods (Table 15). It also reveals that S2 and S3 have identical values, indicating that despite the separation of functions and the appointment of a manager it seems to be the same group of people sharing many spaces of decision-making, control and coordination of activities in the project, as could be demonstrated by the reports of participation to the monthly coordinators meetings.

Additional evidence of the improvements in communication in XOOP is

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[74]   Connectance is defined as the fraction of the links found from a maximum possible, according to the number of nodes (Newman, 2010)

presented by the values of reciprocity of links as presented in Table 16. The increasing value of reciprocity may suggest in this study a better feedback among the VSM systems due to the existence of a more cohesive network, where bidirectional links connect a substantial number of key nodes distributed along the different VSM structure.

This last characteristic may indicate that the property of flow (Holland, 1994) in SO systems has been affected positively by the use of the VSM during the time of intervention.

	S1	S2	S3	S4	S5
Pre-intervention	14.96	26.09	26.09	0	23.08
During intervention	14.04	14.55	14.55	NaN	50
Post intervention	13.74	38.24	38.24	20.83	35.29

Table 15. Variation of relative connectedness in the VSM systems. The values represent the relative connectedness in % with respect to the maximum connectivity of the whole network.

Period	Reciprocity
Pre-Intervention	38%
During Intervention	50%
Post-Intervention	59.30%

Table 16. Changes in reciprocity. The values of reciprocity were calculated filtering the data and considering just the members interviewed living in Town X (26% of the total population).

5.4.4   The ant's model

The use of the SO principles described in the ant's model (Arcaute et al, 2008) complements the observations from VSM and SNA by suggesting how the mechanisms of aggregation and tagging occur.

In first place, the allocation - identification of tasks is observable by the assembling of functional groups presented as a network of tasks and people – from this perspective the model does not distinguish between primary and supportive activities as with the VSM (see figures 22, 26 and 30); the SNA of this network identifies operations (tasks) that seem to be more attractive to members (the operations with higher values of centrality).

This affiliation to tasks (aggregation as described by Holland, 1994) changed with the introduction of a better means of recognizing tasks (e.g. the development of a shared mental model of the organization provided by the use of the VSM), improving the efficiency of the affiliation (e.g. uniformity and diminution of the values of members' degree, observable in figures 26 and 27) if compared with the initial conditions (figure 22) where some individuals were affiliated to several tasks and the imbalance of degree is more evident among members.

In addition, most of these initial attractive tasks were operative and assembled in (reactive) response to imposed conditions by the immediate environment and context (e.g. land use, building, planning, new members, legal, and mobility[75]). It is during the second and third period of analysis (during and after the introduction of VSM) that some functions related with supportive activities were more identifiable and gained in affiliation of members (e.g. process and navigation groups). These facts may suggest that the use of VSM modified the sensitization of the individuals, making them more capable of identifying different – and not so obvious – tasks, roles and functions affecting the viability of the organization (e.g. planning – navigation and process groups).

Unfortunately, the previous argument could not be corroborated with the use of SNA using the data coming from the communications network (figures 24, 28 and 32) because the identification of communities did not confirm the (members) composition in any of the communities generated by this analysis. Therefore, it could not establish which tasks the community formally recognized as attractors (figures 23, 27 and 31). Exploring different possible explanations for these groupings, taking in consideration the coincidence in the number of communities identified with the number of working groups existing in each stage of analysis, none of the data sets available (e.g. comparison with professional profiles, dates of affiliation to XOOP, nationality, age, sex and observations

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[75]   Land use, Town X and building groups were assembled when XOOP acquired the land. Their functions reflected the aspirational values of XOOP members: grow organic food and start the construction of a sustainable community. The legal and planning groups were assembled to prepare the application for planning permission and the transfer of property from the landowner to XOOP, and from it to the members – this procedure was identified just before they started to explore the requirements to build after the acquisition of the land. The new members group was created when XOOP grew fast, to welcome and provide an induction into XOOP.

registered in the field notes such as assistance with informal meetings, parties, sport activities, and friendship links) offered a valid explanation for the configuration of the communities identified with UCINET. To complement this analysis, the use of different algorithms for detection of communities (PAJEK, VIZONE and Christensen[76]) produced similar outcomes, the results produced by UCINET and Christensen being the ones that coincided better with the number of groups recognized by XOOP using the VSM.

With regard to specialization as an effect of the reduction of distance to the task, one mechanism that produces this effect – described in the ant's model – consists in the improvement of the sensitization of individuals to the task through repetition and learning. This way, the individual becomes keener to do the same task again (and more skilled). The other mechanism to facilitate specialization is by reducing the physical distance to the task, making the ant visit the closer task more repeatedly. These elements define the recruitment of individuals (tagging) to any particular task – as indicated in the ant's model.

In the case of XOOP the tagging presents some patterns as being the most evident in the relationships between the members with more continuity in the execution of tasks and the physical distance to the task (e.g. most of the tasks were done by the twenty-five members whose residence was in Town X during 2006-2007) and the membership of some groups restricted by specialized knowledge. With regard to the tagging in these now specialized groups, they became more skill-oriented primarily because of the technical demands of the task (e.g. planning and building groups recruiting engineers with specific expertise; legal demanding the presence of a barrister and lawyers with experience in real estate transactions) and secondly as a consequence of the creation of a shared mental model of the organization and a better understanding of the global view of the project, which improved the description of requirements and profile of the tasks. One example that illustrates this case is the process group; this group started as one with open-voluntary affiliation. With time, members with learning curve, development and/or background in

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[76]   Professor Kim Christensen (imperial College) developed an algorithm to detect communities in social networks as part of his collaboration in the inter-institutional framework in which this research was performed.

desirable skills – communication, strategic thinking – were preferred to join this group. Also, the group initially identified as a VSM –S1 was relocated as a supportive activity related more with VSM S2 as can be seen in figures 15 and 21.

The consequence of this last characteristic of tagging is that XOOP is now more skilled at identifying its needs and at calling for the creation of work groups to attend to newly identified tasks (e.g. the eco-enterprise centre, navigation), including in some cases specific descriptions of the desirable profile of group members (e.g. the call to reinforce the sales group and the board asking preferably for members with expertise and experience in strategic planning and sales and skills in business administration – Source: minutes of the board meeting March 2009) .

Evidence of this behaviour is also identifiable in the analysis of distance to the task, described as a function of the background (member profile), previous experience in doing the task (learning), the actual affiliation to a particular functional group and the theoretical requirements of skills demanded by each task.

Figures 34 and 35 represent the observation of the reported affiliation to functional groups at the beginning and after the academic intervention. In figure 34 the red profile (doing) represents the number of members working in each of the functional groups after the intervention (end of the first quarter 2010); the green-grey (have done) line represents the number of members who were involved in each task at the beginning of the academic intervention and the blue line represents the theoretical profile of optimum recruitment (theoretical), defined as the maximum possible number of members whose profiles match the skills requirements of each task.
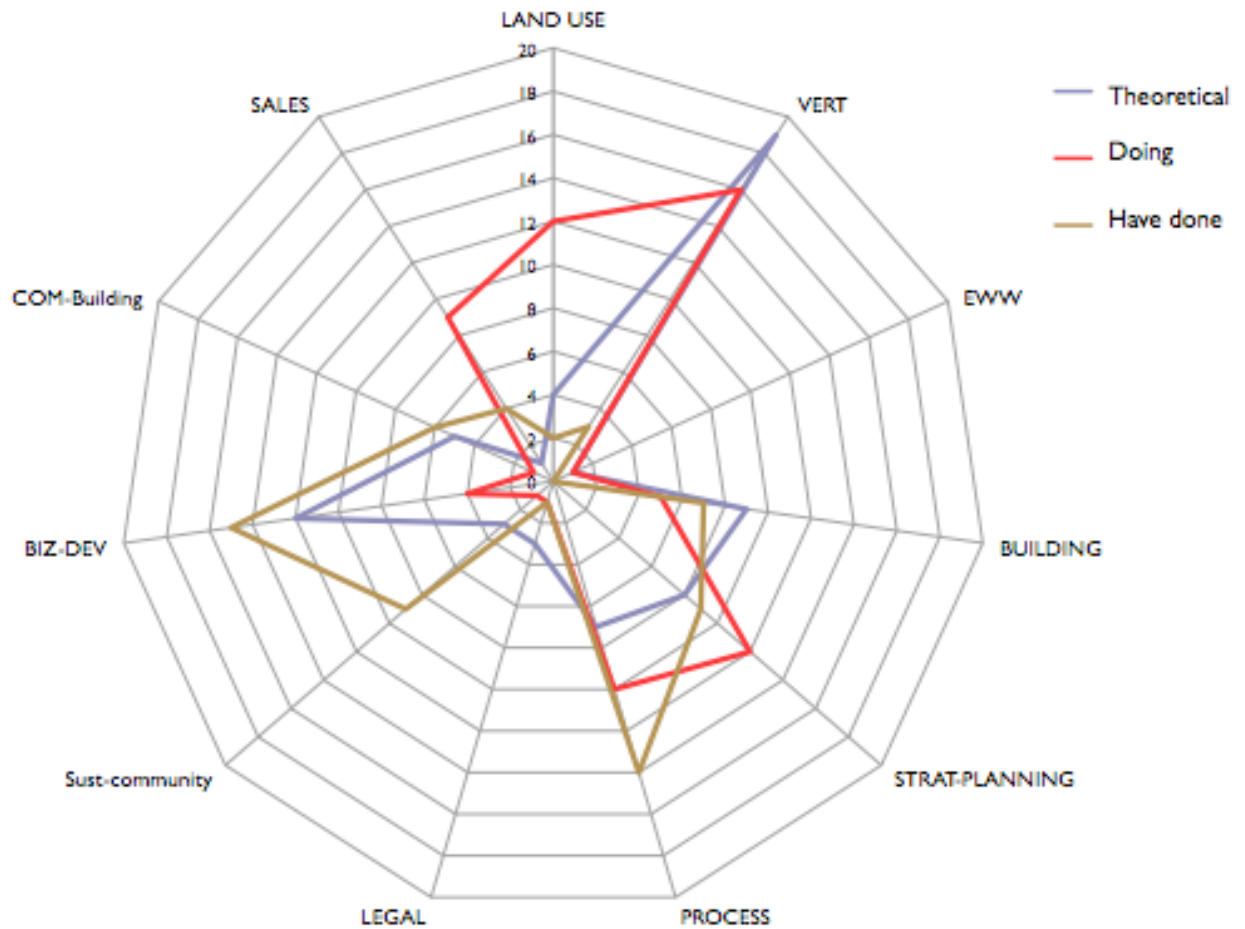
Figure 34. Members' distribution in tasks. Note: The strategic planning was named the Navigation group after the academic intervention in 2010. The scale represents the number of members.

The distance to the task is presented in figure 35 as the variation in the number of members whose profiles matched the requirements of each task. In accordance with the previous figure, the members whose skills matched the requirements of the task at the beginning of the academic intervention are represented by the green-grey profile; the number of members whose profiles matched the requirements of each task after the academic intervention is shown by the red profile and the theoretical profile of optimum recruitment is presented in blue.
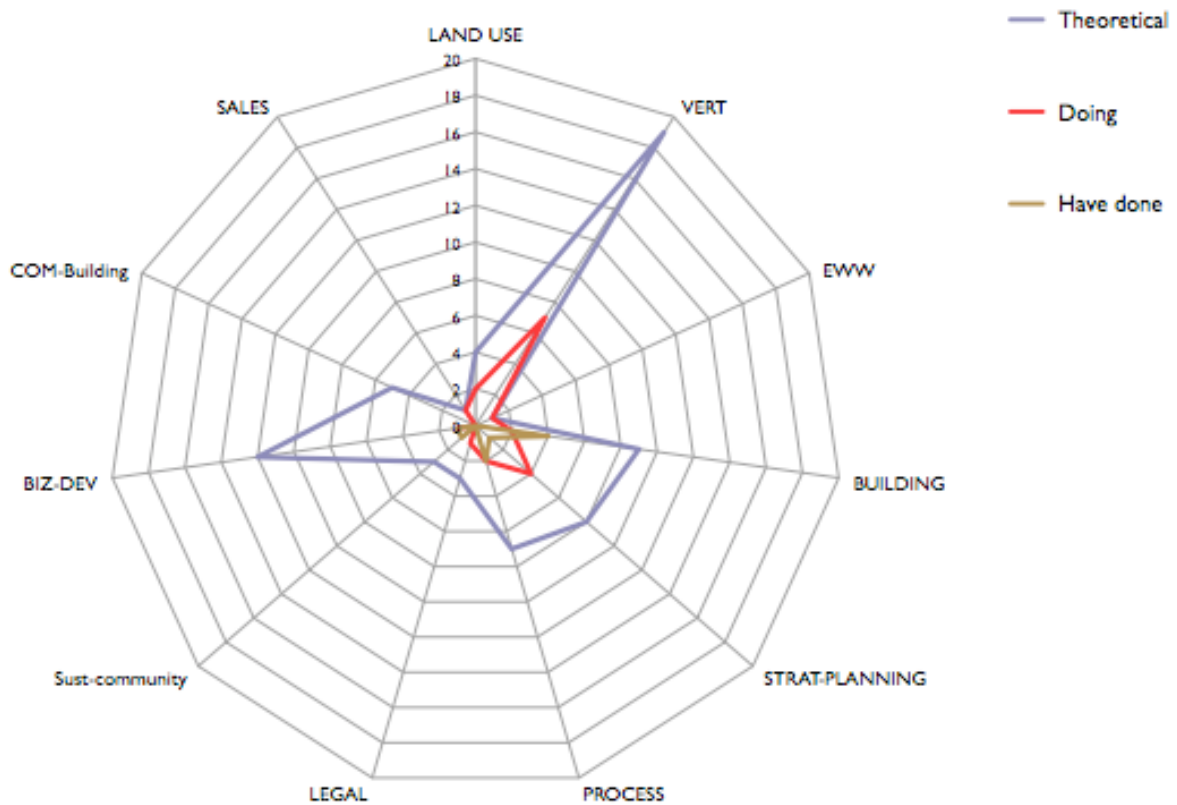
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Figure 35. . *Distance to tasks. The scale represents the number of members.*

The variation in the matching of members' expertise –vs.– the tasks' skills requirements changed from 9% at the beginning of the academic intervention to 21% at the time of the last observation (2010). These numbers indicate that the distance to the tasks has improved by more than 100% with respect to the initial conditions in which this academic intervention was initiated, suggesting that the introduction of elements that affected the tagging effectively improved the members' affiliation to functional groups by reducing their (cognitive) distance from the task[77].

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[77] Note: Notice that the ants model just makes mention of sensitization (a simple non-associative mechanism) as a learning mechanism. This fact imposes several constraints on this model to be transferred to human societies where learning can happen through many other different mechanisms (e.g. associative learning, imprinting, play or observational, among others).

5.5 <u>**SUMMARY**</u>

This chapter presented a narrative describing the evolution of XOOP from its early foundation to the end of the first quarter 2010. This narrative highlights the critical episodes that affected their organizational structure and the context in which these changes occurred. To analyse these events, the VMS, SNA and the ant's model were used, revealing different characteristics of XOOP's structure along its evolution over time and the critical points affecting its organizational viability in each stage of its development.

This review of the facts describing how XOOP evolved also allows us to identify the nature of the organizational structures that emerge from self-organizing processes, and gave us some insights about their inherent potential strengths and weaknesses, such as flexibility and reactive planning, respectively.

Finally, this chapter describes how, through the use of the theoretical framework supporting this research, the changes induced by the academic intervention improved their organizational arrangement and their ability to self-organize thanks to the refinement of the self-reference mechanisms (VSM-S4) and the improvements in the connectivity of the social network.

The following chapter concludes the research project. This last chapter offers a final reflection about the findings coming from this research and the process of how this study was conduced, which are presented together with the statement of contribution that this work has produced.

CHAPTER 6

FINAL COMMENTS AND CONCLUSIONS

"You are rewarding a teacher poorly if you remain always a pupil."
Friedrich Nietzsche (Hecce Homo – 1888)

6.1 GENERAL

6.1.1 The Action Research

The Action Research process was fluid and collaborative in both directions. The community openly provided information – when available – and was receptive most of the time to exploring new ideas, suggestions and enquiries from the researcher. Just some few individual cases – because of the sensitivity of the information and the degree of involvement of these persons in some critical events – chose not to participate in the interviews and questionnaires. A decision that was always respected by the researcher, since it was a perfectly normal and understandable attitude if we consider the drama and strong emotional involvement related to some critical events (e.g. firing the founding member of the project; ex-members leaving the project because of personal differences with the direction and decisions taken by the board, amongst others).

Despite this situation, the number, diversity, profile and degree of involvement – in the critical events that defined this organization – of the interviewees was sufficient to allow the researcher to recreate and gain in the understanding – in the most accurate and complete way possible – about the circumstances in which the decision-making process and the assembly (or dissolution) of functional groups took place. From this perspective, the decision to interview some of the most senior members of the XOOP at the beginning of the academic intervention was asserted. The cascade model in which this interviews were executed generated a set of cross references that facilitated the identification of key persons to

be interviewed, allowing the researcher to create efficiently a complete and rich description – form many different angles – of the main events affecting the evolution of the organization. These features of the interview methodology constitute one of the methodological recommendations derived from this research.

Among the properties of the multi-methodological approach (commonly favoured in AR) is the fact that it provides flexibility to cope with the emergence of social phenomenon. The implication of this affirmation is that plans and programs about how the research has to flow – and particularly the fieldwork – must include space to manoeuvre and change. It was particularly true in this research when the fieldwork strategy, the tools to capture data and the procedures to suggest some ideas of SO to the XOOP, had to be modified once interacting with the community.

An example of that, is the participation of the researcher with some functional groups: initially supposed to work during the in-house academic advice with the process and education (VERT) groups, the circumstances at that time made it difficult to participate in their activities without disrupting their current dynamic (e.g. they were sorting out the rejection of the application for planning permission and starting to understand the implications of the economic downturn on the project. Also some key members were leaving the process group). Alternatively, groups like land use, sales-marketing, and The X Town, were more open to the researcher in their operations and also more willing to provide feedback and help sharpen the tools for gathering information and observe their own self-organizing behaviour. In consequence, the format of the interviews and questionnaires were modified.

During the fieldwork an unexpected event severely affected the XOOP. It was the economic downturn the influence of which modified the trend of work of all the functional groups. Most of them saw how budgets were axed, and their members quickly moved to adapt their individual

circumstances to the new economical conditions. The immediate impact of this was that the 'think tank' concerned with the structure of the project virtually stopped and the attention was focused on how to provide economical viability to the project. Consequently, the participation in some of the elements on which this research intervention was founded was secondary in their agenda (e.g. no members available for extra workshops or formal presentations of SO principles or VSM). Fortunately, the guidance provided by the objectives, hypothesis and methodological design of the V-P, facilitated the reorientation of the participation-observation and the capture of useful data for this research. Specifically, the robustness of the cascade model in which the interviews were conducted facilitated the collection of abundant information about the evolution of their organizational structure. Also, the iterative nature of the V-P provided the opportunity to reflect about the data collected, discuss the partial results some of the most active members and modify the timescales and methods to approach the community to collect information.

"…in times of war plans are useless, but planning is indispensable."
General D. Eisenhower (1890 – 1969).

The iterative process of AR (action-observation-reflection) was superimposed onto the V-P loops (visualization-planning-reflection). The outcome of this mixture and the permanent feedback from the community stimulated a critical review of the questions and core principles in which this research was founded. It suggested in some cases, that there is a need to explore new literature and consider alternative explanations, providing the seed for new research topics and questions, many of them presented in this chapter as Shrapnel of this research.

6.1.2 The Social Network Analysis (SNA)

The SNA was used in this study to provide a quantitative approach to the VSM diagnosis, while offering information about the centrality (e.g. degree, betweeness) and the flow of information between individuals and groups, assuming that all the communications were work-related.

To do so, the data collected were used mainly to identify key persons in the network – the ones with high values of centrality. Then, their centrality values (degree and betweeness) were placed into the VSM structure. This procedure allowed us to identify VSM systems concentrating agents with high connectivity and their role in the network (e.g brokers, gatekeepers, information repositories, etc). The interpretation of the data generated by this procedure coincided with and was confirmed in most of the cases (from a quantitative perspective), through observations made using a qualitative approach (VSM), providing a good example of the possible complementarities between the VSM and SNA as diagnostic methodologies to explore organizational structures (see 6.2 Additional Comments1)

However, when exploring the conformation of communities using the data coming from general communications, the cliques detected did not match the groups reported in the VSM. Having used different methods and to find an explanation, we analyzed the algorithms for this routine in the most used software for SNA (PAJEK, VISONE, UCINET) and discovered that their algorithms do not accept overlapping membership in the affiliation to attractors. This means that one individual could not be connected to more than one group, which is not the case presented in the data collected, where typically the active individuals of this community participated in more than one activity. If these individuals (some of them with high centrality values) are omitted or related to just one group; many isolated groups or individuals emerge, presenting a distorted view of the configuration of communities and making difficult the identification of the attractors (elements of tagging) which around the communities are created. Thus, it becomes a possible explanation for the

incongruence among the reported working groups in the VSM diagnosis and the communities detected with these software; offering a warning about the limitations and the real capabilities of those analytical routines when working with multi task agents. Despite this incongruence in the conformation of groups, the number of communities detected coincided with the number of functional groups of the VSM, which suggest that the procedure still has the capacity to recognize functional roles and functions based on the concentration of links.[78]

Additionally, with respect to the sampling method and its incidence in the use of SNA, the sample was too small[79] to provide the datasets with the characteristics that allow the use the full potential of the software for SNA used in this research. Therefore, to conduct a fine grained analysis (e.g. ego-networks applied to detect resilience, performance of tasks and the tagging in emerging groups – See 6.2 Additional Comments 2) more complete information of the network is needed, pointing to a possible weakness in the use of this methodology.

Notwithstanding these limitations, the results using our datasets were enough to identify key actors (e.g. **A, U, I. M, AB, BE, J** and **F**, amongst others); evaluate the variation of their connectivity at different moments and identify coincidences and inconsistencies between the value of their connectivity and their role during some of the critical events described in the narrative. Thus, supplying quantitative evidence that suggest situations with the potential to generate conflict (e.g. the variation in the connectivity of **I, AB, A** and **BE** and the changes in the land use, community group, general management and sales[80]). Additionally, this analysis exposes weaknesses in their structure, as the profiles detected (presented in both the VSM and SNA) characteristics of uniqueness (in

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[78] In the last intervention the lack of accuracy in the data used to run this analysis could also induce the mismatch in the composition of groups. It was caused because the recruitment of external members in many groups to whom it was not possible to gain access or record detailed information.

[79] Even when the participation of members – return of questionnaires was close to 38%, in contrast with the typically low rates of response using this method to collect information as reported by Krosnick, 1999.

[80] Both, the cited individuals and the tasks they are related with are being substituted; either the individuals in their role of leadership and coordination, by fresh members, or the task by another company; or being dismissed (the community group) or diluted by different administrative bodies (general management or different boards).

terms of connectivity and skills); an observation that was confirmed by the community, providing validity to these results.

In consequence, we recommend for further work the use of bigger samples and the collection of more complete datasets, avoiding as much as possible the use of questionnaires and preferably using automatic data capture (e.g. tagging and tracking e-mails/mobile phone calls) techniques as is suggested by cutting edge research work using SNA[81].

6.1.3 The Viable System Model (VSM)

This research provides evidence about the use of the VSM as a language, which once appropriated by the community, facilitated the creation of a shared mental model of their organization and the subsequent generation of autonomous mechanisms of coordination and decision-making in groups (mainly the VSM-S2 and VSM-S4 as the key ones for the SO). Our findings reconfirm what was suggested by different authors when describing the shared mental model as a key element for the well functioning of the self-reference / self-consciousness mechanism. In this context the contrast-compare interface (VSM-S4) makes possible for the organization to act and learn (e.g. reduce the distance to the tasks – by identifying internal and external factors and the best possible set of skills present in the organization to cope with them; recognize and use relevant information – by filtering the descriptions of the internal and external environment identifying key / relevant issues). This was evidenced by the coincidence of the creation of community-shared descriptions with a better definition of tasks and identity (e.g. The VSM-bicycle and the definition of identity as a development company with a few key operative groups; the rich picture describing the ongoing

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[81] Ajith, Hassanien & Snasel (2010) indicate that the use of automatic data capture to study social networks is the new trend in research. The use of virtual communications have some limitations, such as the fact that not all the communications occur in virtual scenarios, and the tagging of e-mails is only possible when applied into a single domain and server (e.g. gmail, hotmail, yahoo, etc) and not when the exchange of mails occurs within a combination of domains and servers. The ideal application of this technique is with intra-networks were the web domain and server are administrated by the observed organization. The actual advances in software allow for the study of the dynamic of the communications and the analysis if their content and context (e.g. NVivo - software for text analysis).

process of defining a new identity and the redefinition of key activities and relationships with emergent business units).

The observation of the evolution of this organisation provided a description of the reactive structures that emerged under the use of self-organizing schemes (e.g. consensual decision-making, volunteering, self-nomination for tasks). In general, when a task emerged or the need became noticeable, a task-force group was assembled to cope with the immediate requirements of such task. As long as the task became permanent, the task-force group was empowered and recognized as a permanent group, to sort-out that task's requirements. If the task did not become permanent, the task-force group was disbanded[82]. This behaviour suggests that the way in which this organization operated was reactive rather than proactive, since they got stuck in the "activity trap"[83], mainly attending their day-to-day activities - fighting fires, addressing problems instead of proactively addressing issues.

The lack of strategic thinking becomes more evident if we observe the accountability of their actions. In the period before the academic intervention (precisely when they more strongly claimed to be a flat organization, with autonomous self-organized groups) this accountability was poor or nonexistent. The evidence of this situation was the poor (or nonexistent) definition of the goal and objective for the activity of each group, in consequence there were no indications about what to measure or observe in order to know the performance of the groups.

Note that S4 never materialized in this period, despite many attempts to set-up a group to deal with the strategic planning of the organization. This can be related to the fact that, at the same time, the XOOP was not certain of its own identity and objectives, since the ones initially

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[82] For instance search land group: created to find the site wherein to settle the project; once the land was found the group was disbanded. The process group: created as a task force to develop procedures and protocols to keep control on the operation of the work groups. Its functions soon became vital, as the necessity to keep control and coordination on multiple tasks in the ever changing environmental conditions, made of it a permanent body, supporting the functions of VSM-S2 and VSM-S3). The sales group (initially created from the 'experience day' volunteers), when they noticed that sales and marketing should be a less informal group, more stable and professional.

[83] The "activity trap" was a concept coined by Peter Drucker in his book: The Practice of Management (1954).

established (find the land, get money and buy the site to start the development) were already achieved, and did not match the nature, challenges and implications coming with the building activities and the incorporation of many new members.

To summarize, in VSM terms, *this self-organized reactive organization can be described as a Viable System Model in which the functions of S4 and S3* are not well developed or nonexistent. Consequently, affecting the meta-systemic functions and the definition and efficient operation of the working groups.*

Looking back into the underpinning principles supporting the design of the VSM, the previous argument presents some parallelisms with the observations coming from the neurophysiologic backgrounds of the VSM when describing the evolution of the neural system. The execution of advanced functions of abstraction demands a more evolved neural structure that is not present in basic or elemental organisms. These functions come with the evolution of more elaborated interactions with the environment and the development of more sophisticated sensorial organs. The basic structure of the SO groups resembles the basic structure of primitive organisms with not so well detailed and accurate sensors and constrained mobility. Therefore, our findings about the profile of the structure of self-organizing organizations are consistent with the theoretical backgrounds – from an evolutionary perspective – of the VSM.

The introduction of the VSM, offered to the XOOP the possibility to reflect on the appropriateness of the existing S1, the need for accountability and the necessity to assemble a permanent body to assume the functions of S4. Additionally it provided a unified code to describe the organization and create a shared mental model, useful to compare and contrast their organization against environmental changes and facilitate their process of self-conscisiousness / self-reference. This outcome is specifically related to our initial hypothesis:

"The introduction of a common organizational language among members of a social system, facilitates the emergence of robust organizational structures coming from self-organizing processes"

In this order of ideas, we could affirm that the VSM provides sufficient elements to facilitate the creation of more viable and more effective self-organizing groups; but it can be argued that the use of any other organizational design tool (e.g. the "STAR" model) would be useful to induce the same effect, if it generates a shared mental model of the organization and pinpoints the need to assemble a permanent group to do strategic planning, rigorously following the basic principles of this activity (e.g. internal diagnostic, scan of the environment / external diagnostic, identification of matches and gaps, definition of strategic actions, development of plans and work instructions).

In addition, the VSM points out the importance of accountability (S3*), but does not provide the step-by-step elements to constitute and implement it in practice. About this particular issue, the self-directed/managed work teams (SDWT-SMWT) adopted many of the elements of the Management By Objectives (MBO) – and further Value Based Management – such as the SMART method; offering a more conventional alternative to address the different challenges that this case proposed (e.g. the identification of actions related with the development works demanding a particular set of variables to be monitored – linked with financial indicators – that are not specifically described in the presentation of the VSM).

The case illustrates how the community changed (or was struggling to define) its identity throughout the evolution to the project. This fact can be seen in the definition of different objectives as the organization evolved and by the existence of just a chart of principles that should be adopted (in contractual terms) by the joining members. Unfortunately, these elements do not constitute a reflection of the motives, aspirations,

desires and purposes of all the individuals and the organization as an entity. Therefore, they did not offer a solid ground to enhance cohesion and to develop a unified identity. It can be also identified in the lack of a genuine definition of sustainability – the ultimate goal of the entire project: to create a sustainable community – and the recognition of such weakness by the creation of the identity group. The lack of identity in an evolving organization can be related to the permanent existence of tensions and ultimately with the deficiencies detected in the coordination and management functions (VSM-S2 to S5). The adoption of traditional strategic planning tools (e.g. Balanced Scorecard) would be useful to sort out such problems, but because of the values and ideology on which the project was founded (e.g. consensual decision making, non-hierarchical and not business oriented organization) the members rejected this solution in the early stages of the project.

However, also with the use of these conventional management and organizational designs, comes the possibility of failure. The use of matrices of design requires not just expertise but awareness of the key variables to be considered and the logical interaction among such variables. Therefore, in a particularly complex situation, they can become confusing if a multi-level structure has to be designed covering many different task groups each with a different orientation and purpose – each one demanding a different matrix for its design. In that sense, the VSM has been demonstrated to be relatively simple, due its suggested recursive structures that, with a single framework and template ease the comprehension of the minimum roles and functions that the organization (in every recursive level) needs to develop.

Regarding the actual emergent configuration of the XOOP as a network of co-owned, subsidiary and related businesses; it raises a new challenge for the management and design of administrative mechanisms for coordination and control of these multiple relations of work and ownership. In this context, we recommended the XOOP to explore the concept of recursion and heterarchy to coordinate the operation and

management of the emergent XOOP business structure while providing to these business units autonomy and encouraging a high level of self-determination and intrinsic control – in both, the network and in each of the business units participating.

Finally, to support this approach and the use of cybernetics in community-driven projects this research presented a VSM handbook[84] the development of which has been strongly influenced by the intervention in the XOOP and, the feedback coming from groups in which the author participated as a member. It was influenced in particular by the observations and comments coming from the process group who were in charge of the adoption and implementation of the VSM as a language and tool to describe the structure of the XOOP.

6.1.4   The Ant's model

The mathematical formulation of the ant's model has two assumptions that conflict with the nature of the data collected. The first of these assumptions is that individuals will be associated with just one task or functional group – the implications of this are similar to the ones described before for the SNA and imposes some limitations to its use when applied to multi-task individuals. The second assumption is that all the individuals are equal in terms of sensitization or attractiveness to a particular task. In the case of the XOOP, we found several discrepancies with this argument (e.g. people with skills, refusing to participate in the group where their skills fits better, individuals joining groups where their skills do not match with the requirements of the task; tasks that demand a highly qualified personnel – e.g. engineering), suggesting that due to this limitations the ant's model should remain only as a metaphor to explain the SO process in this case study[85].

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[84]   The VMS Handbook. See appendix 13. This handbook was created as an instrument to interact with the community during the in-field academic advice provided by the author of this dissertation. After several modifications in the context and diagrams (informally commissioned by the XOOP) the final version is presented in the appendices of this report.

[85]   The ants model, where people come together in an apparently uncoordinated way to attack a problem can perhaps be used to describe individual events but it obviously doesn't capture the deeper interactions between functional groups.

With regards to the nature of the agents' task recognition in this model, these tasks are given, either because they are (possibly) encoded genetically in the individual – as in case of ants – or, they are determined and programmed within the model as a code of software – as in robots and the virtual ants model. In the human context, the situation is somewhat different. We may be accustomed to think that people gather together in response to the call of a particular task or to solve a problem; but independent of the object, the most important task and the first step still needs to be done, that is, to define the purpose of forming the group and to clearly identify/define the task to be addressed, define its purpose, objectives, scope and operational context. Omission of this first step in the initial gathering process drives groups either to fail or to have a poor performance in their operations.

The case study offers evidence of this, particularly in the first stage prior to the academic intervention. During this period, several groups were assembled[86], some of them in response to an urgent issue needing to be addressed (e.g. solve legal issues, find suitable land, provide advice and design supportive administrative processes). In the above examples, due to the specific nature of the tasks, groups were assembled and provided by the general manager and/or the group coordinator with clear instructions and specifications about what should be achieved, the purpose of the group and the relevance of the task into the wider context of the organization. In consequence, all these groups succeeded in their assignment and found it easy to operate autonomously[87]. A different situation occurred with groups created where the definition of purpose, scope and context was not clearly defined (e.g. mobility, business development, the Town X, new members, among others). Hence, all these groups failed in the identification of the activities needed to achieve the purpose of the task and found it difficult and conflictive to operate autonomously.

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[86]   Note: the assembling of many different groups can be interpreted differently from the CAS perspective. Some implications derived from this perspective are discussed in Additional Comments 4.
[87]   Note the coincidence with the SDWT-SMWT principles of operation.

Finally, with respect to distance to the task, it is noticeable that it improved during the period of observation. One possible cause of this is related with the nature of the tasks, in the sense that those where specialized or technical knowledge was required, persons with that particular knowledge were recruited (e.g. farm, building, legal). In other cases the natural drift of the maturation of the task, drove the group to change its recruitment pattern. Examples of this are the sales and VERT (education) groups, which were open to admit any volunteer member; but as the task evolved and become more focused in some particular activities, the recruitment changed and became more selective; in both cases reducing the distance of members from the task (e.g. sales recruiting people with sales profile; education recruiting academics to offer modules and research partnerships to colleges and universities).

A different mechanism to reduce the distance to the task corresponds to the effect of learning by repeatedly attending to the same task (sensitization and learning-by-doing[88]). In the XOOP it was evident in few groups (e.g. sales, land use) that some of their members gained specific skills due to repetition of the work. Some of these individuals received training in special issues such as closing sales and permaculture that are not transferable to any other task. Therefore, some differences were noticeable from the ant's model: The first one is that the distance to the task is not equal in all the agents and specialization does not occurs just by repetitive attendance to a particular task. From this first difference, a second one emerges and it is the assumption that any agent can become a specialist in any task. This supposition is arguable, since some tasks demand very specialized skills that may not be gained in a learning-by-doing scheme, or which acquisition implies a long – and sometimes expensive – learning curve.

To conclude, the ant's model implies that each agent will make a decision about which task to join, based in the information provided by

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[88] Notice that sensitization is not the only learning mechanisms in the human contexts, pointing out another limitation to transfer the ant's model into the human context.

the nearest one. This means that each agent develops a picture or understanding of just its immediate environment (a picture with information of the status of the nearest task and the activity of the nearest agent). This fragmentation of information may be useful when acting and reacting locally, but will not generate a global view of the organization and in consequence, the structure and functions of a VSM S4 do not emerge.

Experiments carried out with real ants to test the model, indicate that scouting (a function that could be the equivalent of the VSM-S4) does not occur if the ants are fed. It occurs only when the colony is close to starvation and is performed by the elder members.

This means that a global system of information does not exist. And that is only when the signal value from the task (find food) is critical (or affecting a critical number of members) that the colony reacts to solve the situation; indicating that the individual perception of the task does not generate a global understanding of the situation for the whole colony. Therefore, a function, such as contingent planning or forecasting the status of critical functions, does not occur in the ant's model.

Similar behaviour was observed when disturbing the nest. While damaging small parts of it, just local workers went to fix the damage. It was only when the damage was massive and particularly, when threatening the brood or the queen, that the entire colony reacted. To reiterate, it is when the disturbance achieved a high critical value that the colony reacted.

These observations indicate that the suppositions of the ant's model have limitations because it considers learning-by-doing as the sole mechanism to reduce the distance to the task. In this case study, the distance to the task was determined by the nature of the task itself (operating as a selective mechanism), the expertise already existing in the agents and the learning-by-doing - understanding that this last mechanism has strong limitations related to the cost of the learning curve

as well as its constrains in providing specialized skills that need more professional training[89]. Also, that local information does not generate global understanding of the organization. This mechanism will cause a reaction in the whole organization only if the values are critical and affecting a large number of individuals. As the functions of forecasting and contingency planning do not emerge under this mode of operation; there is a great risk in adopting such behaviours in human endeavours, as the consequences in costs can be devastating for a rural community. Consequently, the ant's model teaches us about the danger of reactive and locally oriented management when working with self-organized communities.

From a different perspective, the ant's model coincides with the main stream of SDWT-SMWT when designing the interactions and team building around tasks. Also, the descriptions of how specialization occurs are useful for detecting this potential in evolving teams. In this context the mathematical model using interactions with tasks, could be applied not just to provide a quantitative description of the potential and actual self-organizing behaviour, but also for the early detection of prospects for specialization and assess the conformation of groups facilitating the identification of sources for strategically important collaboration; a relevant issue in innovation and human resources management as described by Cross et al (2002).

6.1.5 The mechanism of SO

Through the introduction of the VSM and the creation of a Shared Mental Model, some of the mechanisms favouring the SO behaviour were modified within the community. These changes were evident in the tagging, flows of information, the creation of an internal model and the use of information systems, during the academic intervention, improving the capacity of the XOOP to operate autonomously.

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[89] A the moment of printing this document Dr. Arcaute was studying the possibility of modifying the formulation of this variable in the model, to adapt it to describe self-organization in human groups. A paper explaining these modifications and their application in a real case (the XOOP) is being planned.

The VSM provided a common language through which the internal model of the organization was created. It also, provided a template to help clarify and make more efficient, as well as expedite the exchange of information within the XOOP. In this context, the most significant changes were the design and implementation by the XOOP, of a more concrete system of information, with monthly reports of activity, presented in the coordinators meeting and the implementation of agendas to make the exchange of information topic-specific, concentrating the focus of the conversations on relevant issues.

The tagging also changed as a result of a better definition of tasks, which derived from the correct recognition of primary activities and the consequent reduction in the number of operative groups. This reduction made it easier to locate the right people in the right places, to the point that the XOOP started to implement a system to assemble members to participate according the technical profile of the task. This strategy not only reduced the distance to the task, but also allowed the emergence of elements that provided group identity in some of the task groups (e.g. VERT – education, related to environmentalism; the farm, related to permaculture and organic agriculture; building, related to self-building techniques; and legal, related to formal structures of management). These group identities facilitated the cohesion of the groups, its communications and ultimately their efficiency.

In addition, the recursive structure considered in the VSM, facilitated the replication of the organizational design in multiple levels (working groups, the XOOP, the network of related business); providing the building blocks that facilitated change and adaptation; making easier the global understanding of the dynamic of the organization.

From the literature review and the observations and findings of this research, we suggest the following as the most convenient mechanism of

self-organization to facilitate the operation of non-hierarchical organizations:

- The development of a shared internal (mental) model: Rich pictures, Story-telling (cartoon-like) and even conventional methods of organizational design and planning that could do the work. The VSM can provide a template or basic guidance, so as to be aware of the existence of the minimum conditions (roles, functions and connections) that provide viability. To ensure effectiveness we strongly suggest these internal models to be designed and implemented using open and participative methods (e.g. open space technologies).

- To gather standard business procedures (e.g. planning, job descriptions and staffing procedures, value oriented activity design, etc[90]) with the task recognition and tagging methods. This will preserve the emergent properties of team building inside the organization, while taking account of the cost, timing and operative convenience of the activity. To do so, a simple list describing the task's technical requirements compared against a list of members and skills, will provide hints and facilitate the best allocation of resources. Previously, a list of tasks should be prioritized (e.g. think about the consequences of not doing the task against the urgency and necessity of doing it).

- Flow of information. Communications will change over time, either in intensity or diversity. What is important is, to always ensure that any useful information that exists (to keep the internal model of the organization up-to-date), will be communicated. The lack of such bits of information as well as variations in the internal model, will point out areas demanding the attention of the manager.

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[90] These basic principles of management can be introduced informally in the form of mantras like:" always get the best people for the job – or hire them"; "if it doesn't add value, don't do it"; "when making decisions, always keep in mind the two basic functions and four main objectives of any organization: produce & sale; and Remain, Prevail, Grow and Generate Profit"; "fail to plan is plan to fail"; "to do planning, in the most complete way, always answer the 6WH!: What, Who, How, Where, When, Why and With (resources)".

6.1.6 Implications for rural regeneration programs

The regeneration programs have been progressively entitled to promote autonomy by transferring most of the administrative duties to the participant communities. As a collateral effect, the communities have found themselves empowered but operating without the administrative and organizational skills and structures that would allow them to use completely the potential to control their own regeneration process. To solve this, an army of practitioners has been settled in the field providing assistance in the administrative and bureaucratic technicalities implied in the multi-agency partnerships. But the cost of it has been the implementation of hierarchical relationships and at some extent, the take over of some of the autonomy and free will of the communities.

The best scenario in which the free will, autonomy and control of the regeneration program may occur is in the independent initiatives. But as illustrated in this research, the lack of expertise in administrative issues has a significant impact on the time and cost of their implementation. Different solutions may be suggested to cope with this administrative and organizational issue (e.g. the adoption of standard business methods, hiring external managers, etc.), among them and related with this research is the introduction of the mechanisms of self-organization to help the communities to develop the administrative structures they need to succeed. But it implies that the community must have a particular set of characteristics. As described for the SDWT-SMWT, these methods and principles will work better in environments where no standardized task performance is expected. In consequence, self-organization (and the use of VSM) will have better possibilities to succeed when used in flat organizations – and definitely not in organizations where top-down structures cannot be modified – and the organization should aim to operate using open participative mechanisms where the tasks are mainly not related with highly standardized manufacturing processes.

In this sense, we coincide with the description of limitations of the environments in which SO process occur effectively. In essence, these are not standardized in their operation; the task recognition is an emergent phenomenon where open communications are indispensable and where the decisions about how to interact and engage the tasks are made consensually. Also it seems to be important that external agents do not regulate these communities, but they do recognize, legitimize and respect their operation.

6.1.7   The V-P Toolset

The development of the V-P Toolset was subject to various modifications, most of them related with the discovery of existing studies – particularly about SO – that reoriented the design and ultimately, simplified it by recognizing a constant mention in the literature about the use of 'shared mental models', or 'collective sense-making' as the key element to facilitate such organizational behaviour.

With regard to the generation of a shared image of the organization, the VSM was an appropriate choice as it contains and summarizes almost all the elements that the copious literature about the management of complex systems describes as necessary to facilitate the emergence of adaptable organizational forms. It provides a graphic visualization of the organization that is easy to share, and is descriptive enough to give a complete view and a framework of reference to evaluate the existing and needed relationships connecting people, management roles / functions and tasks that provide viability. In this sense, The VSM is superior to the rich pictures and narrative descriptive tools.

With regards to the mechanism of SO, The VSM also provided a complete set of equivalent roles and functions that have been reported as necessary to facilitate the SO process (e.g. the gatekeeper, coordinator and leader in AGILE). From this point of view it seems that the VSM can be understood as a complete tool to develop self-organized teams. The weakness of this affirmation is related with the

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fact that there is not a standardized method for its implementation, and does not provide elements to deal with many of the sociological realities affecting teamwork such as the relations of power and conflict resolution.

In the context of the V-P, the iterative use of the routines for VSM (self) diagnosis resulted in a cohesive and unified vision of the organization and its goals, making easy the coordination of the autonomous groups that was enriched with the complementary inputs coming from the narrative and Social Network Analyses.

These inputs also affected the way in how the intervention was carried out by allowing the researcher to identify sensible issues to avoid (e.g. the suggestion of Mr. A to be re-engaged in the dynamic of the project) or to be used as leverage to stimulate the engagement of the community (e.g. informal conversations about the existing tools for self-organized teams; informal conversations discussing the evolution of the project and its potential to nurse independent-related business units).

The SNA and the narratives added to the description of the SO process a quantitative perspective of the links among people, functions and tasks, and a detailed description of the relations of power and the mechanisms developed for conflict resolution inside the community. The use of these tools provided the participants in this research the opportunity to reflect and analyze in retrospective the decisions they made; offering a better understanding of the causes and trends affecting the emergence of organizational structures.

The planning loop of the V-P was difficult to monitor since it occurs as a consequence of – and sometimes simultaneously to – the visualizing loop, being difficult to separate. The implication of it is that this part of the V-P design demands deep knowledge on the theoretical background supporting SO; therefore, becoming difficult to be transferred to the recipient community. I suggest that a handbook containing a succinct explanation of the V-P should be developed to

increase the empowerment of the community about its own SO process.

Finally, the community appropriated the reflective loop and they are able to do the VSM diagnosis and contextualize it with narratives (there are two initiatives to create a narrative describing different aspects of the evolution of the project by some members of the XOOP). From the researcher perspective, the design facilitated the internal validation of the information generated in this research and was successful as the community accepted it as a good and useful representation of their experience and present circumstances.

6.2   ADDITIONAL COMMENTS

1. A further application of the complementarities between VSM and SNA could be the creation of a dynamic model where the design and structure of the feedback boxes and theoretical connections among them could be provided by the VSM. These boxes – and their connection structure – could be fed with the SNA data of flows of information (for example with values of direction, amount and frequency of communications) during a particular period of time and make projections in different scenarios modifying values of connectivity and/or the structure of the network. This route of analysis was not explored because: a) Limitations of resources (time, funds and access to the software to create the dynamic model); b) this analytic route was not clearly located in the theoretical framework of this research; and c) the data collected was not sufficient (in terms of quantity – number of people interviewed, frequency of the data collection, accessibility to data – and quality – incompleteness if compared with the requirements of the algorithms to calculate some properties of the network) to create a model with this characteristics. Therefore, we strongly recommend to explore this analytical route to strength the complementarities of VSM and SNA in the analysis of organizational structures in further research works aimed to advance in

the modelling and forecasting of social networks and organizational structures.

2. Even with the use of incomplete datasets, the ego-networks and the measurement of eigen-behaviours /eigen-vectors of the key individuals revealed that **I, M, J** and **F** concentrated much of the communication roles on themselves (e.g. structural holes, brokers, gate-keepers, hubs) which, when contrasted with their roles in the VSM and the community and their skills expertise if removed any other member would not be able to take their place. In consequence, generating isolated groups leaving some VSM systems without a sponsor - leader (VSM-S3 and S2) and taking away key skills from the community (e.g. Expert farmer, barrister with expertise in property transference and corporative law). However, in order to conduct such a fine grain analysis, it is necessary to have the complete information network, because the partial one reconstructed from the people interviewed is not detailed enough. This analysis would allow us to explore in detail aspects on resilience and performance for each task.

3. At the moment of printing this document Professor Christensen and Dr, Arcaute (Imperial College) were working in a modification in the formulation of the ant's model to include agent affiliation to multiple tasks and the urgency of the task. The inclusion of these variables in the model offers the possibility to predict affiliation to tasks in dynamic environments, and extend a bridge in the integration (and use) of models coming from physics and biology in the human sciences, adding evidence to the benefits of interdisciplinary research projects.

The participation in a trans-disciplinary project provided to this research a rich scenario were to learn and capture concepts, theories and analytical procedures from other disciplines (e.g. Biology, Robotics, Physics). Specifically, the cross-pollination and application of models coming from Biology to the field of Management constituted a step forward in the transference of biological theories and models to the optimization of organizational designs, as an addition to the use of algorithms derived from the description of the behaviour of animal communities (e.g. ants, bees). The interaction with scientist from many other different disciplines

was also a stimulating challenge that broadened my understanding about my research topic and in many cases, offered novel perspectives that clarified my thoughts and provided unconventional and interesting solutions to some of my research questions.

4. In the context of CAS the creation of several groups attending different activities could indicate that in this stage the XOOP was exploring multiple opportunities to find its best configuration to fit within its surrounding environment. The XOOP history insinuates that it could be the case, whereas at that moment the organization was facing a new context demanding a new organizational arrangement. The case also exposed the high cost – in economical and organizational terms – of such exploration, and how the reactive creation of groups without the use of strategic planning analysis did not provide viability in the short term; which indicates the need of research about this particular behaviour from the CAS perspective.

This case also illustrates how the formal structures imposed by the legal system (e.g. the structures and hierarchies imposed when registering an organization: board, chairman, legal representatives) make difficult the development of non-hierarchical and innovative structures. Further research is suggested to explore how to cope with such differences and eventually, to evaluate the actual paradigms underpinning the development of the regulatory measures from an evolving organizational perspective.

Out of the scope of this research there are links with the new trends of research in adaptive, evolving and co-evolving organizations where self-organization seems to be an engine and key principle for the creation of such self-renewing processes in organizational management (Volberda and Lewin, 2003). From this new perspective a completely new analysis could be done, being particularly relevant to the description and understanding of the XOOP's final stage of evolution described in this work; offering an opportunity to contribute with empirical data and a cybernetic approach to the validation of the holistic renewal and collective sense-making engines in multiunit firms as generators of co-evolutionary dynamics. The case also illustrates the emergence of new

business units and the transition of one organization having one level of recursion to one with different recursive levels.

6.3   <u>STATEMENT OF CONTRIBUTION</u>

This study presented a case where the SNA was used to complement the VSM as a contribution in the exploration and development of tools to implement the use of CAS (theory of Complex Adaptive Systems) in organizations – in this particular case with emphasis in the mechanisms for SO. Also, this integration of tools adds to the empirical evidence that supports the benefits of use a multimethodological approach in research (Narrative Analysis, VSM and SNA) to develop valuable diagnoses of organizations and new analytical perspectives.

From the perspective of the context in which this research was performed, the trans-disciplinary research (Biology, Robotics, Physics, Business Management – EPSRC project) have shown to provide a rich and stimulating environment for the discussion of ideas; the cross-pollination and transference of theories and models from one field of knowledge to other that, ultimately, come to nourish the science of management with novel models and explanations about some issues of particular interests in the field of organizational change – in this research, the development and use of the Ant's model to explain how self-organizations occurs, and how this model can be used to analyze processes of specialization and the emergence of operational units in business. In the other direction, this research suggested the bottom-up dynamic exchange of information combined with the simultaneous top-down mechanism of control of emergent tasks, as a dual mechanism that opened new areas of research and an innovative approach in the design of protocols of interaction to induce SO in communities of robots.

In addition, the analytic context in which this research was designed and performed moved (with some few limitations) the use of the concept of

self-organization from the anecdotic and metaphoric sphere to the field of quantitative description and analysis of this phenomenon.

With respect to the V-P, the case study offers evidence of its affectivity whereas the organization in which this theoretical framework was applied improved its performance. More work is required in the development of a succinct handbook explaining the principles, tools and mechanisms that a community can use to drive its self-organizing process. The first steps in that direction were made as a collateral product of this research through the development of the VSM handbook. This attempts to present a user-friendly version of it avoiding as much as possible the use of academic jargon and convoluted explanations.

In addition, from the results of this research a set of new topics of research were suggested, particularly oriented to complement the V-P with the inclusion of dynamic systems modelling techniques. Also, this research put forward the possibility to use the VSM to complement adaptive, evolving and co-evolving management.

To conclude, this research presented new empirical evidence confirming the shared mental model as a key element for SO. In addition, this work suggested – in the context of the V-P Toolset – the integration of VSM and SNA and Narrative analysis as a vehicle to facilitate the graphic representation of such organizational constructs catalyze organizational change and the emergence of viable adaptive organizational structures.

At a personal level this research provided a space to learn about the behaviour o social groups; to recognize the importance of leadership – even in self-organizing and non-hierarchical contexts – and to identify the compatibility and usefulness of traditional administrative tools to support the functioning of innovative organizational structures. It also induced the exploration of novel ways to use some of the tools such as the SNA to facilitate community development. In this sense, my personal interest is to develop interactive methods (e.g. recreate physically the links in the

social networks) where the communities can gain in knowledge, awareness and self-conscience about their roles and function in the organizational structure while avoiding the complicatedness of the technical jargon that impedes the appropriation and extensive use of this analytical tool at this basic level of application.

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APPENDICES

APPENDIX 1. Evolution of the Regeneration Programs in the UK (Adapted from Roberts & Sykes, 1999)

Period Policy Type	1950s Reconstruction	1960s Revitalization	1970s Renewal	1980s Redevelopment	1990s Regeneration
Major Strategy and Orientation	• Reconstruction and extension of older areas of towns and cities. • Based on master plans. • Suburban growth	• Continuation of the 50s policies. • Some early attempts of rehabilitation Area Based Initiatives (ABI's)	• Focus on in situ and neighborhood schemes. Peripheral and suburban development	• Major schemes of development, flagship projects; out of town projects • Tax reduction and financial incentives Discretionary grants for promoting job creation & inward investment	• Move towards a more comprehensive form of policy and practice, more emphasis on integrated treatments • National regeneration agency. • To increase the supply of high quality, affordable housing (English Partnership) Community-led & local regeneration partnerships
Major Policies	• Town and Country Planning Act 1944	• Urban Program 1968	• White paper policy for the inner cities 1977 • Partnership program; Inner Urban Areas	• Urban Development Corporations. 1981. • Enterprise Zones. 1981. • Urban Development Grant. 1982. • Estate Action. 1985 Urban Regeneration Grant. 1987.	• Planning Policy Guidance Notes (PPG's). 1990+ • Regional Policy Guidance Notes (RPG's). 1990+ • English Partnerships. 1993 • Single Regeneration Budget. 1994 White Paper: Building Partnerships for Prosperity, Sustainable Growth, Competitiveness, and Employment in the English Regions. 1997.New Deal for Communities. 1998
Key Actors & Stakeholders	National & local government and Private sector developers.	Move towards a greater balance between public and private sector	Growing role of private sector. Decentralization of local government	Emphasis in private sector and special agencies. Growth of partnerships.	Partnerships are the dominant approach. Devolution of power to the local authority. Community empowerment and engagement
Spatial Level of Activity	Emphasis on local and site levels	Regional level	Regional and local levels initially. Later more local emphasis	Focus on site. Later more emphasis on local level	Reintroduction of strategic perspective; growth of regional activity
Economic Focus	Public sector investment with some private sector involvement	Continuing from 50s with growing influence of private investment	Resource constrains in public sector and growth of private investment	Private sector dominant with selective public funds	Greater balance between public, private and voluntary funding
Social Content	Improvement of housing and living standards	Social and welfare improvement	Community based action and greater empowerment	Community self-help with very selective state support	Emphasis on the role of the community
Physical Emphasis	Replacement of inner areas and peripheral development	Continuation of the 50s with parallel rehabilitation of existing areas	More extensive renewal of older urban areas	Major schemes of replacement and new developments; flagships scheme	More modest than 80's heritage and retention
Environmental Approach	Landscaping and some greening	Selective improvements	Environmental improvement with some innovation	Growth of concern for wilder approach to environment	Introduction of broader idea of environmental sustainability

APPENDIX 2. Tools for regeneration

Tool	Nature	Origin	Orientation
PQASSO	"Off the Shell" Quality Assessment Systematic	Voluntary Sector	- Planning - Budget/Resources Management - Time control
Visible Communities (1999)	National Standard	Community Associations	- Governance. - Charity regulation, trustee's duties - Community anchors & standards for other groups (tenants & Resident Associations)
Local Multiplier 3 (LM3)	Measurement of Economical Impact	New Economy Foundation	- Measurement of Economical Impact
Project SIGMA (1999)	Quality Administrative Management Systems	British standards Forum for the Future AccountAbility	- Toolkit/guidelines to address specific sustainability challenges
KALIF (*)	Complexity & evolutionary sciences	Consultancy in Knowledge Management Learning Futures Ltd & CIbit	- Construction of knowledge and learning infrastructures
Moobela (*)	Complexity	Research	- Diagnostic and Planning

These tools have a systemic approach.
(*) Have foundations in complexity sciences.

APPENDIX 3. Characteristics of the Complex Adaptive Systems
(Adapted from Heyligen, 2003 and Mitleton-Kelly, 2003)

1- Adaptation as a fit: A configuration of a system may be called "fit" if it is able to maintain or grow its identity in a given environment. An unfit configuration, on the other hand, is one that will spontaneously disintegrate under the given boundary conditions. Different configurations can be compared as to their degree of fitness, or likeliness to survive under the given conditions imposed by the environment. Thus, adaptation can be conceived as achieving a *fit* between system and environment. Systems may be called *adaptive* if they can adjust to such changes while keeping their organization and identity intact as much as possible.

2- Regulation at the edge of chaos: Cybernetics has shown that adaptation can be modelled as a problem of *regulation* or *control* minimizing deviations from a goal configuration by counteracting perturbations before they become large enough to endanger the essential organization. This means that the system must be able to: 1) produce sufficient *variety* of actions to cope with each of the possible perturbations (Ashby's "law of requisite variety"); 2) *select* the most adequate counteraction for a given perturbation (e.g. the temperature control in mammals illustrates not only the homeostatic mechanism but also the flexibility of it to deal with a wide range of variations).

3- Variation and selection: If the system is sufficiently rich in inherent diversity and capacity to evolve, the environmental variations will sooner or later produce one or more types of component that can "neutralize" the external perturbation, and thus save the system.

4- Self-Organization and Emergence: The system needs a fitness criterion for choosing the best action for the given circumstances. The most straightforward method is to let the environment itself determine what is fit. Therefore, complex systems such as organisms or minds have evolved internal *models* of the environment. This allows them to try out a potential action "virtually", in the model, and use the model to decide on its fitness. It is close related with the edge of chaos where the system moves to the most probable configuration from the set of options offered by the environment and the match between these and its own capacity to change. Emergence of new structures results as evidence of

the "choice" made by the system.

5- Connectivity and interdependence: Complex behavior arises from the inter-relationship, interaction and inter-connectivity of elements within a system and between a system and its environment. In human systems, connectivity and interdependence means that a decision or action of any individual (e.g. group, intuition) may affect related individuals and systems. That affect will not have equal or uniform impact, and will vary with the state of each related individual and system at the time, as individual variations exist in connectivity.

6- Co-evolution: defined as that the evolution of one domain or entity is partially dependent on the evolution of other related domains or entities; or that one domain or entity changes in the context of the other(s). In human systems the co-evolution in the sense of evolution of interactions places emphasis on the relationship between the coevolving entities. Is necessary to make distinction between co-evolution with and adaptation to a changing environment. When the emphasis is placed on co-evolution with, it tends to change the perspective and the assumptions that underline much traditional management and systems theories.

7- Dissipative structures: Far-From-Equilibrium and History: According to the postulates of the second law of entropy in isolated systems the entropy can only increase, not decrease; it means that the final state of thermodynamic equilibrium is the one with the maximum entropy. But physical self-organizing systems can't be isolated and demand a constant input of matter/energy with low entropy, eliminating the internally generated entropy trough the output of dissipation. Dissipative structures emerge to dissipate energy maintaining the system far from thermodynamic equilibrium.
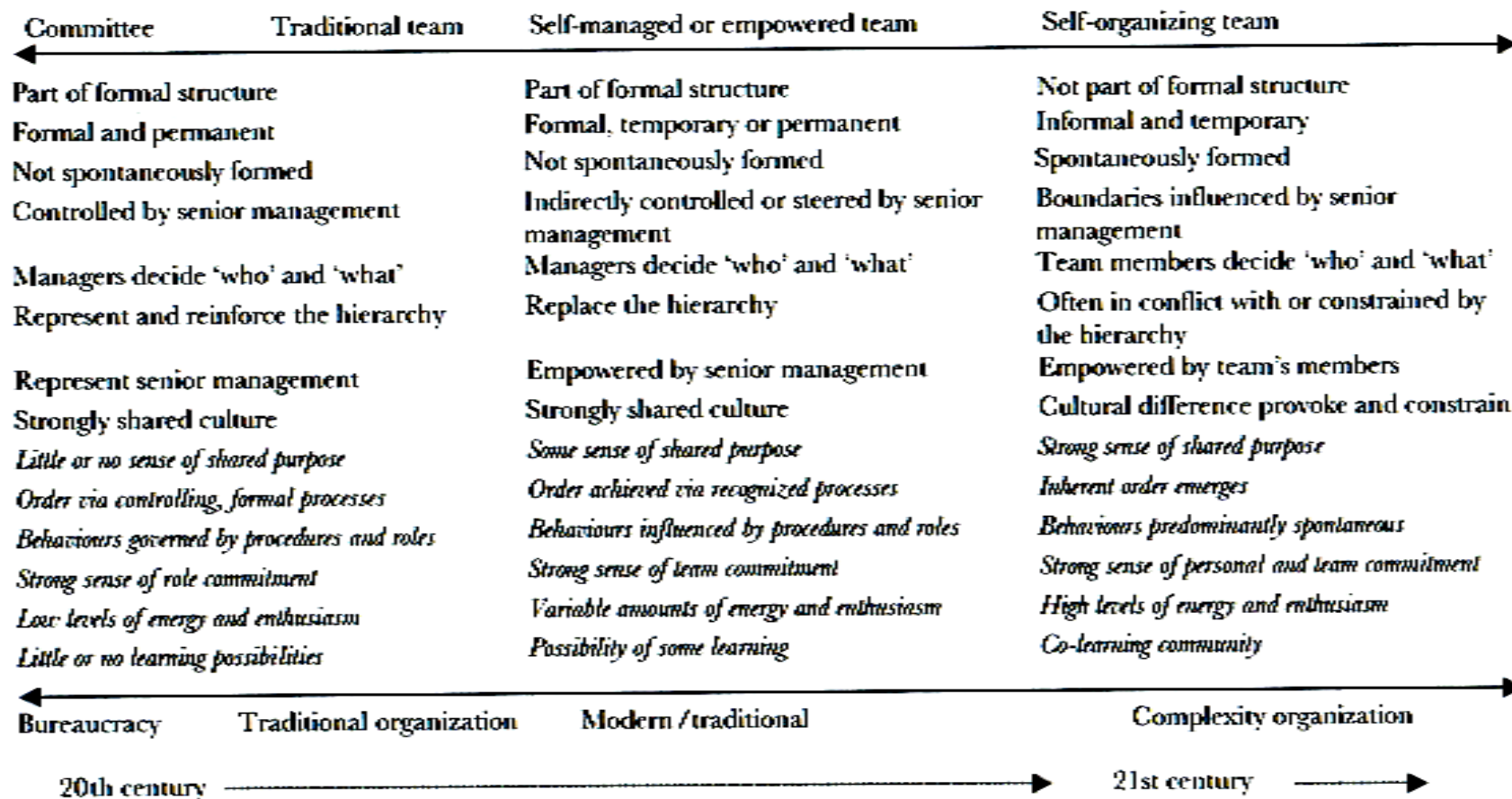
History in a social context is the series of critical decisions each individual makes from several possible alternatives that may determine a particular life path for that individual. The alternatives available are contained by the person's current state and the state of the landscape the person occupies. Thus, the emergent behavior is not a matter of chance but is the result of a person's selection among a finite set of perceived choices; as well as the past choices made.

8- Exploration of the Space of Possibilities: Complexity suggests that to survive and thrive, an entity needs to explore its space of possibilities and

generate variety. To survive an organism needs to constantly scanning the landscape and trying different strategies. An organization may need to have in place several micro-strategies that are allowed to evolve before major resources are committed to a single strategy. This reduce the risk of backing a single strategy too early, which may turn out not to be the best one, and supports co-evolution with changing environment.

9- Self-similarity: Similar characteristics may apply in different levels and scales. In the organizational context, the generic characteristic of complex systems may apply within the firm at different levels (individual, team, corporate), as well as between related business and institutions. Fractal is the term often used to describe the repetition of self-similar patterns across levels of scale.

APPENDIX 4. Team Working in Organizations

Committee · Traditional team	Self-managed or empowered team	Self-organizing team
Part of formal structure	Part of formal structure	Not part of formal structure
Formal and permanent	Formal, temporary or permanent	Informal and temporary
Not spontaneously formed	Not spontaneously formed	Spontaneously formed
Controlled by senior management	Indirectly controlled or steered by senior management	Boundaries influenced by senior management
Managers decide 'who' and 'what'	Managers decide 'who' and 'what'	Team members decide 'who' and 'what'
Represent and reinforce the hierarchy	Replace the hierarchy	Often in conflict with or constrained by the hierarchy
Represent senior management	Empowered by senior management	Empowered by team's members
Strongly shared culture	Strongly shared culture	Cultural difference provoke and constrain
Little or no sense of shared purpose	*Some sense of shared purpose*	*Strong sense of shared purpose*
Order via controlling, formal processes	*Order achieved via recognized processes*	*Inherent order emerges*
Behaviours governed by procedures and roles	*Behaviours influenced by procedures and roles*	*Behaviours predominantly spontaneous*
Strong sense of role commitment	*Strong sense of team commitment*	*Strong sense of personal and team commitment*
Low levels of energy and enthusiasm	*Variable amounts of energy and enthusiasm*	*High levels of energy and enthusiasm*
Little or no learning possibilities	*Possibility of some learning*	*Co-learning community*

Bureaucracy · Traditional organization · Modern / traditional · Complexity organization

20th century ⟶ · 21st century ⟶

Note: Stacey's elements of self-organized and self-managed teams are in normal writing. The additions from McMillan are in Italics

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APPENDIX 5. The 12 Leverage Parameters
(Adapted from Meadows, 1999)

Places to intervene in a System (In increasing order of effectiveness).

12. Constants, parameters, numbers (such a as subsidies, taxes, standards).

11. The sizes of buffers and other stabilizing stocks relative to their flows.

10. The structure of material stocks and flows (such as transport networks, population, age structures).

9. The length of delays, relative to the rate of system change.

8. The strength of negative feedback loops, relative to the impacts they are trying to correct against.

7. The gain around driving positive feedback loops.

6. The structure of information flows (who does and who does not have access to what kinds of information).

5. The rules of the system (such as incentives, punishments, constrains).

4. The power to add, change, evolve, or self-organize system structure.

3. The goals of the system.

2. The mindset or paradigm of which the system-its goals, structure, rules, delays, parameters – arises.

1. The power of transcendent paradigms

APPENDIX 6. The Viable System Model

The VSM (Figure modified from Beer, 1985)
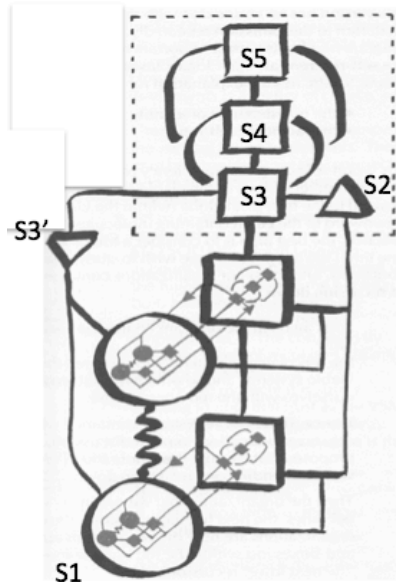
- S1: Operative
- S2: Coordination
- S3: Optimization and monitoring (here & now)
- S4: External Scanning & forecasting (there & then)
- S5: Policy, Intentionality & Identity

Beer (1985) suggests that a viable organisation is the one that can survive – maintain a separate existence – in a particular environment. To do so, understanding the dynamic nature of the environment the organizational structure must present a form of adaptive connectivity to assimilate the external changing conditions. Therefore, searching for systems able to cope with tremendous amounts of internal and external information, response, adapt and preserve its own identity along time; Beer found the human body controlled by the nervous system as the richest, more flexible and complete example of such design (Beer, 1972).

His observations allowed him to identify into the (human) neural network five essential systems for the self-regulation/control of the organism, which provides "…*the necessary and sufficient conditions*" (Beer, 1984) for the viability of any human or social system.

Supported by comprehensive theory (Beer, 1979, 1981, 1985), these essential systems, their interrelationships, feedback loops and information flows creating an organizational structure where two categories of activities in which the five systems where located and described as:

Primary activities: These are the operations that ensure that the indented purpose of the organization is achieved, the sum of the activity(es) inside them,

their (internal –autonomous) management and the information flows with their direct environment is called in the VSM system(s) one (S1)[1].

Secondary activities: These are the *meta-systemic* activities that regulate the operation of the S1, provide coherence and closure to the organizational design. These activities are distributed among four systems being them:

System two (S2)[2]: coordinates the activity of the S1(s) via information and communication, in analogy with the spinal cord (in the neural system) that receives, transfer, filter and classifies the information onto a scale of priority.

System three (S3)[3]: Is occupied with the creation of synergies among the operational units. It does the distribution of resources, optimisation and monitoring on the S1 activities via the system three* (S3*); which function is performed by validating the information flowing through the systems 1-2-3 with the use of auditing procedures. This system deals with the "here and now" of the organization.

System four (S4)[4]: Its function is the scanning of environmental changes, and suggestion of strategies to cope with them. It is done filtering, contrasting and comparing information coming from the overall external environment with the internal model of the organization – information coming from S3. Its work is to develop the organization dealing with the future, the "there and then" of the organization.

System five (S5)[5]: Balances the present and future as well as the internal and external perspectives. Provides organizational ethos, generates policies and vision; necessary elements to preserve the identity and the principles governing the organization as a whole (Walker, 2005).

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[1] Some authors changed the denomination of this system. Beer named it system one (S1) meaning not only that is the first and basic one in the description of the viable organizational structure, but also that its activity is primary for the survival of the organization. These primary activities are recognized as the ones performed by the organs - in the human analogy. Authors like Espejo et al (1996), Espejo (1999), call this system(s) Implementation(s).

[2] Espejo et al (1996), Espejo (1999) call this system coordination.

[3] Espejo et al (1996), Espejo (1999) call this system control.

[4] Espejo et al (1996), Espejo (1999) call this system intelligence; Jackson (2003) calls it development.

[5] Espejo et al (1996), Espejo (1999) and Jackson (2003) call this system Policy.

Schwaninger (2006) indicates that a model of systemic control must have three different logical levels of management, identifying them in the interactions among the different systems of the VSM. Thus, he presents the combined interaction of the systems 1, 2 and 3 (including 3*) constrained to the present and short term as the operative level of management; the interaction of the systems 3 and 4 as the strategic, and the S5 as the normative level.

Beer (1979) also recognizes that systems exist in hierarchies and the organizational forms existing in the higher levels systems can also be observed in the parts. Therefore, to be viable a system must present structural recursion, where the primary activities contain the same structure that contains them[6].

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[6] Beer, 1976: "… viable systems contains, and is contained in, a viable system". The most iconic example used to illustrate this recursive organization are the matrioskas (Russian dolls).

APPENDIX 7. Elements of the Model I & Model II. Organizational Learning.

MODEL I. Theory-in-use characteristics Adapted from Argyris, Putnam & McLain Smith (1985)				
Governing values	**Action strategy**	**Operationalized by:**	**Relationship consequences**	**Learning consequences**
Pursue own goals	Control the environment	Unillustrated attributions and evaluations	Perceived defensiveness	Self-fulfilling processes
Play to win in win/lose style	Control the task	Advocating courses of action which discourage inquiry	Defensive relationships	Single-loop learning
Minimise negative feelings	Unilaterally protect self	Treating ones' own views as obviously correct	Defensive norms	Attributions are untested
Rationality, not emotionality	Unilaterally protect others	Making covert attributions and evaluations.	Low choice, commitment	Single-loop learning
Face-saving moves such as leaving potentially embarrassing facts unstated.				

MODEL II. Characteristics Adapted from Anderson (1997).				
Governing values	**Action strategy**	**Operationalized by:**	**Relationship consequences**	**Learning consequences**
Valid information	Create environments which allow personal freedom	Attribution and evaluation illustrated with relatively directly observable data.	Minimal defensiveness	Disconfirmable processes
Free and informed choice	Joint control of the task	Surfacing conflicting view	Non-defensive relationships	Double-loop learning
People responsible for own behavior	Joint protection of self	Encouraging public testing of evaluations.	Learning-oriented norms	Public testing of attributions
Openness and internal commitment	Bilateral protection of others		High choice, commitment	Double-loop learning

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According to Argyris and Schön (1978: 220-1) the formulation and implementation of an intervention strategy – the 'interventionist' – should move through six phases of work. By running through this sequence and attending to key criteria suggested by Model II, it is argued, organizational development is possible. The process entails looking for the maximum participation of clients, minimizing the risks of candid participation, starting where people want to begin (often with instrumental problems), and designing methods so that they value rationality and honesty.

PHASE 1	**Mapping the problem as clients see it.** This includes the factors and relationships that define the problem, and the relationship with the living systems of the organization.
PHASE 2	**The internalization of the map by clients.** Through inquiry and confrontation the interventionists work with clients to develop a map for which clients can accept responsibility. However, it also needs to be comprehensive.
PHASE 3	**Test the model**. This involves looking at what 'testable predictions' can be derived from the map – and looking to practice and history to see if the predictions stand up. If they do not, the map has to be modified.
PHASE 4	**Invent solutions** to the problem and simulate them to explore their possible impact.
PHASE 5	**Produce the intervention**.
PHASE 6	**Study the impact**. This allows for the correction of errors as well as generating knowledge for future designs. If things work well under the conditions specified by the model, then the map is not disconfirmed.

APPENDIX 8. Abstracts Warwick and NLA Leeds (2009) and Kybernetes (2010).

Emergent Product-Service Systems in one non-hierarchical community. Description of its evolving organizational structure and self-organizing properties

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ABSTRACT

Whit the use of the Viable System Model (VSM) and Transition Management as interpretive/descriptive tools, a case of arising organizational structures supporting the emergent/co-evolving Product-Service System(s) (PSS) in a Self-organizing community is presented.

Successful emergent organizational forms seems to be dependent on the fulfilment of some self-organizing properties such as aggregation, tagging and generation of internal models to create viable and autonomous new operational units inside an existing organization.

The function of "scouts" scanning the external environment and its function as triggers of new organizational process is explained using a biological model; and open questions on the constrains that the legal framework imposes in the emergence of new and innovative organizational forms are presented.

FACILITATING SELF-ORGANISATION IN NON-HIERARCHICAL COMMUNITIES: A METHODOLOGY FOR REGENERATION PROGRAMS

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ABSTRACT

This paper presents a case study about a non-hierarchical community developing an independent regeneration project. From the beginning of this 10 years project, operational groups have worked on a self-organised and non-hierarchical approach but they have experienced tensions and difficulties in achieving their goals. In the recent years some noticeable improvements have been apparent and case study analysis suggests that cybernetic (VSM) intervention has facilitated a more effective path to self-organisation, as well as creating a more robust context in which to allow for the emergence of innovative organisational structures.

Complexity approaches to self-organisation: A case study from an Irish eco-village

A. Espinosa[1], P. P. Cardoso [2], E. Arcaute[3], K. Christensen[4]

We present recent research on self-organisation in communities working on regeneration and/or sustainability projects. We address the possibilities that different approaches within complexity science offer, as a way to support self- organisation. In particular, we summarise a recent action research project where contributions from both organisational cybernetics and complex systems approaches have proven useful for supporting self-organisation and improving self-governance skills in an Irish eco-community. Through a staged learning approach, the community has self-adjusted their structure and tasks and have developed an increased ability for self-governance. The background research project happened in the context of a wider EPSRC funded project exploring the question: 'Defying the rules: How self-regulatory social systems works'. The example illustrates core issues of learning and adaptation emerging from cybernetic and complexity approaches and highlights their differences and complementarities.

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APPENDIX 9. Social Network – General Questionnaire

NETWORK ANALYSIS
IDENTITY /POLICY

1-With whom do you talk about the future, activities, planning and policies affecting the community?

_____ Score _____
_____ Score _____
_____ Score _____
_____ Score _____
_____ Score _____
_____ Score _____
_____ Score _____

2-With whom do you talk about what is important and valued in the community?

_____ Score _____
_____ Score _____
_____ Score _____
_____ Score _____
_____ Score _____
_____ Score _____
_____ Score _____

WORK INTERACTIONS

3-With whom do you work to get your job done (exchange information, documents and other resources / internal or external to the Ecovillage project)?

_____ Score _____
_____ Score _____
_____ Score _____
_____ Score _____
_____ Score _____
_____ Score _____
_____ Score _____

GRAPEVINE

4-With whom do you discuss what is going on at work, and who is doing what in the community?

_____ Score _____
_____ Score _____
_____ Score _____
_____ Score _____
_____ Score _____
_____ Score _____
_____ Score _____

DECISION MAKING

5-From whom do you seek inputs, suggestions and feedback before making a decision?

_____ Score _____
_____ Score _____
_____ Score _____
_____ Score _____
_____ Score _____
_____ Score _____
_____ Score _____

INNOVATION

6-With whom do you discuss ideas, innovations, and better ways of getting things done? _____ Score _____
_____ Score _____
_____ Score _____
_____ Score _____
_____ Score _____
_____ Score _____
_____ Score _____

EXPERTISE/ COORDINATION

7-To whom do you go for expert advice in doing your work and solving problems of lack of coordination or inefficiency in your task/activity?

_____ Score _____
_____ Score _____
_____ Score _____
_____ Score _____
_____ Score _____

EXTERNAL KNOWLEDGE

8-Whit whom do you discuss external issues affecting the Ecovillage (e.g. marketing demands, customers, providers, local community, public agencies)

_____ Score _____
_____ Score _____
_____ Score _____
_____ Score _____
_____ Score _____
_____ Score _____
_____ Score _____

APPENDIX 10. Quotes.

1   *"My initial think is when with members of my family, we were having a conversation going… why don't we buy a land and build houses for ourselves. Starting smaller as that with nothing to do with ecology or sustainability or anything else, just how to cope with the prices of houses going up. We started to find some land and meet every 2 or 3 weeks; I don't know for how long. And then, we went down to a place in west County Y where we met Rob Hopkins, it was a Buddhist retreat, and we started to talk with Rob Hopkins and he started to talk about the whole idea of the eco-village; it was 1996."*
(Interview with **A**, page 1)

2   *"So from 1997, myself and Mr. B developed the concept of an eco-village, prepared the prospectus and we were both in the board of directors of a cooperative, called in The Capital the Food Cooperative, and from there we used the memorandums and articles of the association as a template and we changed them to suit with the XOOP and we developed the main objective which is still there and is to build and manage a sustainable community."*
(Interview with **A**, page 1)

3   *"I think that the Food Coop – when talking about it with **A** – the Food Coop was a disaster, was too much of consensual decision-making going on and no decisions will be made, and it was endless meetings, so, I think some lessons were taken from the Food Coop, but, they were not necessary to copy what was going on in the Food Coop. Like I know in terms of the structure, the legal structure, it (the XOOP) was built as a company, like as the management-type structure…"*
(Interview with **D**, page 2)

4   *"I first introduced to the idea of an eco-village when, back in about 1997, I would say, sometime around then, and I actually fortuitously met with **A**. So we proceeded to look at various bits of land. And after about maybe two or three months of this, it was clear that there was a group in The Capital who was interested and there was a group in County Y who was interested. So in a way, we kind of just parted and the group in County Y concentrated on finding a piece of land down there and we looked at finding a piece of land close to The Capital which we thought would be our market area. So within that context, I took on the mindless work of trying to start a company and organize a group based along what I had kind of picked up from the other people that I've met. So I kind of started to lead the The Capital scheme to get the The Capital thing an open-running."* (Interview with **B**, page 1).

5   *"We had some discussions about the organization and we had to make this organization professional so we wanted to get a very strong board of directors, at least in paper, with doers as myself and B, and we said we need a solicitor, we need an architect, we need a quantity surveyor and we need a politician. So we brought friends with these qualifications, so we found ourselves setting up an eco-village with these men sitting in the board of directors to establish the company because they give us some strength and credibility but they didn't take any active part they were just in the paper"… and then we said that we also need an advisory panel, and all this to give strength and credibility to the project, so we contacted a number of people to be our advisors, people from universities for example, that had knowledge in this area; it was some people with knowledge in systems thinking..."* (Interview with **A**, page 1).

6   *"So I started the company with **A**, and a couple of other people: **F** was involved in the board, **EA** (who's the architect) was on… **D**, the green party leader was on the board of management, there was a couple of other people, solicitors. I identified kind of key-people to start up the company with, and we started up the company and I think in 1999 we officially launched the scheme in the Centre Hotel. And from then on, we*

started to try in get people to join and to invest, and the basics behind it was to get people to come in at a little bit at the beginning and then as they felt more comfortable, they would increase their investment in the project." (Interview with **B**, page 1).

7   *"It wasn't an organization at that time… our meetings were organized in The Capital, the meeting was organized by **B** and **A**… and general members of the public were invited to come along to hear at the ideas of setting up an eco-village… so… it wasn't really an organization, it was a company (XOOP), but it was really just a framework that required people to develop it, to develop an idea and to put in some money [….] so I had no particular interest in green issues, or ecological issues or sustainability… I don't even knew what it meant… and ... well, I suppose I liked the idea of working together with a group of people and do something quite idealistic... and that's what attracted me… so I continued to go to meetings, but I was more interested in the process of meeting people in that sort of informal way and try to develop a very ambitious plan … and… I have legal training and… one of the things that were first needed was the development of a constitution that would reflect what we were trying to achieve. So, I become working quite hard on developing our constitution, the company constitutions' which is the current constitution".* (Interview with **D**, page 1).

8   *"[…] we didn't use it to the full advantage, we used 2 or 3 advisers in different stages to give a comment or give a talk or we asked for their advice but we didn't use them to the full plenitude. But from the very start **B** and myself had discussions about the structure of the company and we were very strong about that we wanted a non-for-profit company, that it wasn't for us to make money; that it had to be very grounded in the community-based project. So therefore, that is why we decided for a non-for-profit structure, and then also to establish it as a charity. These were 2 key elements and we manage to get registered as a charity for education. The education element for what we were trying to do is why we approached the charity organization here in Ireland, to say that we*

were setting up a non-for-profit company [the XOOP] to develop an eco-village, and if you look at the memorandum and articles of association those say that we wanted to be an educational resource into the future." (Interview with **A**, page 2).

9   *"It was set up as a cooperative, so the company was a non-for-profit company. It was attempting to include consensus, essentially it was attempting to become a cooperative company in as best knowledge that we understood what a cooperative company was at that time: so everyone had an equal share, everyone who invested in the company was a member, there was monthly meetings that we tried to make decisions collectively and the whole process of actually buying and deciding which piece of land we were going to purchase was a whole process of understanding and... It was basically a cooperative with an employment, with me essentially as sort of the driving member of staff. I was the manager of the non-for-profit cooperative company."* (Interview with **B**, page 1).

10   *"[...] There were 15 members at the beginning – when I joined the project – and it was though that we should keep it up to 40 or 50... and we tried to keep it small to make easy make decisions, but that changed, that changed and… Then we went through the whole process of finding land… E was involved in that part, he was very involved in searching through the state agencies all over the country to find suitable land… and we went to look for land to different places."* (Interview with **C**, page 2)

11   *"That was established by those people, those 15 people… and there was the consensual decision-making, but, there was also a very strong drive from **B** and **A**… so. I think that it was quite a strong top down driven process as well, and I think that was necessary, because for example in **B** you have a very strong personality, very intelligent person and had a strong vision. And with **A** they worked very closely as a team at the beginning, so, when they were bringing in new people I think it*

forces the consensual decision-making processes into something that develops more slowly, because we… we brought in some outsiders coming to an idea that we haven't ready all formed, but I think that as soon as we begun to develop a constitution we did begun to talk about, as a group, and as a growing number of people as to exactly what we are doing, and learning about what the project is about, and it was… that created tensions as well, because, you have very strong people as well, and the idea of consensual decision making, mean that you can't have this top dawn, so, I think that it was a tension that begun to develop between the idea of having a project manager and having consensual decision making. And at the beginning of the project I think that was necessary because you need an engine to drive the thing. But, after a while those tensions became pretty difficult I think, you know, because you have a lot of strong people joining up and giving a lot of time, voluntary time, and money and feeling that they weren't making decisions really. But at the same time you have some people that were not giving any of their time, so you have also a tension because some people were volunteering a lot of time, so, it was also an issue in this project. Some people giving more time than others, and it was supposed to be equal, it's never been like that…" (Interview with **D**, page 2).

12   *"**B** got paid, **A** is still being paid … now… that's an ongoing tension; and the other thing that has been a tension is the – I don't know how are you going to come with it across – is the whole method of accounting for the people's input … we had a labour-points scheme and we had clough-pennies... And that system never worked. And it was a critical meeting when **B** and **A** basically wiped out the labour-points – that's my memory of it – and the people who had worked for it were incredibly angry…"* (Interview with **C**, page 4).

13   *"…Myself and **B**, we were working on a part-time because he was working, I was working; and we were meeting up and having discussions and it made it easier because we were 2 people making decisions and having progress."*

14   *"When we set up the company in '99, we had a very good business structure; and again there was another person involved who had a very high business profile, project management skills, and he had this ... you know this issues log, that brought us back to the way we were recording tasks, it was not a recording minutes like … so it was to know who was responsible for the task, and when he should have it done; and it actually worked very well at the start.*

And then process [the process group] started taking over in some aspects because... I can understand, we weren't documenting the discussion that happened, we were documenting the action that can measure that discussion and the process group, the people that we have to meet, they were questioning us how the decision was made and we did have to back up text to show how the discussion has actually being done... and then there was other discussion on if we should have minutes of the meetings. And then if we should have actions and... Personally I was trying very hard to have just one structure because if the minutes contradict the issues log... which is the correct one? ... And then you will have another discussion about which is the correct decision and you don't get the things moving on... And we were learning all these kind of things as we were going, and also trying to get people to take responsibility for their actions from the voluntary perspective; and we are still trying to do that today". (Interview with **A**, pages 3-4).

15   *"What this project has been about; the key people that we needed were people with planning experience and we were weak with that and people that have financial experience and actually make it happened; and again engineering experience. Because is a building project, is what has been in the last 9 years. We have all this extra aspiration as to ... how you go into a more community based project, community buildings, enterprise center, the farm... But in reality in the first period is a building project; you need people with experience in the construction area of the project.*

We did have some very good people and they gave us a lot of time, and I suppose partly because some of the things we were doing never been done before; everything we were doing we were challenging the county councils; even from the width of the road, to sustainable urban drainage, they weren't familiar with those concepts; to low level lighting... Everything all way along was a huge challenge for them but also for us because we were learning and trying to get some expertise... We were educating our selves and trying to educate the planners." (Interview with **A**, page 3).

16 *"Yes, some of the people attracted were very strong people with very strong views. And it's funny how at certain times at the very start attracted intellectual people that loved the idea, that loved trying to expand the concept but when it comes actually doing something, they just didn't do it, or we asked them to pay money it was actually a way of shading. [....] And then as the project developed some practical people came on board that was very useful like **W** and **X**, they have experience in planning, they are practical useful people..."* (Interview with **A,** page 4).

17 *"What we did was to put a cap on the membership, again we were trying to get people to pay, and also saying that we were opening it up to 25 members and we won't be taking any more members over 25 for a period of time; and that was a recognition that couldn't allow it to go too big because it would be impossible to make a decision made..."* (Interview with **A**, page 5).

18 *"We ask them to pay money. Because what we did is that we set certain milestones, of what we wanted to achieve, and we reached... at the beginning people paying €700 as seed capital to help the project to develop. Then we increased when we reached another milestone, when we made a new constitution and formally... And the new memorandum and articles people increase to €1500. Then when we identified the site that we were going to try develop and outline planning permission*

people increased their membership to €3000. And then went to €6000, and when we got full planning permission people pay the remaining for €15000, and that's why historically we still asking a new member when joining to pay €15000 as a deposit, that's where it come from. As we achieved certain goals, people could see we were making some progress therefore they paid some more money inn. But it always get people to re asses their evolvement in the project; when you turn around some of them will say now we need to pay €3000, we achieved a goal and now we need to move forward, we achieved what we wanted to achieve and now we are moving to the next step we need more money ... and ... In particular when we went to €15000 it was probably another drop."
(Interview with **A**, pages 4-5)

19 *"We advertised and identify about 6 farms around the country and certain people wanted to go for the farm that is close to The Town N, others in the farm that is in The Town M, and we had a whole long process how to make a decision and I think it was the first time we didn't have consensus. For 3-4 years we always managed to have consensus and it was the 1st time we couldn't have consensus, and we went to an additional process coming with a final decision on The Town X, but some people left the project at that time because were unhappy with the decision."* (Interview with **A**, page 5).

20 *"My memory is probably a little bit vague. When I think back on it, the project, the first 6 month to a year of the project was paper work. It was: what will be our articles and memorandum of the community. It was all setting up the… as we perceived them, the structures, there was no talk about land, there was no talk about, you know, anything like that.*
When we then had all of our leader structures in place, and our basic kind of framework for how we thought the company would function, we went out and we started to look for a land. And then once we started to find pieces of land, people became interested again because there was

something that they could attach to. I remember distinctly the process of whittling down because I looked at maybe 10 or 15 pieces of land around the country. Through quite a complex process, we brought that down to three to make a decision. And there was, within that process, a degree of tension – I would suggest – within the company, as certain people would have been pitching for one site, other people were pitching for a different piece of ground... But it eventually came to the point that – I think – consensually everyone agreed that The Town X was the winning piece of ground. And once the project had a focus, I think members were drowned to it because it was showing that it was developing." (Interview with **B**, page 4).

21 *"My memory of the project losing members was probably around making the choice as to which piece of land we were going to purchase. There were some people who, to be honest with you, just The Town X wasn't attractive for them. So I reckon that each personal individual makes up their own individual decision as to whether... because you see, a company like this has to have something for the group and something for the individual. It's the delicate task of finding enough people within the group who are also individually satisfied; they can find their own piece, their little bit of identity. And there were some people in the company who – I think – wanted to live by the sea, you know, that was a very simple ambition. So because the project wasn't going to be near the sea, it wasn't going to suit them. [....] I presume that it's when we decided we were going to buy the land in The Town X. And again, for me it's quite obvious, because now the place had a place, it had a focus, it had a home, there were people up there who would probably said yes, The Town X is where I would like to live. So suddenly the project had a focus, so new people came and joined. So those who said: "no, I don't like the idea of The Town X" decided to leave. To me, it's fairly obvious, you know, this is human nature unfolding. It's the dynamic of individuals making prosperous decisions, as to what suits their life, and the group, which is the company, trying to facilitate those. And there will always be transition points along that; in other words, there will be people who will*

say: "I want to stay in the group" and there will be people who will say: "no, I'm just going to leave". So that has always been a dynamic in the company, the dynamic and tension between the individual and the group." (Interview with **B**, page 2)

22 *"I remember that the issue that came about was… what was our priority issues … and it was 1 or 2 people involved into ... quite corporeal in their thinking and ... and … they… this meeting was chaired anyway and it was led to some people trying to prioritize what are the issues were of mayor concern to us and ... it drove us to a serious conflict in the meeting … and the people that was chairing and facilitating the meeting were a disaster… and at the end of the meeting it was quite funny because they put us in two circles face to face and you have to say something like I'm happy, are you happy?... and you know… it was a joke! But show us that it was a serious tension … there… now, I think that when first people left was when, in 2002, was when we were deciding in The Town X."* (Interview with **D**, pages 2-3).

23 *"We negotiated the purchase of land with the [former land owners] and this negotiation took a long time for them to agree. Then it was subjected to planning permission, so we had to prepare a master plan, we needed to engage **M** and **AE** architects to prepare a master plan and go through the planning process. Well the first thing we did actually, because they were revising the county development plan which every county council provides; so we made a submission to get the land zoned for sustainable development, that was a lot of work in preparing that, and then when we went to trying purchase the land from the [former land owners] they try to pull out of the deal and it took us about 6 or 8 months. It went through a whole legal, we went to the steps of the high court, because... fortunately we had a very strong document, it says that they were to sell us the land for a price and they tried to pull out of the deal."* (Interview with **A**, page 6).

24 *"It's very complicated first of all. I mean, my position in the company was to try and make things happen, so I had to try and get 50 people to invest together, to buy a piece of land, to apply for planning permission. There are a hundred… like if you got 50 people, probably their partners and their children and, there is a hundred people attached and, you know, when you think of it, all with their own opinions and views. It's impossible in my mind to capture all of that, first of all. I just don't believe it's possible.*

Within that context, I think there was also… I mean I don't believe there was any deception going on in the company, I think there may well have been difficulties in organizing so many really quite strong willed individuals, you know, you had a lot of well-educated, sort of ambitious, sort of politically astute people who all were trying to figure out how they worked together. And there was always has been a constant struggle – I think – within the organization, between the people who are staff and who are working on the ground, essentially at the cool face, making things happen, and then the people that surround that, in the wider group. I think there has always been a sense of communication difficulties or, some people would perceive it as a lack of trust, some people might perceive it as being autocratic or controlling, but essentially, in my mind, again, it's down to the nature of how people work together. And we're not very good at it, really. I don't think our society is hugely supportive of how we make things happen. There is a desire for individual freedom and yet an attraction towards leadership. It's always these contradictions that go on. And in my mind, for me, when I was involved in the project, as a manager, I also perceived myself as having a certain leadership function. And you can not keep everybody happy when you're in a leadership function, it's just impossible. And I never wanted to keep everybody happy, and it was never my ambition.

For me, personally, there was always going to be a degree of tension. And I have no difficulty with that, really. I mean, there is other people leading the company now, and let them off more power as far as I am concerned." (Interview with **B**, page 4).

25 *"[…] as I said, myself and **B** worked very well together; my strengths were their weaknesses and my weaknesses were his strengths and we worked in a very good working relationship but I thing that some members tough that we were controlling the project because I was working part time and.. I worked more than part time but I wasn't paid for it at the time... But... we had a very good idea of what we needed to be done and I don't remember even... there was... Because we were in a difficult time there was a lot of apprehension from a lot members even ... now I remember, because I was the secretary and I use to take the minutes, some people said that they should bring a tape recorder in to the board meetings to record what was being said; it was that kind of conspiracy going on and it was crazy... But a lot of it was to do with.... **B** is a very strong personality as I said and ... he upset some people and they actually... well it will be wrong to say that they tried to ensure that **B** was no to stay in the project but... Something like that ... the board ... some people had difficult times working with him because he just wanted things to be done and blame people for it and some people didn't wanted to be responsible... For example I do remember in this European project and even it was such a positive thing to be involved and there it was absolute interrogation to both, myself and **B** by email; asking why we went, why we didn't consult members, what are the implications… Even though the information was there but was more the kind of... Why didn't you send an e-mail informing us? ... now we have the benefits of what we did, but was that kind of ... it got to a stage where the relationship between Mr. B and some of the members just broke down completely and the board basically said that we have to terminate the contract.*

*In terms of **B** as well it was a difficult space personally outside of the project. Sometimes he's not strong as to be in a crisis management and we were in a crisis at that stage. And his fear and apprehension coupled with the members and the board fears and apprehension and just clashed and I thing that was the main reason why he left."* (Interview with **A**, page 7).

26   *"**B** was the driving force behind this for a long time. We came to a point when **B**, for the project to succeed, **B** had to realize that it was bigger than him. That it wasn't his project and that he was only part of it. And that was a big crisis point [....] it came to a point where if **B** have stayed very much in control it would be like living in **B**'s XOOP. And be like a cult or something. It's never been like that, it's never been in any way religious, but that was a critical moment. And I don't know… I know **B** very well we share home together, we lived together with **F** and **A** and **F**'s ex girlfriend. We share house and it was very intense and… I know **B** very well. Like I remember him saying, he was very upset at that time, we were doing the negotiation for the land here, and he was in the house – the one we were sharing – and he said, you are taking my baby away from me…"* (Interview with **C**, page 2).

27   *"For me, I had a very simple motivation, and it was really quite ruthless in a certain extent. I wanted to buy some land, I wanted to get planning permission and I wanted to start our next first eco-village and I really didn't give a shit how that happened in a certain respect. I had a very clear focus, and with **A** – and with a couple of other people – we really did plough into that. And, to be honest with you, I got as far as I could and then I think I pissed off enough people to just… right…"* (Interview with **B**, page 5).

28   *"Well, I think there was a couple of things. I was having a difficult relationship with my girlfriend at the time, which was fucking my head up, so I was a little bit distracted from the project, so, that was a big interference in my life, so I wasn't as concentrated as I had been up to that point. And as well as that, I think I had sufficiently build up, … There was quite a number of people who really just saw me as being maybe too bossy. And I wasn't at the best of health myself, you know, I just don't think I was concentrated on my job, I wasn't giving it everything I could have been doing. I was distracted with personal problems at the time. So, like that.*

And we almost had closed the deal, in a way. We had almost done what we set out to do, which was buying a land and get planning permission. And they were always my goals; for me, I didn't see my engagement going much beyond that anyway. So it came to it really, I mean, I think the company just decided that, look, let's just cross it now, let's get gather … and we'll take it on ourselves. And, for me personally, I was quite fortuitous because I knew that this was happening, I could see the fucking … I could see the knives gathering, you know, I could see things coming in, so I wasn't blind to all of this, it was quite obvious. I was fighting them off bravely and trying to get my job done, with all of this shit that was going on in my personal life as well. So I saw all of that coming and… So I went looking for other things to do." (Interview with **B,** pages 5-6).

29   *"The thing with **B** was very, very difficult for me because I was in the board; I was trying to deal with the situation and I was negotiating with B… an … very strong individual, he had started the project with **A**, but I don't think that he was the person, I don't think that he was able to fit into a sort of a consensus type situation ... he as too strong… and he wasn't good at that kind of arrangement, you know. But we needed him, we needed an engine to drive it, but then we went to into a different type of situation and it was a lot of conflict between him and a lot of members … it was a lot of real antagonism towards **B**. I don't think that he realized it, I was give with a lot of complains about it in e-mails as a chair of the board and I don't think he had any idea of the level of antagonism that was there, so, we have to go … the project have to change, the structure have to change … it couldn't be that top-down, it just wasn't working and I think that a lot of people perceived … **F** at a sort extent but, **F** has a sort of dynamic, but I think that **A** and **B** have a certain dynamic, they worked quite close together but **B** being very dominant and **A** operating as a support to **B**. And the whole thing changed, inevitably. Now, I remember … I've worked out an arrangement with **B**. Part of the problem was to see that **B** have been offered a site if we achieved a certain amount of sites or certain milestone in the project and that is the*

core of the idea. It was in a meeting year before, and looking back at that whole thing I realized that was a mistake, it should never been offered a site or anything like it. He should be just paid, you know, for the work he was doing, and he was doing a lot of hard work for a very little money, as so was A. So, I worked out an arrangement with B, a deal, basically, that he would be back-paid as if he has being paid a certain wage going back for a number of years and… see a lot of people opposed the idea if giving B a site … so I came up with the solution, let's forget it, he is not getting a site, he is getting back wages that it should haven't been paid, that if he was paid a fair wage this is what he should be paid for the last number of years – now is actually the amount for a site, anyway – but it was presented differently; and people agreed with this, this is ok, that's fair. But that has been a change in the tax codes since this arrangement have been made and now we have to pay taxes on top of it…" (Interview with **D**, pages 6-7).

30   *"The next thing was A, before I finished on the board I was determined to at least give A a break – now, me B and A were close friends – so, I think that A was a bit pissed off looking that B got a pretty much good settlement, and A spend the same amount of time, and having given any wage, but spend a lot of its personal money and driving all over the country driving B around everywhere and … so I think A was a bid pissed off about it … you know what he got out of it?... and ... so, I, again, with the board worked out an arrangement with A that he will be paid a certain amount of money for past expenses , that's the way it was presented , and he got a lump sum and he ahead alone to south America. So, in essence I was negotiating in behalf of the company but also I was thinking about A as a friend, so I wanted to see A go away and refresh and come back and reengage and enjoy it."*
(Interview with **D**, page 7)

31   *"We had a process group actually, because it's one of the things we... we were strong, we recognized, we wanted to have processes; but M had developed the Gaia democracy and it was evident that there were*

*problems within our structures, so we started to implement the Gaia democracy type of structure, but what happened over a period of time – and this is where the whole lot of working groups just seems to appear – because it was about maximum autonomy for people and some of them have an idea at the members meeting or in a discussion in the pub an go... well should we need to organize the traffic in The Town X? or ... let's set a working group! ... and then they have to go through the whole process to bring it to the membership and have to show a statement of mission and vision to show what they want to do... but there was no real... again, probably links into a strong working plan... just people coming up with ideas, let's set up a working group to look at this or that... and then it started to get too big with the amount of ideas and the amount of things they were trying to achieve and loosing focus on the critical planning, finances and legal issues.... It seems to be going all over the place but... the people into the planning went burn out because it was so much of work in that area and... we got lot of very god people but that was the busiest of the groups and the most testing... even down to ... the way we developed the project ... it was only ... when you go into the detail you realize the complexity, because we eventually bought the land and you have to decide who should get a site first ... and how do we design a process for selecting or choosing your site ... and we have to go through a whole ... **M** worked in a document as to ... Site allocation process ... people had 7 days to choose their site and if is not choose whit in that 7 days they will lost their opportunity. We had to come up with a whole... and what if people went away, what if people want to change, how to feedback into the site allocation process ... so it was so much work in the background that we created for our sites because of our structure...”* (Interview with **A**, pages 8-9).

32   *“In late 2005 we got full planning permission and we manage to close the land deal with the [former owners of the land]. These were the key elements that happened at that time, and it gave us a lot of media and a lot of publicity to the project, It suddenly became real for a lot of people who were been sitting in the sidelines very interested waiting for that to*

*happen. Whit in that period I was involved in the project up to May 2006 and then I took 6 months off, went away until the end of 2006. But it was 2 teams that we had... we had to get a full bill of how much it will cost and we have to go to tender and get contractors involved... And we always said that the price of the site was an indicative site price until we got contracts from the contractor to say that he will build it for certain amount ... But during the summer 2006 there was a big sales drive and **Y** was doing sales and he was offered a bonus to sell certain amount of sites by a certain time. I wasn't on top with it... it wasn't what the project was about… And the site prices were very attractive because we haven't actually made done the adjustments for the contractor and the contractors agreed price so... at the current climate at 2006 the site prices looked very attractive, therefore was huge interest and a lot people put inn their money to take up an option to purchase a site."* (Interview with **A**, page 9).

33   *"I just been working, it has been one crisis after the other; personally I felt I was holding a lot of the project. I was a lot of… particularly when **B** left we went to a legal crisis with the [former owners of the land], we went to through all that stuff… we had a good support, but personally I could feel the pressure and also was trying to negotiate a loan with the financial institution to actually purchase the land because no financial institution actually talk to us at that time so, it was a huge amount of work in that to secure the money for the land and also to try to secure the money for the infrastructure so, when we appointed with the contractor we will have the money in place. So… this is my personal opinion that we needed to ... the board as well, I felt that the board was also very reliant on my and I needed to … for personal reasons I was burn out and I needed to take a break. But also the company needed to grow up, the board needed to take responsibility for the project and we identify **Z** as someone who could take over from me and He worked with me for two months before I left so, it was a good transition, but I think that he found a bit difficult to bound because I was in the project for so long and **Z** has different skills as he's specialist at the engineering*

aspects but he wouldn't be strong at the financial part, and then the board was not functioning very well and N… Somehow employ N to help Z, which was a bad combination, it was a king of staffing problem. I was unaware; I was off in South America, I wasn't here so I didn't care."
(Interview with **A**, page 10).

34 *"We went away, we were in Sri Lanka. But my understanding is that Z was employed as manager, H was chair at the time and AF in the board and… basically what happened is that Z was employed and employed N without advice and basically they start fighting and they were not even talking to each other…"*
(Interview with **C**, page 6)

35 *"My sense of this time is that it was incredibly bad managed, the directors ended up effectively as executives and AD was all around the country looking for engineers and ... well … AD is an actor I don't know how … I joined the board after that [the clash between N and Z and the meetings we were having like 6 hours long... the agendas were so long and... They were dealing with everything! … it was total micromanagement… and working in voluntary basis and depending on people having time ... and absolutely crab employment – human resources understanding, bad contracts, it was a mess. Do you know AA? She was also working for the eco-village at that time and she had a contract and had a breakdown... it was a hilarious place to work... so if you look the board of directors from 2004 to 2005 it was no continuity… and N is an academic, and his brain just goes on everything, and I don't know if he can focus on something because he was involved in so many things and Z... Z is an engineer as well, and I don't know if he has experience in management… and then what happened at that time is that M become involved introducing weakly the Gaia democracy and the whole thing was a completely mess… During the 6 months when A was away the whole thing became a complete mess, and then when A came back the office was a mess. AA is not a good administrator, she is good in many other things but apparently things were not well filed and … I*

*think **AC** was employed at that time as well and she is still doing a lot of work and… then… **M** was doing a lot of work for the eco-village but **AC**… the working environment was so bad that **AC** started to work at **M**'s house. My view is that... they didn't understood what was happening... and what happened is that the board meetings were carried out at **M**'s place.*

*And it was a very bad management situation, you have bad management, you have a kind of toxic work environment, and you have this kind of incestuous… everything is happening in the **M**'s house, is very hospitable, but it wasn't right … and then **M** started doing this weekly reports when he went to talk with all the people and assuming the role of coordinator and had an incredible amount of knowledge about what was happening, and he did it voluntarily on weekly basis… around that time as well the beginning of 2007 we decided that it would be good to employ a coordinator and it was lot of advertisement to fill that position and again the terms and job description were done by **M**… **M** was obsessed about giving the coordinator who had effectively no… no… he wouldn't be a manager, he wouldn't be able to tell people what to do… because this is a conflict with the idea of being a flat structure … so, that was the problem from the very beginning. Because you end up as a coordinator with all you can do is encourage, you don't have actually any formal responsibility. The problem was at the climax of the critical situation, the recognition of that we needed somebody to coordinate as a title, and needed a job description... and we employed **Q**…"*

(Interview with **C**, pages 7-8)

36   *"He was working for the eco-village, he is a watchmaker and then he went into the theosophy… so **L** is a character and he is a salesman as well. **L** managed to sell 132 plots, but they were not sold at all they were just solid deposit stands and he… he... he is the person who tells you what you want to hear, he is a salesman. If you tell anyone what they want to hear, maybe not 100% the truth... so we said we sold 132 sites… it was an absolutely ridiculous statement to say that in the village*

all the sites were sold… they were €1000 deposit notes for the whole price of the site and the people were told that the cost of the site were about to grow up but not excessively [about 5%]. So, what happened when the new cost came out… was a huge exit of people and that's still impacting on the project." (Interview with **C**, page 6).

37   *"[…] the thing is that we never knew exactly what the site prices were going to be and… we had an estimate, a row estimate of what the sites prices were going to be but we never knew it until we came across about what the cost of the infrastructure was, so, probably at certain degree at the beginning **B** and **A** were trying to get the figures and see what can be at the end [….] So, when they come across the cost of the infrastructure and we got a figure of the project, for a lot of people it was just not to work, it's gone through the roof, and they left. I don't have a big problem with that, you know, we were a bunch of amateurs, you know, trying to do something very idealistic, and we didn't get it right all the time, we have a huge amount right but we got the figures wrong, we got the sums wrong… but is not as if it is one person to blame or to … we all got a round and when the numbers and the figures came inn, some people decided with their feet, and some of them made a lot of noise as they left, and others didn't, others decided it wasn't for them. But I think is how I agree with what says **A**, it come up t a time when you pull up or shut up, you know… now you know the figures, are you going to move, sell in The Capital and made a commitment, and that was the other reason why people left, because they were given with a cut up period, you will lose all of your money or you will get back up to 12000 if you left by a certain date and it was a very difficult decision to make for a lot of people but I know personally, that for some people helped them to make up with their mind, and some people left a lot of money… and I think that the people left not because the project was too expensive, they left because for other reasons. I don't believe that it was because of the cost; I think that they left because they were not going to stay anyway."* (Interview with **D**, pages 8-9).

38 *"I wasn't in the office at that moment... I don't remember it as that terrible thing… I knew about tensions because in behind an e-mail is a lot of shit going out… and… you just can tell by the tone and by the context... All of that... But still... I don't see, I mean I know A came back and said that financially was a disaster… I don't think so, maybe is right but… financially it wasn't a disaster, we haven't sold a huge amount of sites but the prices were going up and that was the problem."*
(Interview with **D**, page 8)

39 *"I came back and it was a lot of turmoil going on and… the main reason why people left was because of the site price adjustment. At that stage people… Y during 2006 sold a lot of sites then, when I came back in February 2007 it was critical, the contracts were starting, we had to fix prices, so, the site's price went up dramatically – increasing about 60 to 65%."* (Interview with **A**, page 11)

40 *"Q was employed for a year but she did a very good work in terms of... between her and the board, employed a lecturer very careful to explain the duties of a board and we managed to have meetings following a strict agenda and the process of professionalizing the [board] work started with Q. And she was very good in putting together directors, and files, and started to charter procedures and... But she wasn't great with people... the result was that the directors were much more aware of their financial responsibility, and the other responsibilities as member of the board, legal issues and the contracts and employment. I've been in the board for two years. In the course of these two years all the staff got contract, we got a very clear contract process we went through. The thing is we… we… we are much more professional, more business like…"* (Interview with **C**, page 8).

41 *"It comes from the process group and again... I've to go to that moment with all this turmoil and everything else, we were dealing with a lot of things so, they [the board] ask B to do an analysis of where the*

*company was at, and what need to happen to develop it. At that time the report that **B** wrote at the end of 2006-2007 as an external consultant, well he was given with a kind of methodology and terms of reference from the board; and it was at that stage when I thing was **M** come across with the VSM, and in **B**'s report he is asked to look critically at VSM as a potential model that the project would adopt. As I said, I was away for 6 months and within that time **N** was working in the office with **Z**, and there was a very bad relation between the 2 of them, and not a very healthy working environment, and the board was having its own difficulties. I came back at the time of increase the site prices and the members started to leaving so... it was so much going on that the board couldn't see what's going on and **B** was available at the time so he was given with instructions about how to write a basic report and what he perceived what was wrong and up to that came the gradual introductions of the VSM. It took a long time to... it was so much going on and people just coming on and "yeah ok yeah" and then back to process, process, process... fight a fire, fight a fire, we will come back to that when things are settled down, so that's why is taking over a year for the [VSM] introduction and I believe it hasn't been formally accepted by the members yet…"* (Interview with **A**, page 12).

42   *"[…] he (**B**) came back with a strategic report that was crap! ... He tried to use VSM and apparently he didn't and was a waste of money because he got paid for this… a bad piece of work."* (Interview with **C**, page 5).

43   *"That strategic plan was badly... it was basically a kind of reading cabbala of **F** and… I don't know who else decided that **B** should do the studio… And it wasn't properly agreed that **B** should do that and it was a bad piece of work."* (Interview with **C,** page 8).

44   *"Well I was brought back in, to give a consultancy kind of job: I was asked for one month to try and devise how the company might function a little bit more effectively. So I went away and I discovered, through a*

couple of people, the idea of VSM for example, … I also went in because I hadn't been involved in the project day-to-day – I had a great knowledge about the scheme, I understood how the company worked – but I wasn't involved in the day-to-day politics, I wasn't… you know, I had no axe to grind, I wasn't there, I wasn't fighting anyone. And I think basically I was offered a job to come in and try and offer some advice. So I produced a report, I was given four weeks to do it. And that was to ground an interview everyone, and to find out what was going on, and try to assemble it. I mean, it wasn't the best report – in other words I didn't get… you know, I didn't have enough time to do it as good as I had hoped – but I think what I did was I introduced some basic ideas. Things like a rational restructuring of the organization in using the idea of VSM, looking at the area of staffing and difficulties within… you know… I can't remember all the details of what was in the report, but just from the top of my head… So that was what I was asked to go in and do. And again… you know… it's taken … what? Two years or two and a half years to try and bring some of those things into tuition; things happen terribly slowly in non-for-profit, voluntary organizations, or whatever we're going to call it, non-hierarchical, you know… things happen terribly slowly. I think there was some very practical... Like, in my mind, again, I like simple problems, you know. Like, my original scheme was find some land, buy it and get planning permission. Three very simple things; all of the other stuff is just detail. Right? But those are the three goals that have to be approached. Once all that was done and we had the planning permission and we had the infrastructure contract to being carried out, there was really only one thing that the company had to do. And that was: sell our sites. But invariably it got distracted with fucking systems of governance and… you know… ideas of this, that and the other and… you know… people doing whatever was fucking… you know… important to perceive is important, at the time. There was really only one thing that the company actually needed to achieve, one goal, one target, and it didn't achieve it. It needed to sell all of its sites; and it didn't sell all of its sites. So that's – in my mind – that's a failure, that's not a success. The company will disguise it in many, many different ways. You know, the

collective denial or the collective problems that go on within an organization will always exist, but it didn't achieve its goal. You know, and I think we're still going to live with that legacy, that problem, that we didn't join the Celtic tiger; sell all of the sites is a failing on the part of the company. You know, whatever what were the details, all of the stuff that goes on around it, that's fine and, you know, that happens; but it's actual mission – what is it supposed to do – it didn't do it." (Interview with **B,** page 5).

45   *"**A** wanted a person who had a plan, who had a vision and all the rest of it **B** was brought to look at the VSM stuff… or at least **M** suggested him to put it together … I didn't know why I didn't agree with **B** being brought again. And I said that, I said I don't agree, I've been through a lot of shit with him and you are paying this man a lot of money when he has not been around for years to tell us what to do. I didn't agree with that and I think that the result of that was… nothing really I don't think that… I don't know… as a personal comment I don't believe that bringing him as an external consultant… everything is gonna be… we can do it ourselves."* (Interview with **D**, page 10).

46   *"[…] and after much conversation and ideological... we went for **A** as general manager to assume this idea of coordination, and **A** has been doing the finances of the project since the beginning so basically ... he receives help from some externals and members such as **P** who was the chair of the board until a couple of months ago and is the director of fair trade in Ireland and he has experience in management and as a manager reporting to a voluntary board of directors, so, he (**P**) was very good as a director in terms of professionalizing the board and the relationships within the staff."* (Interview with **C**, page 8).

47   *"Now, she (**Q**)… she… is a very difficult place for working, because it's not like a classic NGO, or a classic business… and she found it very difficult … to be honest it was not a very good decision to the end… and we ended the contract after a year … we were paying the salary that we*

*would pay for a manager, somebody who can get involved, take decisions, push the thing forwards. But, our structures and coordination under **M**'s job description saying that's not your role, that's not your role, it must be self-organized plus the existence of 17 self-organized groups … and trying to coordinate things when you are having groups that in several months have done nothing... is very frustrating... is like give someone responsibility without any power and authority… so basically that was very unfortunate… to be involved in a project like this you must be very strong emotionally and she... she… she was not that person. It cost us so much … and I was involved in the final decision to terminate the contract… […] So, staffing has been always an issue, also the way how we ignore advice depending on if we like the source… that's something that always has been happening in this project, I remember one e-mail sent by **B** at that time saying that an economical downturn was forthcoming and we said: Well is again **B**, again with his bad vib and we ignored it"* (Interview with **C**, pages 7-8).

48 *"I don't think she (**Q**) was able, I don't think she knew what she was giving herself into… and I suppose there is a learning to us from that, there is no one not a single person that can manage this thing … and if we expect one person to do it… like I told about **Q**: Ok, she is a woman, she seems to have a very good way of managing people and processes and stuff like that … so … **B** is more like… he is a control freak … a lot of us are control freaks in this project … and as I told, she was very much able to talk with people but it just turns out, it is too big, it nearly kill her I said."*
(Interview with **D**, page 11).

49 *"**A** has evolved, really, and I think **A** saw all of this happening ... and I think it's a kind of pain seeing this person getting so much money for something I can do… so, I think what comes out of that is **A** as general manager. And I know **A** very well, we are very close as friends, so I talked to him about it and I think it have been a great thing for **A**. He*

sees that happened is... I can do this, but is not like tonto to the long range, you know, he is on his own." (Interview with **D**, page 12).

50 *"They actually come to these groups and they expect the company to take on their own personal stuff, you know. So they'll come to a meeting and they will go: "Oh, I think somebody should do something about this situation…" And because they have an emotional connection to this issue, they will dump it on the company. And the company is left holding all of these dreams from all of the people who are involved in it. And there is no ownership; there is no responsibility for those dreams. When you come along, when you dump your kind of ambitions, your wish for a green world, your wish to remove homeless people from the streets… Everyone has those dreams but you can't just come into a company or an organization that you are involved in and dump it on it, and then expect that because you come along… somebody in the organization is actually gonna make that happen. So it's just not fair on the company. It's not fair on the staff; it's not fair on the structures of the organization… So there has to be boundaries. And so I'm very much in favour of consensus decision-making and processes of cooperation, but there has to be seen within the boundaries of what can and can't be done. And I think that, in a way, often these companies are left carrying too much. There is too much put on their shoulders. And this is often reflected in the efficiency of staff, the wearing down of staff, you know, the stress that sometimes staffs feel. Because they actually don't […], they get loads of people's dreams and ambitions just thrown inn and expected to deal with them all in some rational way."*
(Interview with **B**, page 7)

51 *"… (the consensual decision-making mechanism) has its weaknesses. In terms of strategy, it is weak. One of the reason why strategy is weak is that consensus tends to mean that we avoid difficult decisions. The proposal is laid and if people don't like it then forget it. It (the issue) may be important for a person but because we don't want to create tension,*

*create stress, create disturbance in the organization and the group we just forget about the idea". (*Interview with **N**, Min 3:19)*.

52 *"The landlord is a very difficult person to negotiate with. One of our members – I wont say who he was - suffered a mental health problem and finished in a mental hospital. One of the other patients there told him that he knows The Town X and he knows the land lord and he said 'don't negotiate with that man… it will drive you mad'…"* (Interview with **N**. Min 14:40).

53 *" … same day, is a great day, party-field, it is summer, many of us were here… and a lot of big decisions were done like here like the decision to move the office down here from the capital"* (Interview with **N**. Min 34:10).

54 *" …(After the leave of **A**) when **Z** found he was not coping with the job he said to the board I need an assistant. And I was persuaded to take the job… and it become very, very difficult. At a time I expose I have a personality clash, I complained to the board of being bullied by **Z**. Looking it from the distance, the job was badly set-up by the board, **Z** asked for an assistant and got an assistant whereas what the board present to me was that I was about to be his pier, his equal. So, If **Z** asked to me would you think is a good idea x; I would say yes, let me thin about it and I would give a concept event asking why x is necessary – Which is my experience as consultant. Form **Z** perspective, I was his employee, he asked me to do something and I didn't do it. Now you can see the potential to generate a big problem. The other issue that effected the relation was a kind of professional ego. We were at that moment dealing with the preparation of the planning permission application with two people who know very little about how to do it and the ideal person to do that (**V**) was recovering from a mental disease. So we were in presenting our advances in the meetings, destroying the work of the other person and then doing a dramatically exit – like in the opera. So, it was a long period of time with very poor progress, with the*

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wrong people in the wrong place … and the management was weak" (Interview with **N.** Min 38:40).

55 *" … we got **L** working in an scheme were he would get a bonus is he sell 90% of the sites by a certain date and double the bonus if he sells 100%".* (Interview with **N.** Min 45:15).

56 *" … there were ideas like that we could run an energy company; we could heat The Town X with our boiler plant, but they didn't realize that it was never going to be viable – and we decide that these kind of business would never be considered – because most of the people living in The Town X are tenants or relatively poor or both; and they are not going to invest all their money in a system they can't afford, to improve a house they is not theirs, or simple they don't need a central system like ours".* (Interview with **N**. Min 1:06:00).

57 *" … there are some few members that have been constant in the project, and a constitution that has been improved with the time. Initially this constitution states that all the managers should leave after one year of service; then, we became more realistic and now the time to leave is three years, and we stop thinking that everyone should be manager. A the end we have to realize that we are a volunteer organization depending in the availability of time of some few people with specialized skills to sort out particular problems … and that probably why we are constantly reinventing the wheel. A good example is that four years ago we assembled a strategy group and didn't last. Two years ago we hired **B** to do a strategy plan, he presented his report - that was not satisfying - and it was just ignored… it doesn't matter if we agree or not with the content of the strategy report, should affect in somehow our way of thinking about… why did we not act on the previous strategy report? … it is because we didn't set-up mechanisms to implement whatever came out from that report and now we are going through this situation again with a new strategy report.* (Interview with **N**. Min 1:24:22).

58 *" At that time it was very little activity really, we have no land and we were concentrated in the processes. And is when we set-up a limit of twenty-five and it was a mistake, because some other people wanted to join and it was … **B** was having too much influence and we were not strong enough to stop him so… there is when we decided to keep it as a small group no more than twenty-five, basically o be able to deal with the strong personalities already existing in the group. At that time we didn't have a real process group, we just sit and discuss in a circle. We didn't have a process we didn't know how to make a decision and we tolerate that because de diversity of the people involved and we were keen with the idea of consensus… but at the end of the day it was **B** and **A** making the decisions "* (Interview with **E.** Min 4:13).

59 *"… My recollection of the negotiation with the landlords is that they were not taking us seriously. They tough that we were a bunch of hippies disorganized - and it was because we sent **A** to sing the contract with his long hair and his leather jacket and looking disorganized – and we were trying to buy the land and they were trying us to… … they tough that our organization was about to collapse in within the next six months and they would take forty grant for free. But when we were serious they didn't wanted to show up; they started to hide from us… and it was a kind of funny because we have to pay them four thousand Euros every month but every time we came they disappear – we walked inside their house a couple of times in the morning and the kettle was on but nobody in the house - so they could say we defraud them.* (Interview with **E.** Min. 11:53).

60 *" … I think that it was because they didn't gave to us the real figures for the planning and other developments. So, when the real figures arrived we realized that it would cost to us a lot more of what we tough. (…) The other thing is that before **A** returned there were a clash of personalities (between **N** and **Z**)… and that was a disaster for us because in one hand you have an intellectual and in the other a practical. And it was a shame because the management was chaos, and*

it was a big problem for the whole development, and the Celtic Tiger died at the same time as well. (…) So, definitely, the increasing of the figures was a big issue because we were trying to build affordable houses – and an ecovillage as well – and then they brought the real figures and we lost a lot of practical people - more hands on - and they changed the whole driving of the project. (Interview with **H** and **I**. Min. 19:45).

61 *"… The consensus was very good in the argumentative way but not at a practical level. It was very sharp and you have to be very careful about how do you say things and I felt like in a boardroom and I found it very intimidating – as many others as well. That's why it seems to be run by a handful of people … but history has shown that became very problematic in their ability to run the show and just don't have the right skills to run the building sites.* (Interview with **H** and **I**. Min: 27:15).

62 *"… I tried to put a project together before (in other initiative) but it didn't worked… and then I joined the XOOP. But it was (the ORGFARM) intended to be – a communal farm – for The Town X community, not just for the XOOP. Without the support of the XOOP it couldn't happen... So, my reaction was I will run the thing myself and … I suppose I'm a ideas person and I found hard to sit around procrastinating to long so I tend to get ideas an get them done. I should do it with the group but it would be to slow. So, I got a farm near by and started the ORGFARM with the support of some members and involving the local community.* (Interview with **H** and **I**. Min. 36.00).

63 *"… All the decisions were very reactive rather than in advance of what was going to happen and as a result is nothing to efficient. But we are learning now and it seems to be improving now.* (Interview with **H** and **I**. Min 46:30).

64 *"I think that strategic plan… I don't call it a strategic plan because is not a strategic plan. Is a discussion document with some ideas on it and is*

very abstract and is not based in what we are now... is abstract thinking written by a particular individual who is probably with another individuals who had discussions with other individuals about a particular approach of what is sustainability over years or whatever... but it is another example of ... is an elitist example of... sort of... is almost an elitist type of approach to an strategic plan ... we need to talk to people about our ideas but they must be grounded in our reality and that document was in anyway ... have nothing to do with our reality, our past or our possible future... is just some ideas but you can have it in a pub chat and come up with that without generate the amount of trouble that it did. It was another example of how not to do that. And now as a consequence Mr. J wrote a detailed note in response and I wrote... I was furious when I read it and I tough: Is that the best we can do? You talk about a strategic plan and you wrote this document and send it up to the people. I mean, is an insult to my intelligence! Is what it was... and again, nothing personal... I could done that in my sleep and would be nothing like the conflict it has created [...] what I did was I wrote a response and I did my best to be as much constructive as possible. So, now is enough people saying: Ok, lets go back to the drawing board and Mr. U has done brilliantly dealing with this issue, is managed now. (Interview with **D**. Min 45:50, part two).

65   *J – Answering a questionnaire asking about the impact of this research:*

1- How would you describe the overall change (if any) in the management of the project
in the last 3 years?

It became much more orderly and coherent. There has been steady improvement in this, and we still have a way to go, but we were pretty chaotic at the time.

2- How would you describe the development of self-organization and autonomous
work of the working groups (Primary activities) in the last 3 years?

We already had a system of self-organising workgroups, but they were not working together very well. The VSM allowed us to restructure the groups rationally and to put structures in place for them to cooperate more effectively.

3- How would you describe the introduction of the VSM into the eco-village? Was it of benefit?

It was of great benefit, and will be more so in the future, but it was a slow process due to natural resistance. It was hard to get the buy-in of Members, or to get more than a few key people to study VSM in any depth. This has slowly developed to a point where many of the most active members are now getting a good understanding.

4- In what way do you think the introduction of the VSM influenced the performance of management and the PA Groups during the past 3 years?

There is more confidence that the organisation is under better control. The general manager gained better access to necessary information, but less need of detailed info. The board have been able to step back from too much micro-management and concentrate on their oversight role. There has been some mild confusion as people experimented with the VSM and its language without necessarily understanding it fully, but this will improve as the learning grows.
The PA groups vary. Some operate well and have used the VSM to model their own internal organisation. Others have been slower to integrate properly.

5- What thoughts or reflections were generated by the presentation of the results of my Research at the members' meeting?

For me it was mostly that our use of VSM had worked very well at first, but that establishment of the Navigation group had taken too

much focus away from necessary Primary Activities and become a talking shop where practical strategies were held up in endless analysis and discussion.

It highlights the need to work on the interactions between different subsystems. Especially the S3/S4 loop and the oversight of that loop by S5. Groups need to understand what to expect from each other and the duties they owe to each other if we are to work as a cohesive system.

6- Finally, please feel free to express any other comment related to the

outcomes of my research on the self-organization and the use of the VSM.

The VSM handbook you prepared was very useful. The approach of building the model up logically, starting with just a bunch of individuals who want to work to some common purpose and developing the structures they need to do it, is easier for beginners to follow. I used this approach myself recently when I suddenly was asked to do a presentation on VSM to a small group and it worked very well.

Your research also gives us important external assessment of a scientific nature, whereas otherwise we tend to just argue about what is going on!

66 **AC** *– Answering a questionnaire about the impact of this research:*

1- How would you describe the overall change (if any) in the management of the project in the last 3 years?

Clearer and more focused in terms of groups and tasks.

2- How would you describe the development of self-organization and autonomous work of the working groups (Primary activities) in the last 3 years?

Still in it's infancy, think there's a lot more work to be done. There are serious financial constraints on the project due to lack of sales and this is having an impact.

3- How would you describe the introduction of the VSM into the eco-village? Was it of benefit? I'm not sure. It makes sense on paper but due to the voluntary nature of work required I'm not convinced that it's an appropriate model for the village.

4- In what way do you think the introduction of the VSM influenced the performance of management and the PA Groups during the past 3 years?

In general terms I think it's beneficial and think it's helped with workplans and accountability, also groups are aware of their responsibility. However in a group where there's either lack of project management skills or discord/individuals don't think it's useful.

5- What thoughts or reflections were generated by the presentation of the results of my research at the members' meeting?

Sorry I wasn't at the meeting, have stopped going to them, so I cannot comment.

6- Finally, please feel free to express any other comment related to the outcomes of my research on the self-organization and the use of the VSM.

I think that a lot of processes/work, and documentation that's issued within the village plus the language of VSM suits the "intelligentsia". It's not intentional, but it's clearly the an elite group who are educated to 3rd level have an advantage and use the power of the written word to push their own agendas, establishing a kind of elitism. This precludes the exclusion of members who feel intimated either

because of educational disadvantage, or dyslexia and lack confidence they don't feel they can contribute as much as others. I'd like to see this make meaning for the average person and more plain talk.

67 t – *answering a questionnaire asking about the impact of this research:*

1- How would you describe the overall change (if any) in the management of the project in the last 3 years?
more transparency and discussion
2- How would you describe the development of self-organization and autonomous work of the working groups (Primary activities) in the last 3 years?
too multi layered, with not enough cross communication for role clarification to established

3- How would you describe the introduction of the VSM into the eco-village? Was it of benefit?
Excellent for providing a framework to understands the process of groups –yes beneficial- but perhaps laborious at times

4- In what way do you think the introduction of the VSM influenced the performance of management and the PA Groups during the past 3 years?
accountability

5- What thoughts or reflections were generated by the presentation of the results of my research at the members' meeting?
Unfortunately could not attend

6- Finally, please feel free to express any other comment related to the outcomes of my research on the self-organization and the use of the VSM.

Useful framework – but too complicated in its presentation – which in turn confuses and disheartens.

APPENDIX 11. Evidence of appropriation of the VSM

The Bicycle

Document created by Mr. J. and circulated to all the community in the first quarter 2008. Edited in October 2010 to fit the terms expressed in the consent form.

VSM – What's it all about?

As you know, we have been working with something called the Viable Systems Model recently. Although our procedures have been informed by these ideas for several years we have been fortunate lately to enlist the help of Jon Walker and Angela Espinosa, who are both experts in the field and who are eager to aid us in understanding and applying the system to XOOP. The Process Group has established a study group, open to all members, to explore the VSM in more depth and think about how we might use it to improve our organisation. Although VSM theory itself consists of a large and detailed body of work, we feel that everyone in our community should be able to have a basic grasp of these ideas. Therefore we have produced the following overview in consultation with Jon and Angela.

****

The Viable Systems Model (VSM) was developed by a fellow called Anthony Stafford Beer as a branch of the field of Cybernetics. By looking at lots of different natural systems he was able to identify a framework of interrelating principles that were common to all the systems he was observing and that therefore he concluded to be Universal. This leads on to an idea called Recursion, which means that the same pattern recurs at lots of different levels and can therefore be found in whatever aspect of Life is being viewed at the time. Think of a tree, it's trunk grows out of the ground, limbs grow out of the trunk, boughs grow out of the limbs, branches grow out of the boughs etc. until the twigs that form on the outer reaches of the canopy. All of these different levels of growth follow the same essential pattern and resemble each other in

miniature. This Fractal system is what we mean by Recursion. The benefit to us of Recursion is that once we can formulate the model, the basic underlying pattern, we can apply that model to our own circumstances at any level so that we can operate in harmony with Nature. Thus Stafford Beer outlined a set of relationships that he saw were both necessary and sufficient for any organism, or organisation, to be Viable.

To maintain Viability the model must be kept in Balance, both with itself and with the constantly changing external Environment. It's like riding a bicycle, as you go along you maintain your balance by making constant adjustments to your steering in order to keep yourself upright. If you're good at cycling this process will be easy and almost imperceptible, but if you've just started learning then you will probably find balance hard to achieve. In this regard the history of XOOP has been somewhat Wobbly as we try to develop a new approach to organising ourselves without the steadying Parental hand of the old Hierarchical Command-and-Control systems.

Balance also has to be maintained over any type of terrain that we wish to cross. There is a reason why most of us follow the Mainstream and that is because it is a nice flat well-surfaced road that is easy to cycle on. Unfortunately it is clear that it has now become the Road to Destruction and that we must find another Way if we are to survive. When we encounter rougher ground then keeping our Balance becomes more difficult. As the ground becomes more varied then we have to pay more attention and respond by making more complex adjustments in our cycling manoeuvres. This principle is referred to as 'Matching Variety' in the language of the VSM and means that we must match any changes in the variety (or complexity) of our environment with equally varied responses from our own organisation.

The Model itself is broken down into different spheres of involvement, each of which performs a different but complimentary function in the overall scheme. These are numbered 1 to 5 and it is this language that you will hear most often. "Our system 3 is out of balance with our system 4, so our system 1's are not clear and system 2 is getting overloaded" is the kind of thing that you might hear from someone conversant in VSM-speak. It seems daunting, but you soon

get the hang of it, and it allows us to discuss our organisation in strictly functional terms without it becoming "Wilma and Fred can't get their act together so now Barney and Betty are squabbling and it's doing my head in ". Problems that seem to be about personalities may often in fact stem from systemic imbalances, and it's best to deal with them in neutral systems terms.

System 5 is what we are about, our identity. It is the meaning of why we are doing what we are doing. In XOOP our basic statement of Identity is 'Building Sustainable Community' and from that flow other policies about how we go about things. Thus system 5 is the sphere of Policy and has a twofold aspect. On the one hand our policies are decided by the whole membership through the passing of motions, by consensus, at our formal meetings and are enshrined in our Rules of Operation and other policy documents. The other aspect of system 5 is in making sure that these policies are held to. Our Board of Directors has the legal responsibility of XOOP according to Company Law and therefore are in the position of having to oversee the company in legal terms. We also designate to them the task of making sure that the whole thing stays on track according to what we have agreed as a Community.

In our cycling analogy System 5 encompasses what philosophy to take (it's a nice day, let's take a scenic route), our policies (going safely and slowly, rather than fast and reckless) and whether we are on track (is this the way to the park, or did I take a wrong turn ?). This is not a static fixed situation and what we do can change at any time (if it starts to rain, we might decide not to go through the park after all) – although we are still working within the same System 5 policies.

System 4 is the sphere of Navigation. It constantly watches the external Environment to monitor changes that need to be adapted to and maps out the way ahead in a practical manner. It also has an eye to the future and is sometimes called 'Outside and Then'. It is both the eyes and ears of the organisation and the faculty that charts the route. In SPIL we have identified a weakness in this area which we are currently trying to rectify.

On our cycling trip System 4 watches out for threats or opportunities on the way (a bag of chips in the road, that 4x4 reversing out of it's driveway, the smell of fresh bread from that little bakery) and also plans our responses (swerve

around the chips, let the 4x4 out, stop to buy lovely bread). It has autonomy within it's mandate, but alerts System 5 when Policy decisions are needed (it looks like it's going to rain, and I can get home if I cycle very fast, is this OK ?)

System 3 is the Heart of the organisation and looks after it's internal dynamics and the flow of resources around the whole scheme, optimising efficiency by encouraging synergy in the operational parts. It focuses on keeping the organisation working effectively and facilitates the operational elements in their endeavours. In SPIL this is the day-to-day role of our project Co-ordinator and is also one of the main functions of the monthly X meetings. System 3 is "Inside and Now" and a perfect compliment to the "Outside and Then" of System 4.
When cycling we need to work within the capabilities of both our body and the bicycle itself. System 3 keeps our muscles fed with enough blood to let them do their job and also makes sure that the chain is oiled, the tyres pumped up etc. and that everything is working harmoniously to maximum efficiency. The needs of System 3 are balanced against the needs of System 4 and this equilibrium is overseen by System 5. System 4 might want to cycle up the hill, but System 3 knows that we're feeling quite tired. System 5 makes a policy decision based on the overall picture.

System 2 works alongside System 3 to maintain an even keel and prevent conflicting demands on resources - (there is also a system 3* which carries out occasional information gathering activities , but we don't need to get into that level of detail currently). Imagine Barney from production needs 3,000 euro to fix the Widget machine, whereas Betty from Sales needs 3,000 euro to book a stall at the Widgetworld trade fair. There's only 5,000 euro spare at the moment, so what to do ? System 2 provides a mechanism by which a solution can be found without them just going whinging to Wilma the co-ordinator (at System 3) and giving her a headache. We have not had any serious difficulties with System 2 so far, but as the building phase starts and we get a more individual focus we will need to make sure that this system is kept working well, as conflict resolution may then become more important.

System 1 is called the Operation and is what the organisation actually does, or in other words how it expresses itself in the world. Systems 2-5 are collectively called the Metasystem and provide the necessary support for System 1 to do it's stuff. The Operation is divided into Primary Activities, which are the main things we are trying to achieve and are labelled 1a, 1b, 1c etc. It has been found that it is usually best to restrict the number of Primary Activity divisions to around 7 as more than this become difficult to handle.

The Primary Activities of our cycle journey might be say A.Pedalling, B.Braking, C.Steering, D.Balancing…etc. These can also change with time. Fixing a Puncture might become the most pressing Primary Activity for a while, as might Gossiping if we bump into friends on the way.

Something we have been looking at recently is how to restructure our, fairly scattered, working group system into one that is easier to cope with and keep track of.

One of the most important aspects of the VSM for us is the balance between Autonomy and Accountability, which like Rights and Responsibilities can only function successfully in equal measure. When we are cycling along most of our responses are actually autonomic, we don't think about every little adjustment of the handlebars consciously and if it's all going well we may not have to think about very much at all except how nice the day is and how good we feel to be out on our bike. In fact if we tried to keep conscious control over every detail of what we were doing the results would probably be a big heap of bones and metal in the ditch. The key to a smooth running organisation then is to keep as much of the decision making on the level at which it is needed and only to bother the other systems when necessary. The principle of allowing maximum autonomy to 'doers' (ie. those at the coal face actually doing the "primary activity" tasks) is vital if we are not to become bogged down in endless and pointless bureaucracy. The flipside of this though is that we still need to be representing the whole company in any decisions that we might make individually. The integrity of the organisation depends upon us all working together in harmony to further our aims. For this reason it is important that there is a constant flow of information circulating around the whole scheme of the model so that everyone knows the fundamentals of what is going on and can

make decisions with the confidence that they are being made in the context of what is truly needed. Not that we want to be lost in a blizzard of minutiae and meaningless details, but that we need to get focussed and necessary information to and from the relevant parts of the organisation as efficiently as possible. If we don't report on what we are doing then how can we expect the company to support us and keep us on track? Equally, if we're not listening to what other parts of the company are saying, how can we represent them? Getting this balance right is the most difficult part of becoming a Viable System, but with time we can only get better at it.

APPENDIX 12. Description of the rich picture – The XOOP today (2010).

Our House explained.

Document produced by Mr. AB, member of the Identity group. Edited in October 2010 to fit the terms expressed in the consent form.

[[[XOOP is the owner, the landlord, with whom we all have contracts.]]]

XOOP is the legal entity through which our project is run, and as a registered company it must comply with both the terms of its own Memorandum and Articles of Association as well as with legislation in general. It is also a charity and has to make sure that its charitable aims are followed. XOOP has legal title on the ecovillage land and has responsibilities towards how that land is developed. It is XOOP with whom we negotiate the contracts to buy or to lease individual sites as part of the project.

We also join XOOP as members and all have a contract with the company which grants us certain rights and obliges us to certain duties. These are set out in a collection of documents we call the Village Charter. The Village Charter contains all the terms of the Members' Agreement, the registered Memo and Arts of the company, and any other by-laws that the organisation has agreed such as the Ecological Charter and the Rules of Operation.

[[[These contracts forms part of the roof of our symbolic house. The roof represents the common identity, shared values, general policy and agreements that we are all standing under. Everyone living or working under this roof agrees to operate within the same framework. (The Identity group are up there with ladders trying to fix all the leaks!)]]]

These legal documents and contracts are only the formal side of what is actually happening in real life, which is that we are a bunch of human beings trying to somehow 'Build Sustainable Community'. They give a commonly agreed framework with which to do this, but of course there is much more to it than that. The underlying principles upon which our project is based, and on which those documents and contracts are therefore based, have to be

understood and implemented by us all if we are to work together to a common purpose. There is an infinite list of things that we could agree collectively as 'ecovillagers', but in practice we choose a small number of things we wish to make agreements on and otherwise are free as individuals to live our lives as we see fit. We have mandated the Identity group to help us reach common understandings about the things that we want/need to agree upon.

[[[XOOP's obligation is to make the house a model live-work cohousing unit (!!!) in which people live happily as a community in accordance with shared ecological and sustainable principles, but which also provides a centre of educational and research work in these areas.]]]

The project is unusual in that it is both an educational charity and a community development scheme. We are building our own homes, and the necessary systems for living in them, but in doing so we are also contributing to a new model of community development. We are obliged by our charitable status to promote education and research into the various aspects of this model.

[[[The Service Company are contracted by the landlord to provide and maintain services in the house.]]]

We have incorporated a separate Service Company, which will be responsible for managing the running of the housing development. Anyone who has bought a site is a member of this company, which will be set up so that residents can cooperatively manage the various services they need. XOOP and the Service Company share the same values and principles and the Service Company is currently operating within XOOP's Primary Activity of Building and Maintaining Infrastructure. XOOP will eventually transfer title to the urban land and infrastructure to the Service Company.

[[[BUILDCO are contracted to oversee the building work that's going on in the house. They live in a mouldy old caravan.]]]

XOOP has also licensed BUILDCO as a construction management company, according to the terms of site sales contracts, to coordinate and oversee the building process. BUILDCO shares the same values and principles as XOOP and is therefore very closely aligned with it, even though it is a separate company.

[[[The house has a name written on the front, which is the outward expression of our Identity. This name, and any accompanying logo, can be used by people outside the house too if they subscribe to our values. This is the brand.]]]

A big part of us working together as a collective organization is in how we are represented to those outside of it. Our shared values and principles have to be reflected properly whenever we show our face to the world. People also have to know what they are dealing with when they engage with The Town X Ecovillage and what to expect from it. This is our Brand and if we maintain a good reputation, and a clear sense of what our brand means, then we can also sell the use of that brand to others who we feel are operating by the same standards and principles.

[[[The house sits in a garden (maybe with a little white picket fence round it?). This is the physical boundary of XOOP's legal title and includes all the land. Land Use Group is the gardener and landscape designer.
In a nearby house lives the Community ORGFARM, our close neighbours who are also going to come in and grow some potatoes in our garden because we can't cope with it all. The Town X Development Committee are a little bit further down the road, but are still close neighbours and are welcome to call round (if they take their muddy boots off!). There are numerous other houses dotted around forming a local community.]]]

Outside of the housing development, XOOP also has responsibility for the rest of the land that falls within the boundary defined in the land registry. We have mandated the Land-Use Group to make sure the land is looked after. Some of it is going to be leased to our neighbours, The Town X Community ORGFARM, for a few years while we are too busy building houses to maintain it properly.

There are a number of neighbouring organizations with whom we have similar relationships, some formal and some informal, such as The Town X Development Committee. We also have relationships with 'strategic partners' who may be further away geographically, but with whom we share some common aims.

[[[As well as our own little dens and follys we can also erect outhouses in our garden, which we can rent out to other organizations according to our terms. These can either be in a lean-to, where the organization falls partly under our 'roof' and partly not, or stand-alone sheds, where there is a more arms-length relationship.]]]

In fact we have a range of different kinds of relationships with different people and organizations. Some, like the SERVICE COMPANY, operate as subgroups within our project as a whole, some are completely separate bodies with which we have only arms-length relationship, but many of them fall somewhere in-between. We need to decide the terms with which we engage with people at different levels (whether with suppliers of woodchip, the enterprise centre, the Global Ecovillage Network, The Town X Cineclub or whoever else) and how much of our values and principles we expect them to share.

[[[Our house itself has a ground floor, which has both public spaces/reception and our own functional spaces. This would be where the work of managing the project is done, according to the aims set out by XOOP, and also where visitors can come in for a cuppa and a chat, attend a workshop or to get involved with our activities. There are shared resources here for everyone to use (which Mr. A manages), along with autonomous offices for our various groups to work in.
Upstairs is the more private residential space. There are shared resources here too, but which are for the use of residents only, and each resident also has their own private rooms that they live in, where they are free to do what they like as long as they comply with their contracts. They must work with BUILDCO to build these private spaces.]]]

Because there are several different facets to the project, we have to decide where to draw the boundaries between them too. Between the need for privacy in our homes and our duty to be a centre for education for instance, and also how to divide resources amongst all the different activities we have going on. We will have areas of public access, offices and workshops for both our own purposes or to rent out, resources that are for the shared use of residents only, and of course our own private spaces.

It's best not to look in the cellar.

Hopefully there will also be room for a little humour!

APPENDIX 13

THE VSM HANDBOOK

1. Imagine you are a member of a group of people wanting to join forces and act together to achieve a particular purpose…
   (e.g. have a house for holidays)

2. This very raw elementary idea will naturally be shaped by the choices and limitations of the group (internal variables; *e.g. number of people*) and by the environmental constraints (external variables; *e.g. real estate crisis*) as the project evolves.
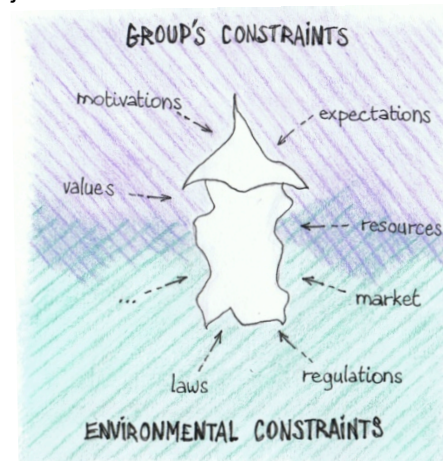
But before the project is officially launched, some of the internal variables should already be considered at this early stage in order to avoid many unnecessary misunderstandings and deceptions in the future.

3. Indeed, it is essential you start by analyzing yourselves as a group *(e.g. what motives, resources, expertise, expectations, values you have, etc)* and by discussing what would be your ideal outcome *(e.g. attached/detached house, modern/traditional architecture, in the city/in the countryside... rooms, materials...).*

Separate the specifications you find essential from those that are flexible.
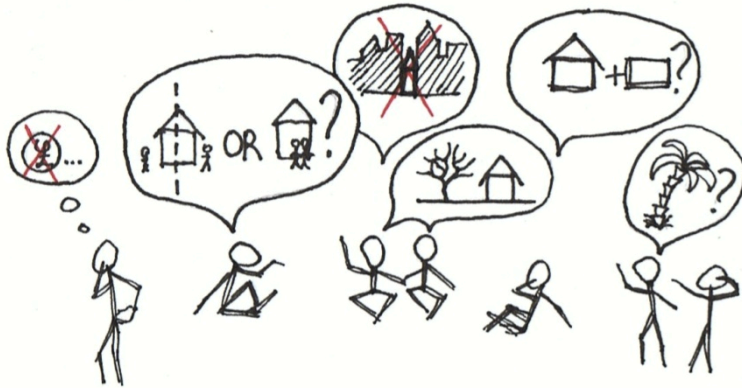
Then, an introductory study of the ground should give you enough insight to identify all the possible ways to achieve your purpose *(e.g. buy a house, build it, have it built)* and make a choice, having weighted how they would affect you *(e.g. cost ranges, time scales, expertise required, etc).*
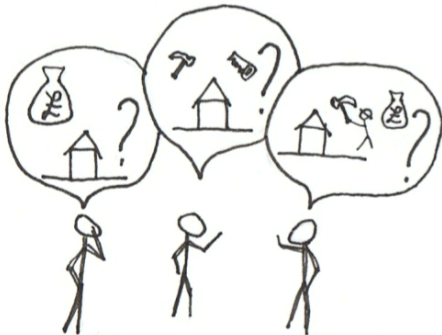
Finally, bearing in mind the values that bind you together *(e.g. equality, democracy, friendship, ecology, ...),* think about how you consider yourselves as an entity *(e.g. group of friends, co-op, NGO, Corp, etc).*

4. In short, at the end of this stage you will have roughly defined as a group your expectations of the project's ideal outcome *(specifications),* why and how you intend to realize it *(plan),* and how you present yourselves according to your values *(identity).* These preliminary consensual decisions are vital to ensure that all the members that choose to commit themselves to the project adhere to a shared mental model. Opportunely, you will have put to the test that you can get along with each other and are able to reach agreement. These first steps should thus lead to a strong group cohesion.

5. It is at this point that you formalize your identity by creating official documents that testify to the core values of your organization *(e.g. a charter, list of internal policies, decision-making principles, etc).*

6. However, remember to allow for the moment some flexibility to your plan and specifications, enabling the project to adapt to new or changing internal/external parameters. Indeed, it is just meant to provide a solid starting point and a main framework for the project, which can then be exposed to the real world.
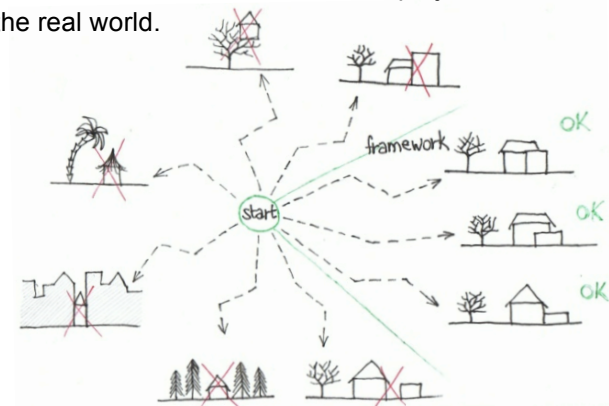
7. Now the big question : in practical terms, how do you organize yourselves to make it all happen ? How do you manage the group to obtain maximum efficiency ?
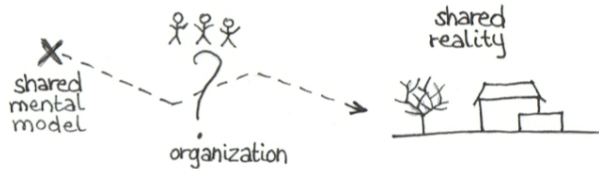
Well, the success of your endeavor from an organizational point of view depends mainly on your ability to :

- divide the whole process into smaller parts manageable by subgroups of members *(i.e. a set of core activities directly related to the execution of your project and evolving throughout + the necessary managing activities; subgroups will thus be focused either on operations or on supporting managing functions)*;
- coordinate your actions by setting up an effective network of communication and interaction among yourselves to process and sort out relevant information at different levels of decision-making *(from the most detailed to the most general, i.e. from the operational to the upper managerial subgroups)*. Of course, effectiveness also implies that you have necessarily agreed in your internal policies on procedures that prevent deadlocks when making decisions.
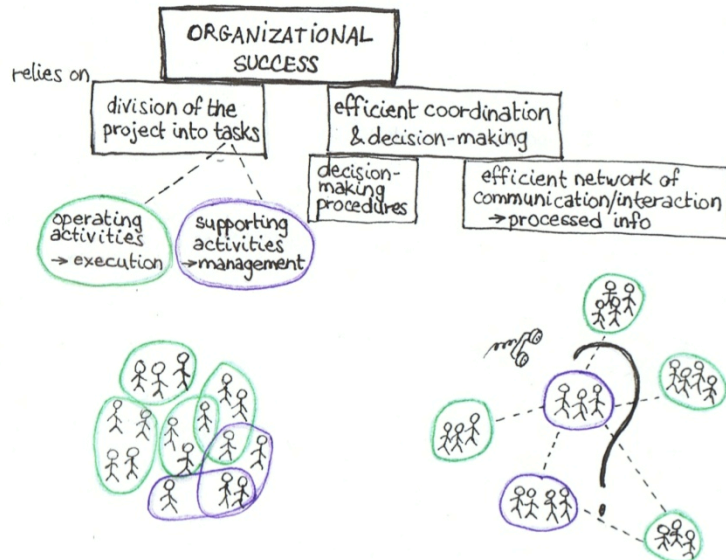
8. The Viable System Model (VSM) is used here below precisely to explain how an efficient coordinating network interconnects the subgroups of members *(i.e. how they interact with one another, what they communicate and to whom)* to ensure the viability of the whole system *(organized group of people)*. As we shall see, this model identifies 5 sorts of subsystems present in every viable system on the basis of the essential role they assume *(i.e. operations + 4 supporting roles : local regulation, general coordination, forecasting, and leading)*. Subgroups of members are thus classified accordingly.

ANSWERS IN THE FOLLOWING PAGES...
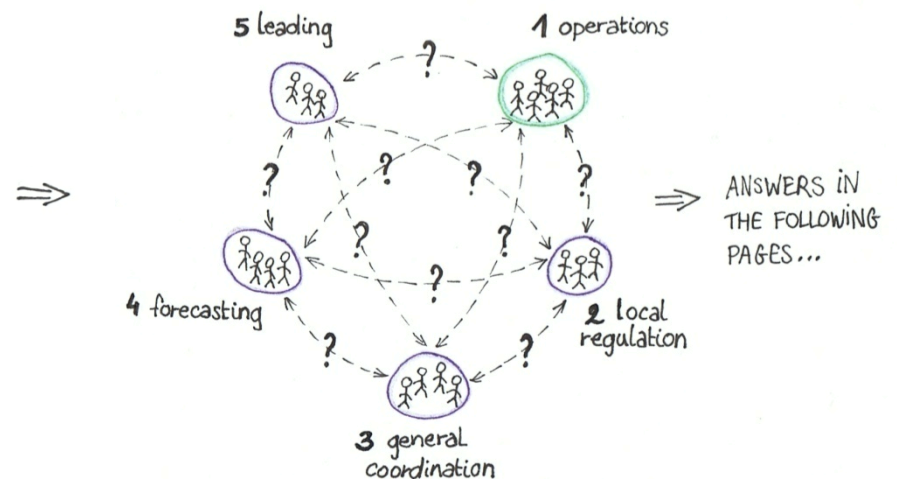
9. So first of all, how to identify the core operational activities that need to be done? Let's take a closer look at your main framework and represent it graphically using a timeline. Try to perceive how the projected realization of your endeavor can be formed of different phases articulated by milestones *(e.g. finding the best place, planning & designing, building the house).*
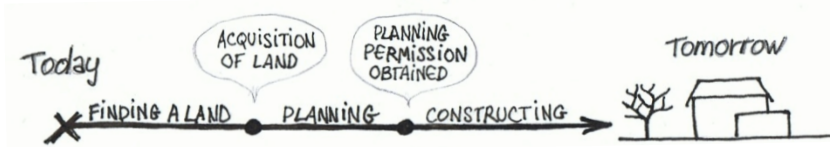
Each of these phases is challenged by related environmental constraints. Throughout the timeline you will also have to handle your own constraints *(e.g. managing your resources, sorting out legal issues, etc).*

10. In order to reach the milestones enabling you to move on to the next phase, some core tasks to fulfill will start to emerge in the graph at given periods of time *(e.g. make the financial planning, choose and visit various plots of land, study the town-planning regulations, deal with material providers, design and draw the architectural plans, etc).* We shall call them the Primary Activities, or simply PAs.
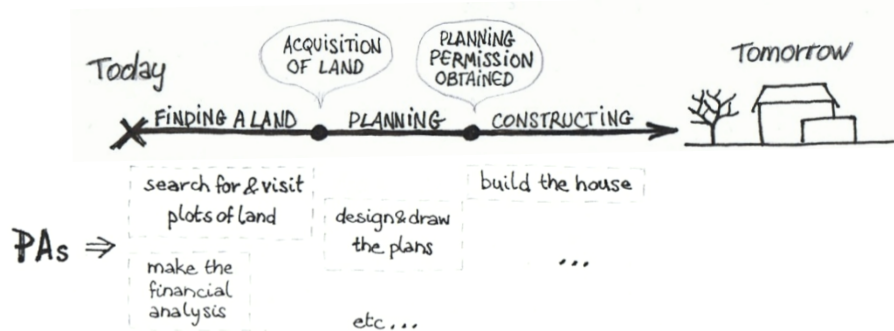
11. Proceed until you obtain a sequence of PAs that makes sense from start to finish but remember that every single PA and the exact chronology won't be established once and for all; it depends again on the (constantly changing) environment and the choices you will make all along.

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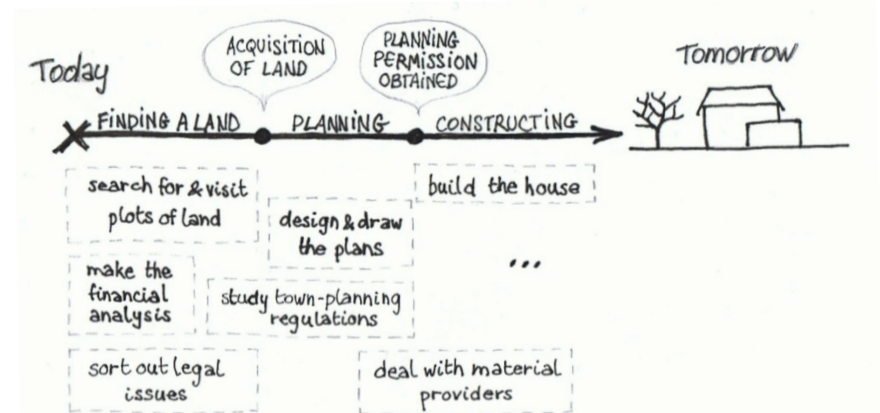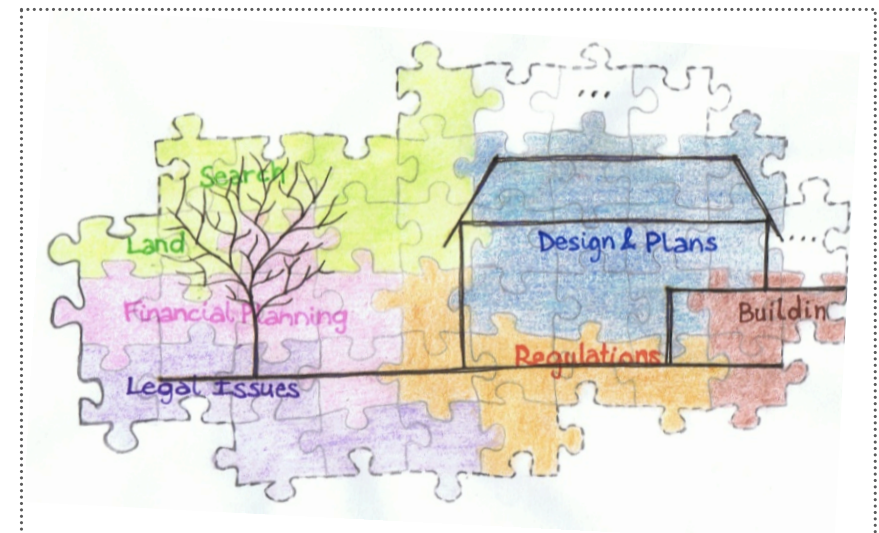
12. However, you should carefully identify with certainty the PAs crucial during the launching phase of the project *(e.g. obviously look for suitable plots of land, but also raise funds for the whole project and decide on the distribution of the money as well as deal with legal issues related to the ownership of a land as a group)* since they will define the initial state of your organization.
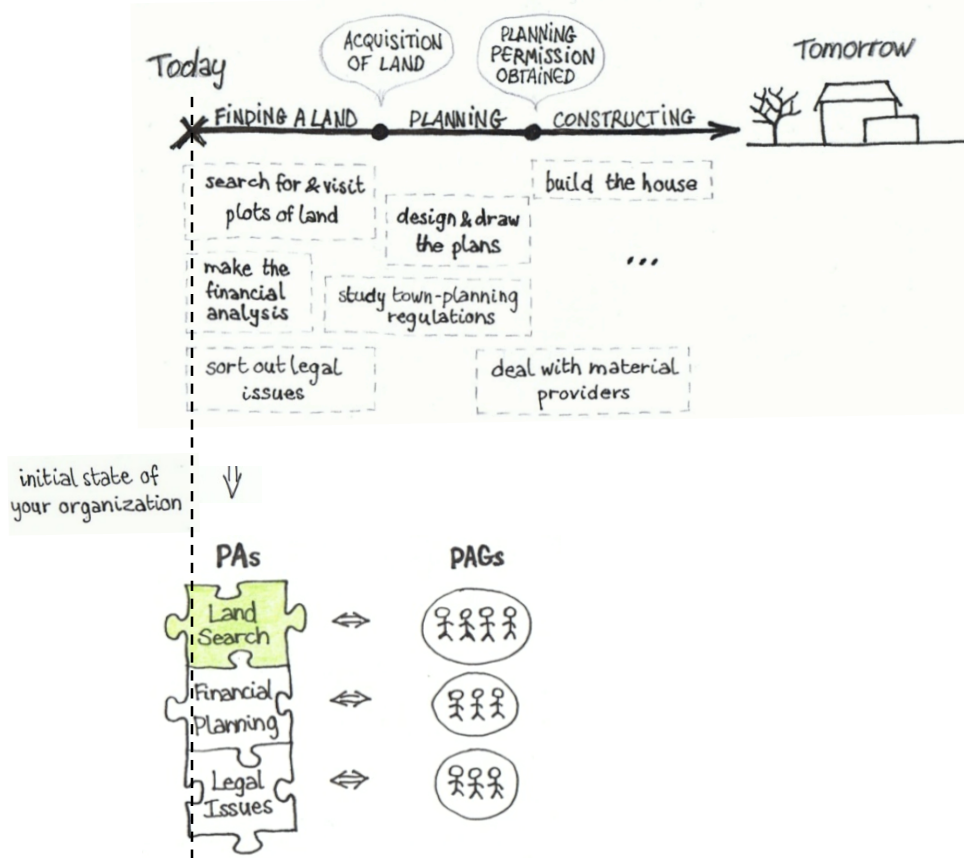
13. So now you can move on to structure yourselves according to these first activities and set up your coordinating network. Logically, start by entrusting subgroups of members respectively with the operations of each of the launching PAs identified; for each of these, the members should have the appropriate expertise and skills. A subgroup in charge of a PA shall be referred to as a Primary Activity Group or PAG.

14. The PAGs will naturally break down further the operations required to fulfill the purpose of their activity in sub-tasks and processes manageable by the individuals inside the group *(e.g. "Land Search" PA can be broken down into search on the internet, search in estates magazines and specialized agencies, availability and conditions check, information processing into comparative tables, etc).*
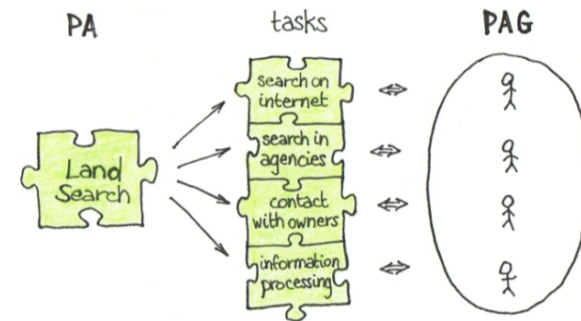
15. Each PAG has to find a way to manage itself and coordinate the accomplishment of the sub-tasks *(e.g. nominate a member to assign the tasks, design an informational board that enables the tasks to be done on a voluntary/self-assigned basis, etc).*
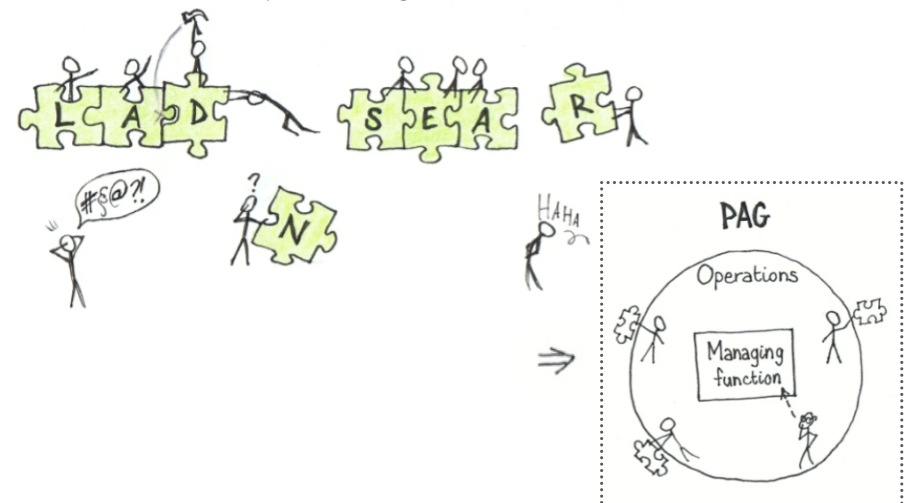
16. Much more than merely the assignment of tasks, the managing function of each PAG involves sharing information and resources among its members, monitoring what is being done and how it is done, as well as balancing complementarities by helping each other to tackle problems and carry out tasks. Part of the communication also includes providing continuous feedback from team members or at least making the progress of the PA's operations transparent enough to enable self-assessment.

tasks distribution/coordination
resources distribution
information sharing/helping each other
monitoring actions & compliance with internal policies
OK? assessment/feedback

communication/interactions
inside the PAG
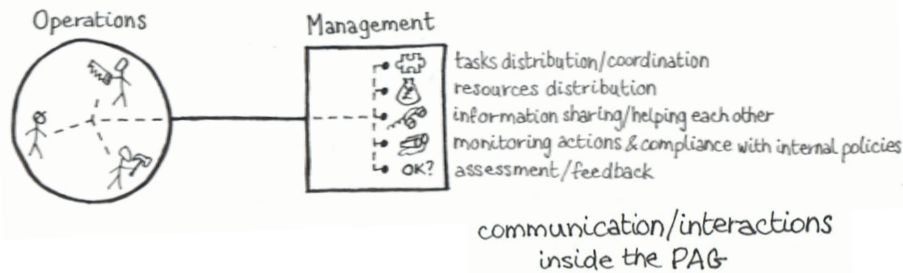
17. Thus, through the monitoring, feedbacks and actions taken subsequently, each PAG's management generates spontaneously a regulation mechanism *(i.e. a repetitive process that constantly adjusts the members' activities according to one another until all the tasks to achieve the purpose of the PAG are fulfilled).*
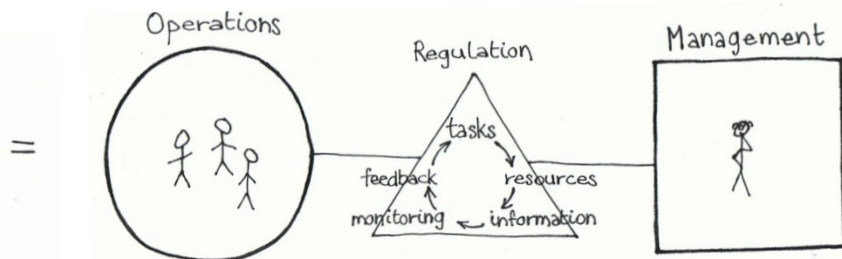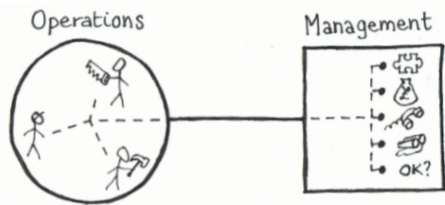
18. The relations among the members inside a PAG – including its self-managing function – and the relations with the actors of the PA's direct environment form the first level of interaction/communication inside the whole network. At this level, the purpose is to solve local specific issues in order for the groups to carry out the operations of execution of the project. Each individual PAG with its PA's environment forms what is called a System 1 (or simply S1) in the VSM.
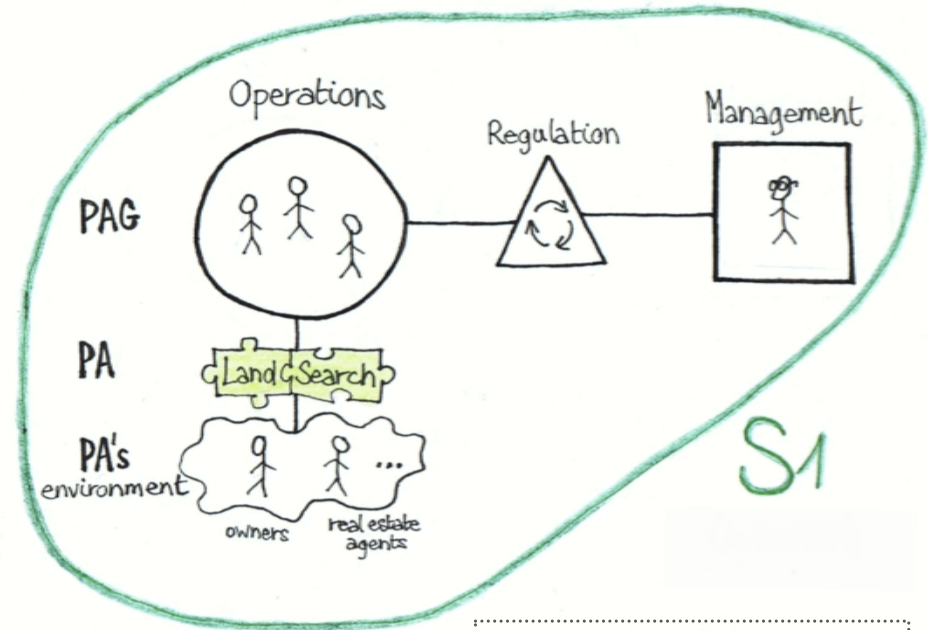
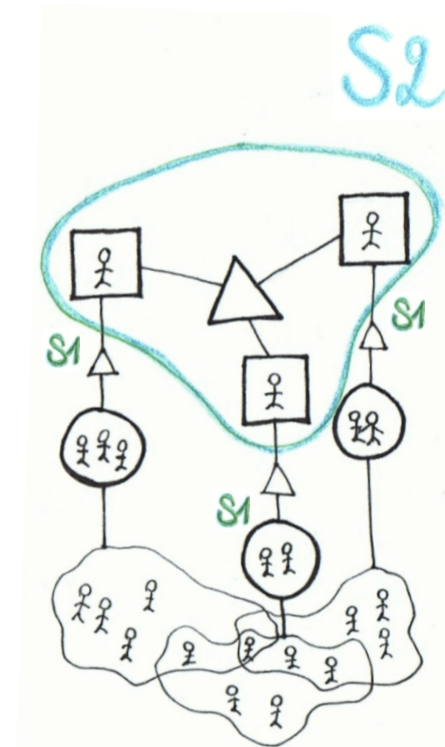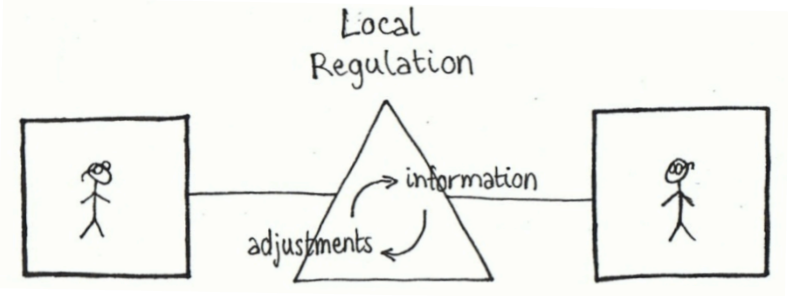main role
in the VSM:

OPERATIONS

⇒
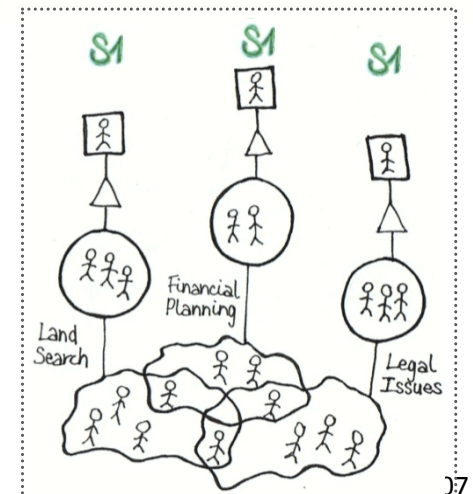
19. Although the individual PAGs enjoy a certain level of autonomy in their operations, they are nonetheless interdependent because some of their activities are intertwined *(e.g. "Land Search" PAG depends upon "Financial Planning" PAG to calculate what can be dedicated for the acquisition; in turn, "Financial Planning" has to collect actual data from "Land Search" to come up with a realistic suggestion)*.

20. In order to avoid confusion or solve conflicts, the PAGs' coordinators/managers communicate with each other and have regular meetings all together, where they share information, complement each other's activities and schedule the operations for their PA according to one another *(e.g. while waiting for actual data from "Land Search", "Financial Planning" can count up all the funds raised)*.
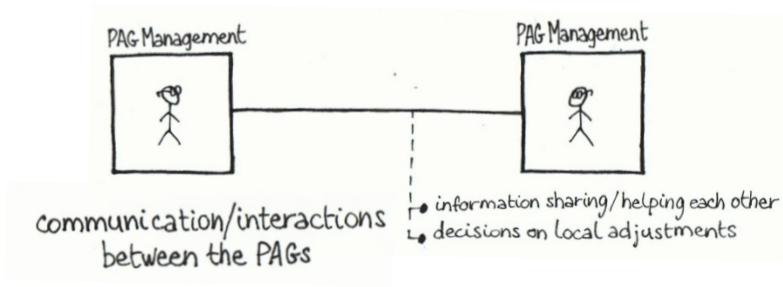

21. At this level of interaction we are in the System 2 (S2), which is meant to enable the PAGs to make local adjustments between them, thereby regulating their functionality according to one another. In other words, S2 provides local coordination and regulation for the S1s, in charge of the operations.

22. However, there still needs to be an independent level of coordination and management for all the PAGs as a whole ; one with a distanced overview in order to create a real synergy and optimize the PAGs' functionality.
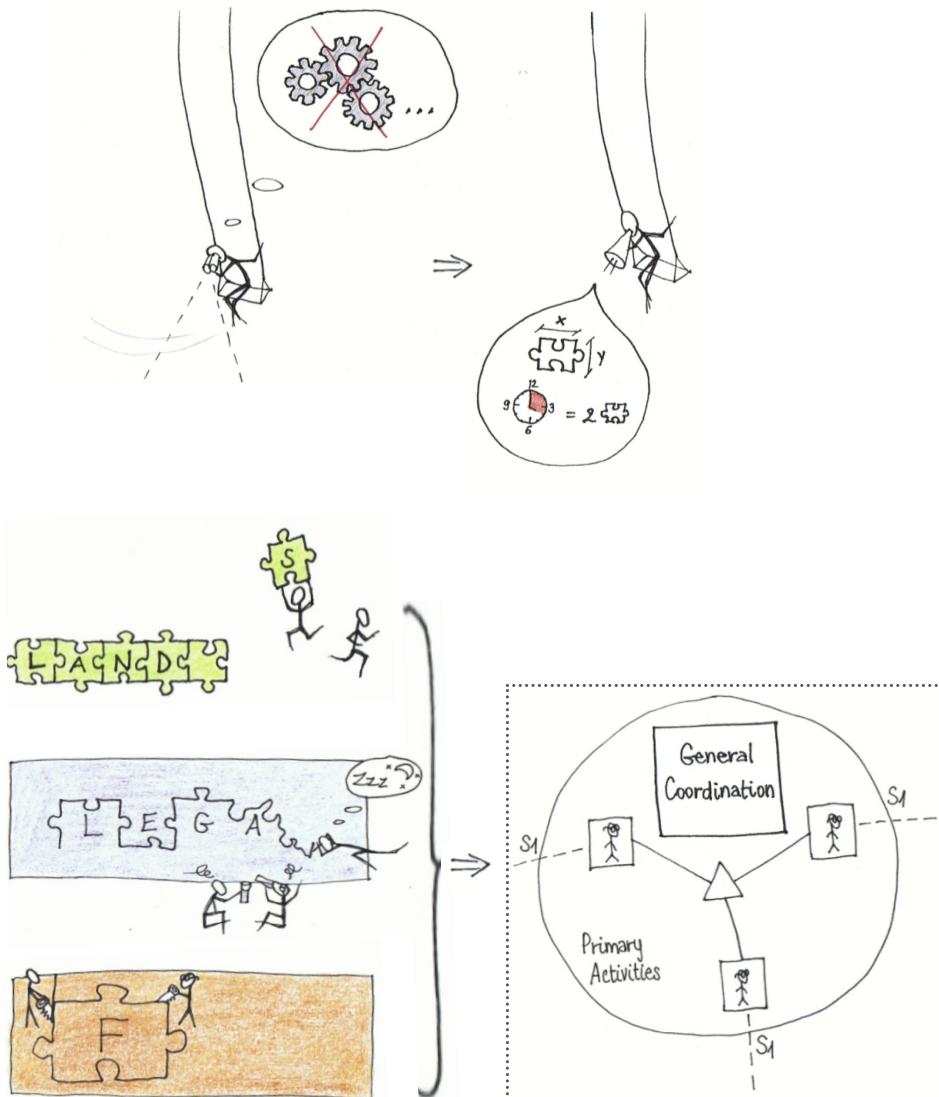
23. This role of general coordination is assumed by the System 3 (S3), which is thus responsible for giving the impulse to the operations movement. The group of members in S3 not only have a direct relationship with each PAG (more broadly S1) through its manager, but they also supervise the regulation process that is done between the PAGs in S2 *(e.g. by reading the report or even assisting to the managers meetings)*, which creates in a sense a secondary link with the operational groups.
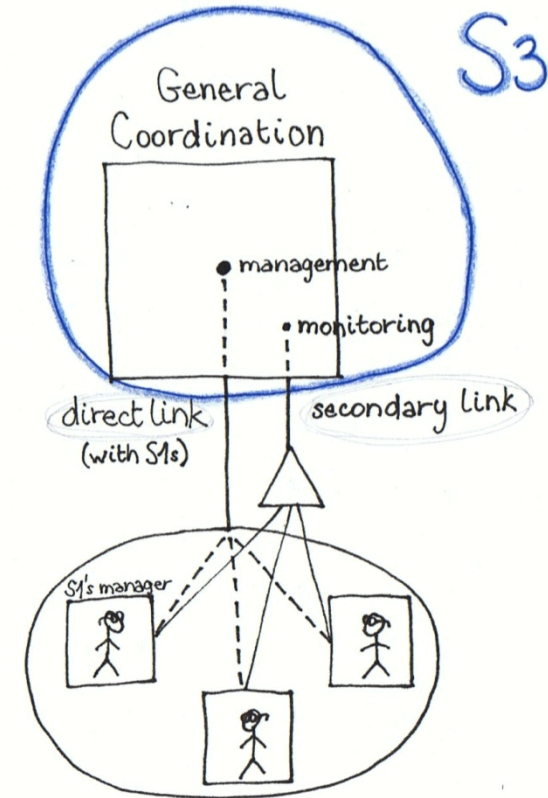
Most of the time, the communication channel between S2 and S3 conveys the decisions taken in S2 about the adjustments made *(rules and actions to be followed and their outcome)*.

24. As for the direct link, together with each PAG's manager, S3 sets targets for his team according to your plan *(e.g. in 3 weeks, "Land Search" must have shortlisted 10 places to visit and "Financial Planning" outlined the entire money distribution of the project)* and negotiates the allocation of resources *(e.g. how much "Legal Issues" needs to pay the services of a notary)*. S3 then monitors by collecting information about the tasks' progress and checking that the PAGs are operating within the organization's internal policies (in accordance with the group's identity). Having assessed each PAG's performance, S3 provides feedback and discusses new targets, repeating the whole process all over again until the purpose of the PA is fulfilled.
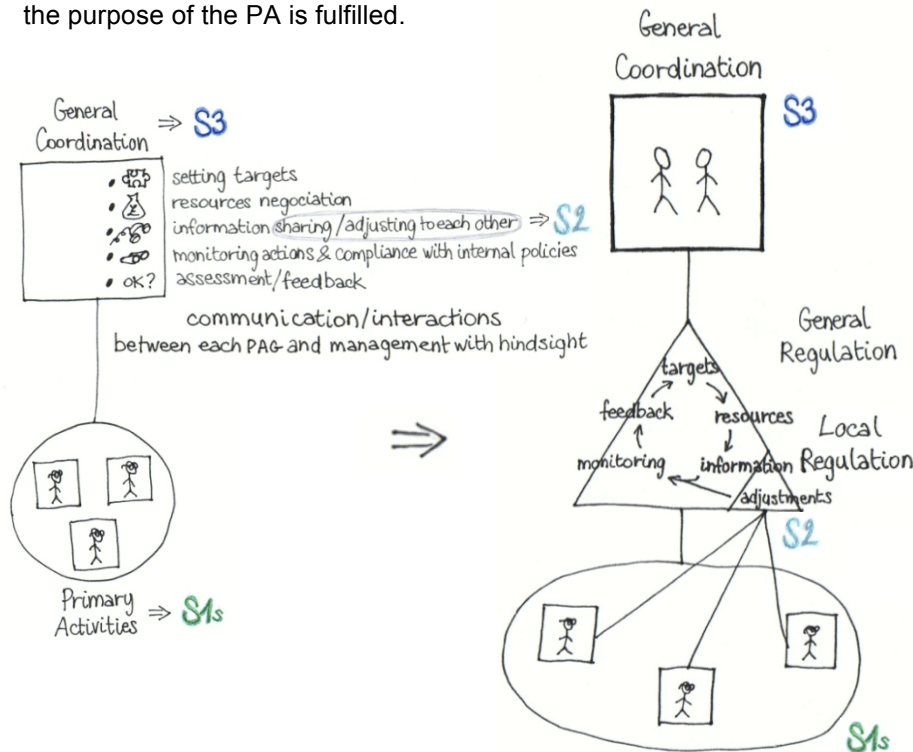
At the end, all this is similar to the management function described in the PAGs, except that instead of managing individuals we are now managing groups. This difference makes the management task more complex, which explains why some regulation and coordination is already done at an intermediary level, in S2.

25. To verify that everything is working as expected, S3 may use complementary means of monitoring, that it so say, an additional way of getting information *(e.g. an occasional audit to ask for more detailed information about specific issues inside each PA when needed)*.
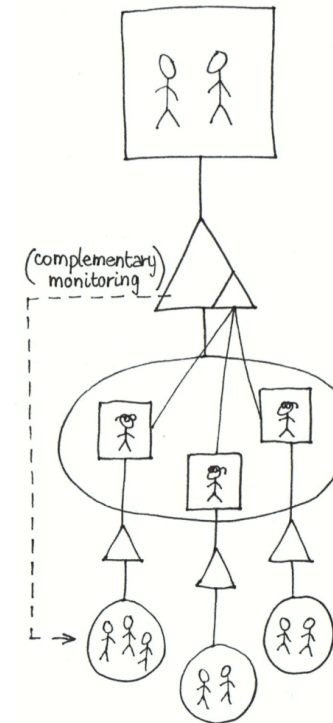
26. The purpose of the network of interaction between S3 and the S1s is to make general adjustments between the PAGs – whereas in S2 it was local – to generate the movement of all of them in a set direction *(your plan)*, and gather the relevant information in order to get the big picture of the whole project's realization progress. S3 keeps control of the day-to-day operations.

main role
in the VSM:

310

S3

27. In short, up to this point, we have established that each part of the project's execution (more precisely, a Primary Activity or PA) is attended by a Primary Activity Group (PAG) who finds its own way of managing its members. We have also said that, in the Viable System Model (VSM), each PAG forms with its PA's related environment a subsystem called S1. The PAGs interact with each other through their managers, which creates the S2; thanks to this system of interaction, the groups can adjust to one another. However, all the PAGs are coordinated on a general level by S3 and, from this distanced position, S3 can have a good overview of all the operations' progress.
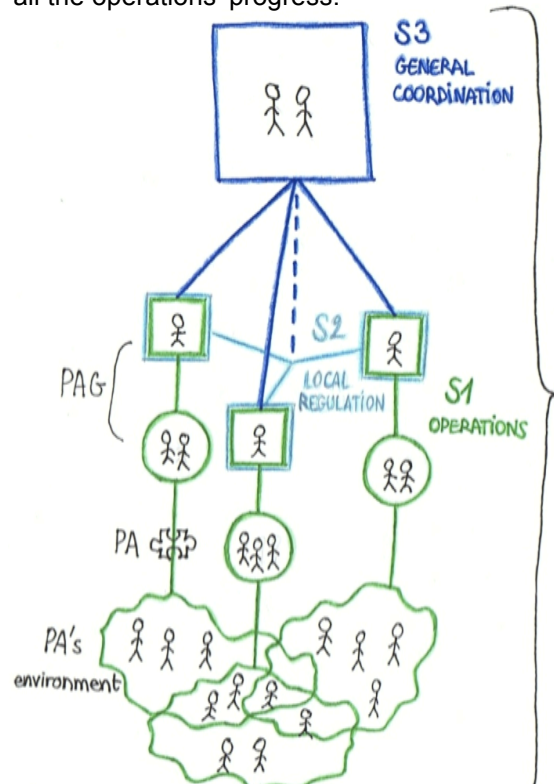

3 subsystems

COORDINATED
= ACTIVITIES

28. All the activities are thus coordinated and the project is being executed, but is it enough to guarantee the viability of your organization?
No… So far, we have only described 3 of the 5 essential roles present in every viable organization *(in the shortcut terms used previously : "operations" assumed by S1, "local regulation" by S2 and "general coordination" by S3)*. So now you know how to organize yourselves to do it… But how can you know what you should do to adapt your plan and specifications in a changing environment ? And how do you decide on what to do (as a democratic group of friends) ?
The description of the next 2 subsystems *(whose roles are in short "forecasting" and "leading")* should answer these questions.

viable system ? NO ⇒

= 2 other subsystems
- how to know what to do ?
- decisions on what to do ?   =

S3
GENERAL
COORDINATION
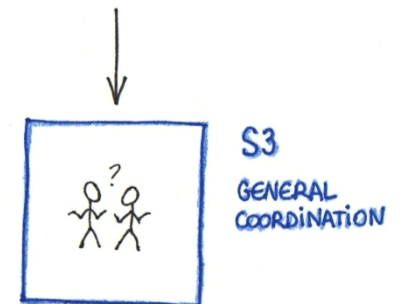
29. As we have seen, S3 focuses on the day-to-day operations, on what is happening within the execution of your project at the moment *("here and now")*. Since adaptability is a prerequisite for viability, we also need a team that allows for anticipation by analyzing parameters that could affect the group from a wider environment or in the future *("there and then")* ; these parameters are thus not necessarily directly related to the on-going tasks carried out in the S1s. Basically, the new team – called System 4 (S4) – is looking out for possible threats or opportunities with a mid/long term vision *(e.g. economical crisis, forecast of unsuitable season timing for the construction phase, interesting investment offers for the funds to be used in later activities, etc)*.
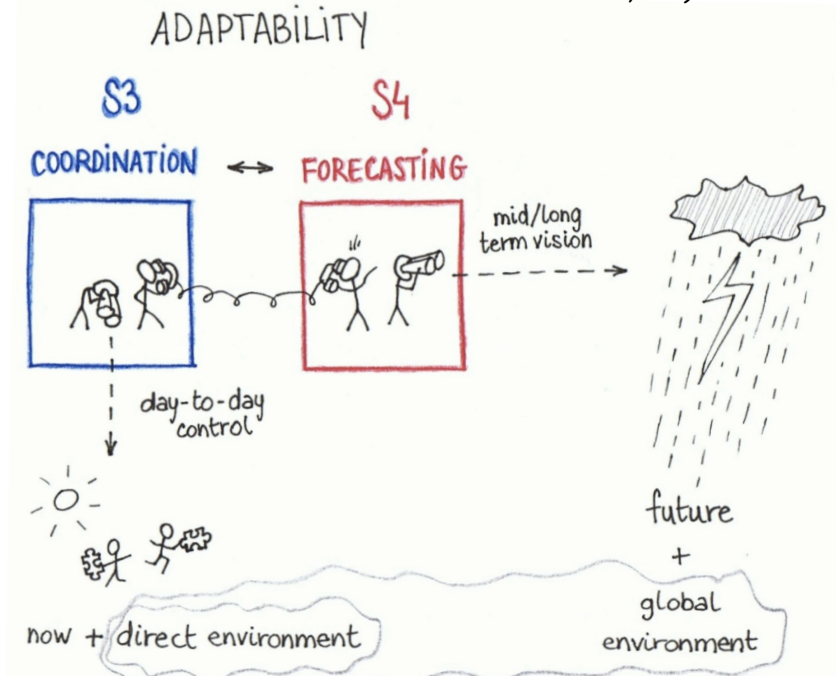
30. The interaction between S3 and S4 and their exchange of information is at the source of strategic planning as it enables your organization to anticipate, face change and adapt. Indeed, visualizing together and contrasting information of "here and now" with "there and then" facilitates the identification of key-issues to discuss and, consequently, different scenarios can be envisaged depending on the possible choices that the group could make.


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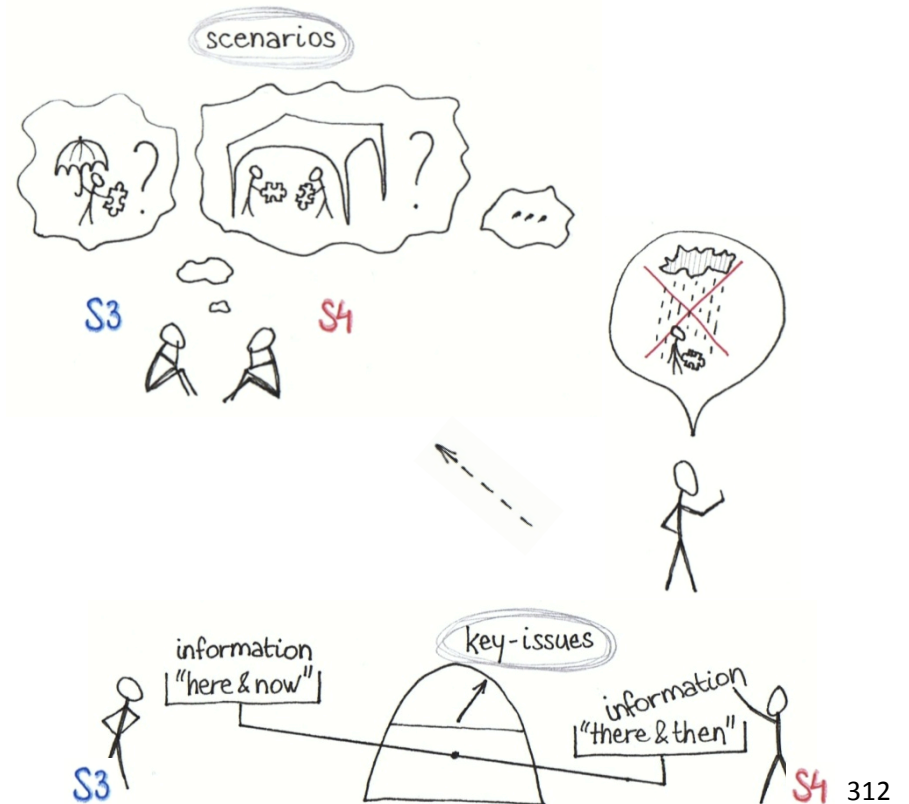
31. On the basis of the information and indications coming from S3 *(the big picture of the operations)* and its interaction with S4 *(the identified strategic issues)*, you will all have to agree on what to do and make the main decisions all together, as a unified coherent voice, to lead the whole group towards your common goals. The way you take into account the opinions of all the members and consequently make the decisive choices for the project and your organization is identified in the VSM as System 5 (S5). Usually this is done via a board, a group of members chosen to represent all the members of the organization and who make the decisions on their behalf.
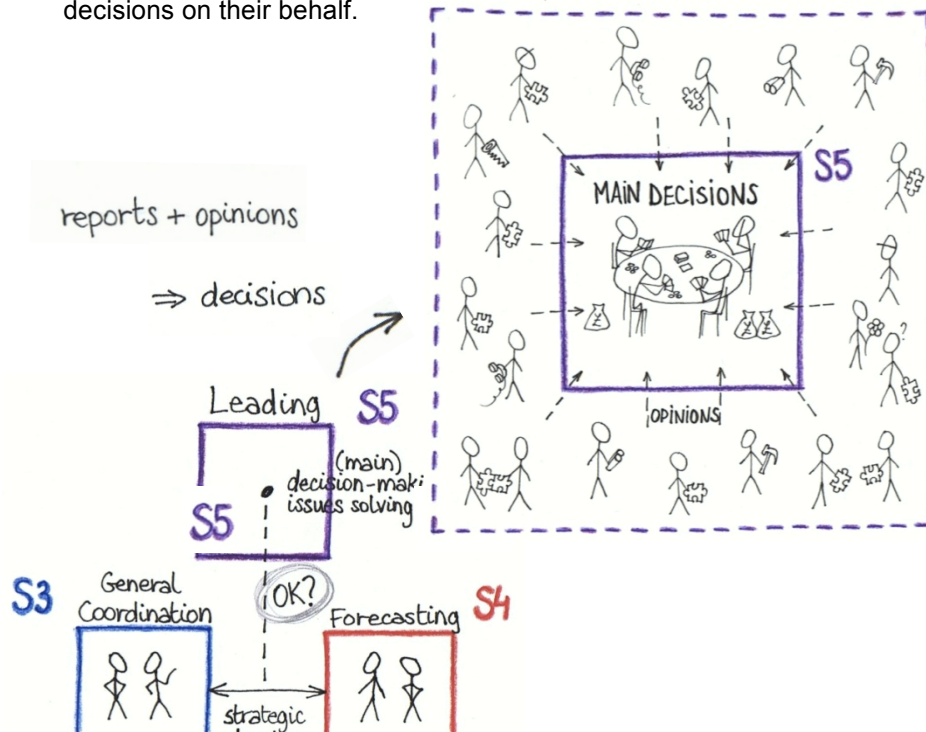
32. As a representative of all of you, the group of members in S5 is the guardian of the identity you have defined all together at the beginning of your enterprise *(by agreeing on your values, creating a charter, deciding on internal policies, etc)*. As such, not only S5 has to be faithful to this identity when taking decisions but it is also responsible for ensuring the actions and decisions made in subsystems S3 and S4 respect the values and internal policies of the organization as well; S3 will in turn further verify this is also done within S2 and in all the S1s, as explained previously.

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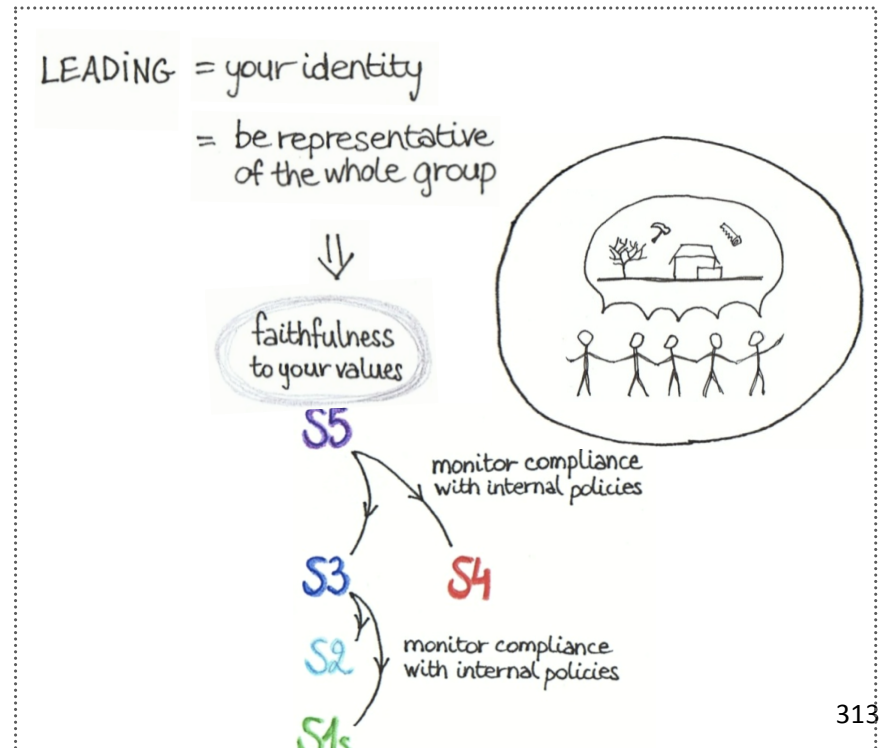
33. Since we are at the most general level of decision-making, the network should have filtered only information and issues that are of the entire organization's concern. Indeed, everything that involves all the members *(e.g. their expectations, their money, etc)* requires all the members' consent, which is done through the board. It is thus S5's duty, as the ultimate authority, to deal with and sort out each of these issues to regulate the functionality of the whole organization.
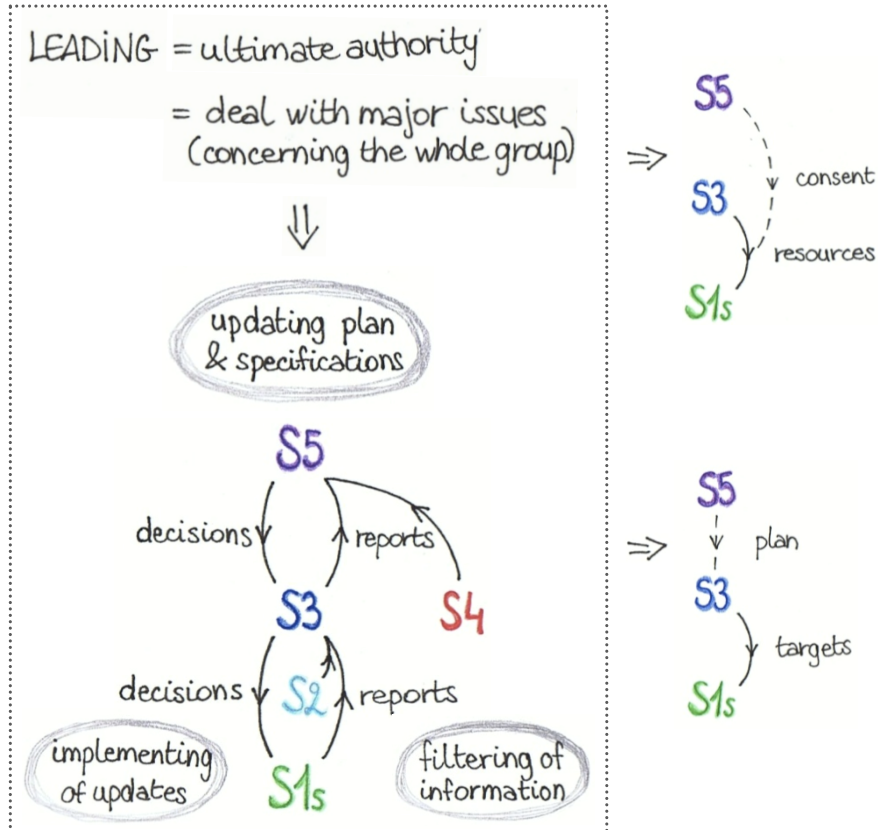
34. Therefore, it's in S5 that your plan and specifications will be discussed and redefined in more depth all along the project, enabling you to adapt them to new or changing variables, whether internal *(e.g. some members have less time to devote to the project)* or external *(e.g. you found out wood is much more cost-effective than bricks)*.

35. For these reasons, every major progress in the S1s is reported to S5 by S3 and the related decisions made in S5 *(i.e. comments, modifications, approval, rejection)* are subsequently communicated back to the S1s by S3 *(e.g. S3 will have to regularly submit the intermediate drafts of the "Financial Planning" PAG to the opinion of S5, the choice of land among the suggestions of "Land Search" PAG is also made in S5, etc)*.
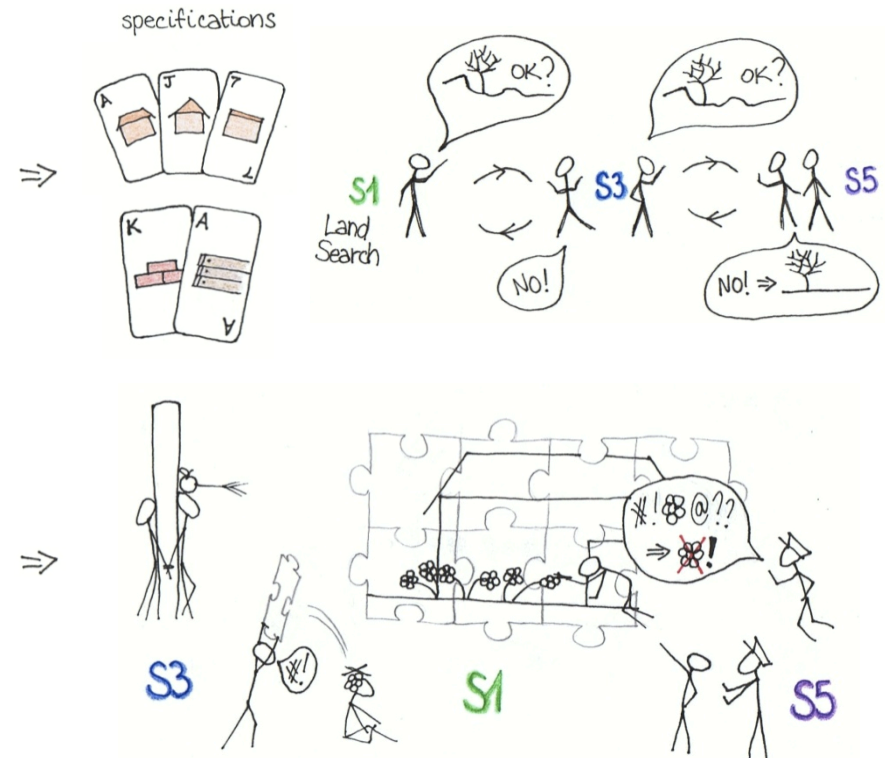
36. Thus, as the ultimate authority, S5 has to intervene directly in any issue or conflict in any other subsystem (S1, S2, S3 and S4) whenever it becomes a concern for the whole group, and when important signals indicate something must be done immediately, this system should initiate the necessary corrective actions *(e.g. once a PA is no longer needed – like "Land Search" after the acquisition of land – S5 would instigate the reorganization of the members according to the new actual PAs).*

The whole Viable System Model

LEADING
- represents the whole organization (all of you)
- regulates its functioning by:
  – taking all the main decisions (plan, specifications, issues)
  – ensuring respect to your values

GENERAL COORDINATION
- manages the PAGs (S1s) in order to apply the plan
- supervises S1
- having the big picture of "inside the project" discusses the plan with S4

OPERATIONS
- are in charge of the execution of the project by taking care of the essential activities (PAs) at a given moment in the realization

S4 FORECASTING
- analyses threats and opportunities "outside the project" (future and wider environment)
- plans for anticipation and adaptation (strategic planning) with S3

LOCAL REGULATION
- enables the S1s to share information and adjust to each other when their tasks are related

supporting systems (S2→S5)

operating systems (S1s)

internal variables (group) → project in progress ↑ external variables (environment)

You may observe that all these roles and functions essential to the viability of the whole group *(i.e. coordination, resources allocation, monitoring, feedback, forecasting, decision-making, …)* are also necessary at the micro-level of the PAGs! Each S1 (PAG with its environment) constitutes thus a mini viable system on its own, where each member carrying out tasks and in contact with environment actors is like a mini S1 while the manager assumes the condensed supportive role of S2, S3, S4 and S5.

37. This is the complete picture showing how the group is organized into a viable system. Here we can see how the operating (S1s) and the supporting (S2 to S5) subsystems are interconnected as well as the role and functions they assume.

At the end, you are simply a group of people trying to do something together…

... and to achieve your mutual purpose, each of you will assume a specific role with specific functions, and by acting cooperatively and thoughtfully, you will naturally create your own viable organizational structure.

END !