Systems that Learn, Evolve and Foster Shared Activities: Shared Work Environments as Ecologies

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Abstract

This paper explores the nature of Shared Work Environments arguing their systemic nature by re-defining them as ecologies (Dix 2002a, 2002b). Shared Work Environments can be appropriately developed within organisations to develop shared dynamics, relationships, and activities between organisational members.

Significant ecological notions that relate to shared workspaces are:

o   <u>Teaching</u> – each entity of an ecology teaches those who operate within that ecology;
o   <u>Relationships</u> - ecologies evolve and increase in size and complexity as new relationships are formed;
o   <u>Responsiveness</u> – as the nature and composition of an ecology change entities need to act and respond differently to ensure they still have a role within that ecology;
o   <u>Surprise</u> - when part of an ecology individual entities often prosper for reasons that could not be foreseen;
o   <u>Dependence</u> – an ecology's 'form will be dependant on all the entities within the ecology and the environment in which that ecology is embedded' (Burrows, Coburn and Loi 2002; O'Reilly 2000).

This paper reflects on and emphasises the relationships between workspace and work practices - relationships that appear to be significant in shaping workspace ecologies and are fundamental for sustaining those ecologies.

The role of users within these ecologies and a consequent shift in design responsibilities is highlighted and it is proposed that appropriate design methodologies are required in order to develop and sustain these ecologies.

The paper examines two interrelated aspects of Shared Work Environments as ecologies: in the first part of the paper a definition of ecology is articulated and the issue of Shared Work Environments as ecologies is discussed; in the second part a series of consequences that originate from such a redefinition are discussed, with emphasis on the role and responsibilities of designers.

The paper proposes that Shared Work Environments are complex ecological systems where each 'actor' or organisational member represents a necessary condition for the system to be sustained. The notion of ecology offers a new way of conceptualising work and shared workspaces.

Keywords   Systemic thinking, ecological thinking, work environment, work dynamics, learning organizations, evolutionary mechanisms, design, multi-disciplinary territories.

Introduction

In this paper I discuss the nature of Shared Work Environments and argue their systemic nature by re-defining them as ecologies (Dix 2002a, 2002b). For the purposes of this paper, the term ecology refers to an entity composed of interdependent elements and their environment.

Shared Work Environments are complex ecological systems where *actors* are necessary conditions for the system to be sustained and construct its identity on a daily basis.

It is argued that users' practices and actors' dynamics represent strong features of Shared Work Environments and that within such systems actors should not adapt themselves to a pre-designed space, but rather develop and manage their own.

Generated and created by actors' practices and dynamics, Shared Work Environments help shaping social systems that will be the basis for physical and organisational settings.

The proposed notion of Shared Work Environments offers a unique opportunity to reflect on how to shape organisations so they can enable shared and supportive work practices. Such practices are solid organisational foundations as they enable systemic growth and development within the complexity of contemporary work dynamics.

Background

In 1999-2000 I had the opportunity to be part of a six months experience as research assistant and supervisor of an urban telecentre[1]. Following an analysis of this case study (Morelli and Loi 2001; 2002), some observations arose around the notion of Shared Work Environments:

o Shared Work Environments are product-service systems, therefore a systemic approach should be considered in their design, implementation and management;
o Users of such environments play an essential role in the development of such spaces; their unpredictability needs to be acknowledged; a design that reflects such unpredictability and users' needs is necessary;
o The relationships between various actors (users, technological artefacts, software and interfaces, physical space) play an important role in during the life of such spaces (Loi 2001);
o These spaces require constant upgrades, re-designs, re-assessments and modifications, and have to be designed considering such characteristics to allow their maintenance over time.

Following these findings, my proposal is that Shared Work Environments should be considered, designed and managed as if they were ecologies as they behave as ecologies[2].

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[1] The project was funded by the Australian Research Council under the SPIRT (Strategic Partnership with Industry, Research and Training) scheme and it was a cooperative research between University (RMIT University and Melbourne IT) and private institutions (Virtual Moreland and COASIT).

[2] An interesting event that made me reflect on this notion was my January 2002 visit to some Reggio Emilia schools (Reggio Children 1996; Reggio Children & Project Zero 2001). Reggio Emilia schools are learning environments, based on constructivist methodologies, where experiences and ways of teaching, learning, playing and sharing common spaces are interrelated to the point that they become one thing – like ecologies. Reggio Emilia's characteristics of interconnectedness of learning and work practices, of bond between practices and space and of respect of the importance of users within such systems consolidated and encouraged some thoughts that were incubating since my telecentre experience.

Shared Work Environments and Their Systemic Nature

A Shared Work Environment is a complex system composed of actors and their relationships where parts are linked to the whole and the complexity of the system represents its strength. In addition, a Shared Work Environment is part of a larger system. In this investigation the larger system is represented by an *organisation*.

Systems are complex *creatures* made of a series of elements (or actors). In this paper I will focus on the following actors which I see as major components of an organization:

o People (or users);

o Physical space (such as room, walls, building, urban area..);

o Objects (for instance: technology, furniture, little tools, decorations, etc);

o Relationships (between all components);

o Values and opinions (of an individual, a team, a company, a social group, etc).

I argue that a Shared Work Environment should be included in this list of actors (**Error! Reference source not found.**) and suggest that:

o People and relationships are necessary conditions for the existence of a Shared Work Environment – they generate Shared Work Environments;

o Objects and physical space are influenced by and influence people and their relationships (and therefore Shared Work Environments);

o Values (and opinions) are held by people and manifest in their actions therefore influencing Shared Work Environments.
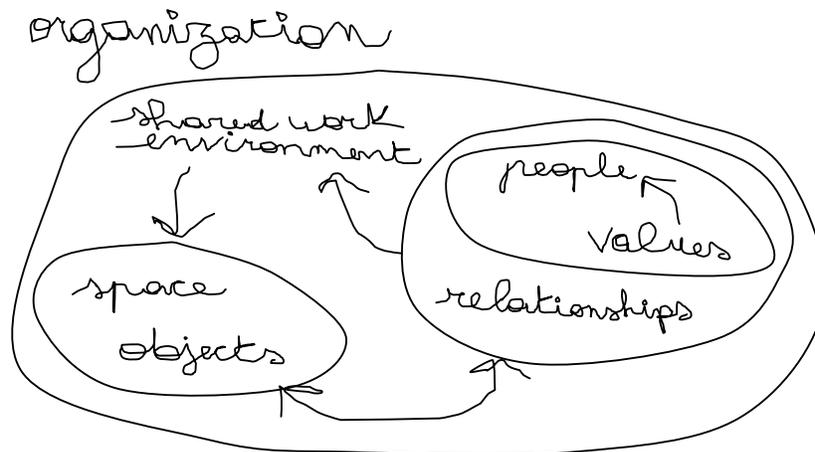

Figure 1 – Organisation: System/Relationships

Ecology: a Definition

> *ecol-o-gy \ i-'käl-ə-jê\ n. pl. -gies [G ökologie, fr. Ök-ec- + -logie -logy] (1858) 1. A branch of science concerned with the interrelationship of organisms and their environments. 2. The totality or pattern of relations between organisms and their environment. 3. HUMAN ECOLOGY. (Source: Webster's New Collegiate Dictionary)*

The term ecology is used in several domains and disciplines, such as science, information technology, management, philosophy and design.

For instance, Eric Trist (Emery and Trist 1972; Trist 1976; 1979; 1983) and several social scientists developed the organizational ecology concept "investigating the possibility of developing new patterns of interorganizational relations that can help shape the future in a proactive way" (Morgan 1986, pp. 70-71).

As these relations are a natural response to the environment's complexity and turbulence, Trist argues that "they should be encouraged to help make the environment more manageable" (Morgan 1986, p. 71). As individualistic actions can make the social world unmanageable, evolution and survival of the ecology of organizational relations are Trist's main concerns.

Nardi and O'Day (1999, p. 49) have defined information ecologies as "a system of people, practices, values, and technologies in a particular local environment. In information ecologies, the spotlight is not on technology, but on human activities that are served by technology".

Fritz Steele (1986, p. 8) discussed that:

> a human organization is an ecological system whose health is determined by its balance of a number of factors: users' preferences and needs, users' activity patterns, the required action patterns of the organization (including major technology), the physical features of the organisation's settings, the environments in which these settings are located, and the management decision processes that control the stability and rate of change of the settings.

The author (Steele 1986, p. ix) defines organizational ecology as "the pattern of reciprocal relationships and influences among organizational members and their workplaces". Borrowing his terminology from animal ecology studies, Steele's intent is to understand the relationships between organisations and the settings in which they operate 'so better choices can be made about how to structure, use, and change these settings to satisfy both organizational and individual needs' (Steele 1986, p. ix).

In this context I borrow the notion of ecology from a variety of sources and domains and I define it as an *entity composed of interdependent elements and their environment*.

Important aspects of ecologies that relate to shared workspaces discussed by some authors (Burrows, Coburn and Loi 2002; Dix 2002a; 2002b; Emery and Trist 1972; Kelly 1994; Nardi and O'Day 1999; O'Reilly 2000; Steele 1986; Trist 1976; Walck 1996) include:

o Teaching (each entity of an ecology teaches those who operate within that ecology);

o Relationships (ecologies evolve and increase in size and complexity as new relationships are formed);

o Responsiveness (as the nature and composition of an ecology change entities need to act and respond differently to ensure they still have a role within that ecology);

o Surprise (when part of an ecology individual entities often prosper for reasons that could not be foreseen);

o Dependence (an ecology's "form will be dependant on all the entities within the ecology and the environment in which that ecology is embedded" (O'Reilly 2000; Burrows 2002).

In the next sections I discuss the implications of an ecological view of Shared Work Environments and offer a case study to contextualise the discussed notions.

Shared Work Environments as Ecologies

Stating that a Shared Work Environment behaves like an ecology, does not provide any specific tangible description of what a Shared Work Environment should look like and be designed. The statement offers however a series of *points of departure* to create a methodological framework for Shared Work Environments to emerge.

The main aim of this paper is to discuss and develop understandings and possibilities for the designing of Shared Work Environments where the *organising metaphor* is that of an ecology. Furthermore, I suggest that the physical space should mirror and be consequent to such understandings.

Gareth Morgan (1986, p. 73) discusses the limitation of the use of the metaphor of organizations like organisms stating that "we are led to view organizations and their environments in a way that is far too concrete" – view that breaks down because organizations can be understood as "socially constructed phenomena" and have therefore "a more fragile and tentative" shape and structure if compared with the "material structure of an organism" (Morgan 1986, p. 73).

A consequence of this critique is the acknowledgement that organizations depend on the "creative actions of human beings" and that "it is misleading to suggest that organizations need to adapt to their environment" and that "environments select the organizations that are to survive" (Morgan 1986p. 73, italics mine).

These points are consistent with the discourse around Shared Work Environments. The ecology-metaphor has value if regarded as a *flavour and opportunity*. A Shared Work Environment is a space created by relationships, by people – *it is socially constructed* (Bijker 1997; Bijker, Huges and Pinch 1989).

I suggest that the physical space should mirror such social construction and that each Shared Work Environment is different from another due to this characteristic. Consequently, the Shared Work Environment I discuss in this paper represents an *ideal socially constructed type* I intend to explore and promote.

Some Characteristics of Shared Work Environments as Ecologies

I now discuss major characteristics of Shared Work Environments that behave like ecologies. These are: evolution, co-evolution, responsiveness, dependence, surprise, flexibility, playfulness and beauty.

Evolution

An important aspect of ecologies is their evolutionary dynamism. Actors and their practices evolve; relationships evolve. An ecology experiences continual evolution (Nardi and O'Day 1999) - it is a fluid entity that should be acknowledged, observed, and fostered.

Fritz Steele (1986) mentions that, in the case of workplace management, continuous processes should be in place "with regular attention given to data collection, diagnosis, action, and assessment as a cyclical process". Due to its ecology-like behaviour, a Shared Work Environment should be considered in terms of continuous processes and modification.

A Shared Work Environment is a *fluid entity* as it *evolves constantly*. This implies that flexible mechanisms should be in place to encourage and cultivate such fluidity.

Co-Evolution

When a new actor enters an ecology, relationships are reformed and the ecology morphs/adapts itself to accommodate the new patterns and "as the nature and composition of the ecology changes, many entities will have to act and respond differently to ensure they still have a role" (Burrows, Coburn and Loi 2002). As Nardi and O'Day (1999) mention, different parts of an ecology "*co-evolve*, changing together according to the relationships in the system".

The same occurs in Shared Work Environments where actors, linked by relationships, co-evolve and re-assess as patterns change. The individuality of each actor is granted within a system where *the space between such actors* is the centre of consistent evolution.

As evolution occurs, actors, due to their relationships, adapt to new patterns *together*, co-evolving. In this way individuality is enriched at the same time as the space between individuals.

Responsiveness

Like in an ecology, both a Shared Work Environment and its actors are required to respond to change, acting like organisms – *they are required to be responsive*. Failing to be responsive may imply loosing a place in an ecological system and losing opportunities for growth and enrichment.

This characteristic is significant as it put emphasis on actors as *active organisms*. Actors are required to respond, be active, create, be open to change and contribute.

Dependence

An ecology's form is "dependant on all the entities within the ecology and the environment in which that ecology is embedded" (O'Reilly 2000; Burrows, Coburn & Loi 2002). Each entity

is dependant on the rest of the system; influences other entities and the entire system. Similarly, in a Shared Work Environment entities cannot function in isolation.

As Jonathal Benthall (1972) points out "where human artefacts are concerned, we are dealing with entities that are not self-sufficient but depend on continuous refreshment from *their* environment, including ourselves".

This characteristic emphasises not only the requirement for actors to be active, but also that this *being active* is both an internal and external process where one is active towards oneself, the system (Shared Work Environment) and other actors (**Error! Reference source not found.**).
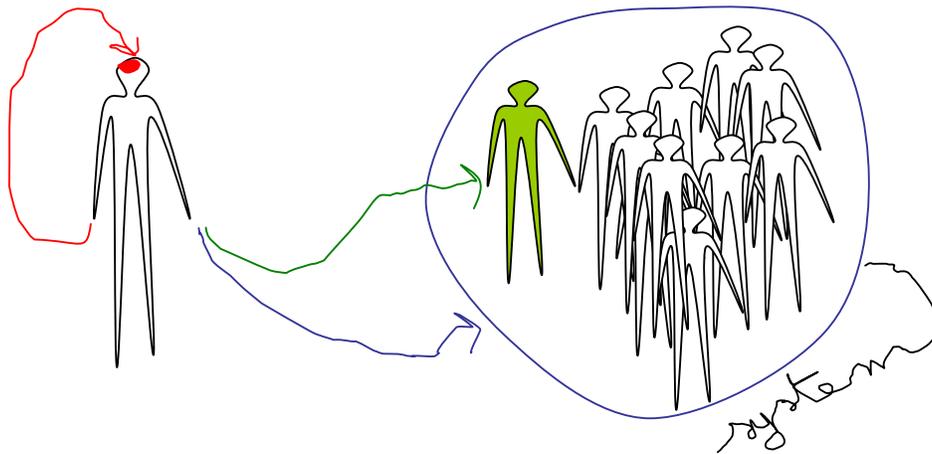

Figure 2 - Active toward... oneself, others, and the entire system.

Surprise

When part of an ecology, actors often prosper *for reasons that could not be foreseen.* Unpredictability is at the base of an ecology and of a Shared Work Environment.

Such characteristic is a positive one as it represents a *possibility for growth.* Actors should embrace surprise and be empowered by it.

A Shared Work Environment *should have mechanisms that trigger surprise.* Surprises make actors respond and act.

Flexibility

A Shared Work Environment should "lend itself to manipulation and transformation" by its occupants and "be open to different ways of use[3]" (Ceppi and Zini 1998). Only a flexible mentality and environment can accommodate growth, evolution and dynamism.

As Bateson (1978) suggests a healthy ecology is "a single system of *environment combined with high human civilization* in which the flexibility of the civilization shall match that of the

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[3] This quote refers to the class environment, although I suggest it is equally applicable in this context.

environment to create an ongoing complex system, open-ended for slow change of even basic (hard-programmed) characteristics".

Playfulness

A Shared Work Environment, to be and grow *must enable playfulness*. Play is "a function of the imagination" (Alexander, Ishikawa and Silverstein 1977) and it should be not simply enabled, but fostered. Play is central to learning patterns, allows surprise and unpredictability to emerge, it is a creative act which carries co-evolution.

In a Shared Work Environment people should feel free to contribute with their individual self. The physical space which houses a Shared Work Environment should become the place for creative activity and display – people should be encouraged to bring *stuff*, their own creations and artefacts, to create a sense of shared identity and play with it.

A Shared Work Environment should be like a playground. *A playground that enables ownership*[4].

In a Shared Work Environment actors are free to play and bring their own identity to create ways of playing. Objects become triggers for play to take place and for relationships to be created and sustained.

Beauty

A Shared Work Environment should be a beautiful place to be in and be part of. Like a home it should reflect its *inhabitants*, their feelings, ideas, and dreams.

The finding of beauty is up to the inhabitants of a Shared Work Environment – they are responsible for finding and creating beauty, whatever beauty may mean to them.

A sense of beauty which is built and maintained by actors *enriches the identity* of a Shared Work Environment. Actors need to understand how their own and the shared sense of beauty can be sustained, fostered, modified, and created. They are in charge of their Shared Work Environment's beauty.

Some Questions

Like ecologies, Shared Work Environments dynamically grow via evolutionary mechanisms - they are *fluid entities* constantly morphing, growing, and changing.

The design of these spaces represents a challenge – workspaces rules often prove to be inappropriate as each team, person, system, and organization has its own dynamic, character, values, and ways of doing. Like an ecology, a Shared Work Environment cannot be managed or designed in the traditional sense.

If this is the case, who should design such spaces? How should they be designed? Is it even possible to design them?

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[4] As Alexander, Ishikawa & Silverstein (1977) argue when describing children's playgrounds: "Not a highly finished playground, with asphalt and swings, but a place with raw materials of all kinds – nets, boxes, barrels, trees, ropes, simple tools, frames, grass, and water – where children can create and re-create playgrounds of their own".

In the following section I discuss these issues and provide some methodological frameworks.

The Need for New Methodologies and Roles

Stating that a Shared Work Environment cannot be managed or designed in the traditional sense implies that "is not feasible to think in terms of building them. However it is possible to facilitate a diverse range of user practices in order to watch for and eventually capitalise on patterns and trends" (Burrows, Coburn and Loi 2002, p. 194).

Users' practices and actors' dynamics are strong features of ecologies – "entities that thrive in an ecology become part of that ecology because they have a capacity to contribute to the well-being and livelihood of other entities and vice versa" (Burrows, Coburn and Loi 2002, p. 189).

In the same way users' practices and actors' dynamics are strong features of Shared Work Environments. I consequently suggest that actors should have a key role on the development and maintenance of these spaces.

Frits Steele (1986) reports an interesting example of a space designed with such a mindset: the Dutch insurance company Central Beheer that hired Dutch architect Herman Hertzberger "to create an environment that would truly feel like *home* to the users and thus be likely to increase the employees' sense of identification with and loyalty to the company" (Steele 1986, pp. 86-87, italics mine).

Hertzberger employed the notion of the building as *the beginning of the design and creation process, not the end of it* and as Steele (1986, pp. 86-87) reports:

> It was made to encourage and require the touches of its users in order to be functional, and both the designer and the company encouraged users to make it their own by personalizing both individual and common areas.

> Plants, graphics, banners, personal furniture and the like were all considered to be a natural part of bringing the building to life as a real place – not just something to be tolerated if a few people wanted to be stubborn, as is often the attitude of top management when they commission a new building

In *A Pattern Language* (Alexander, Ishikawa and Silverstein 1977, p. 963) it is argued that "the fundamental philosophy behind the use of pattern languages is that buildings should be uniquely adapted to individual needs and sites; and that the plans of buildings should be rather loose and fluid, in order to accommodate these subtleties".

The same notion should be applied to Shared Work Environments: actors should not adapt themselves to a pre-designed Shared Work Environment, but rather develop and manage their own. Steele (1986, p. xii) highlights this clearly when he states that "management processes should enhance the sense of self-worth of members, not degrade it. People should be able to influence or control some elements of their immediate work surroundings, so they do not feel powerless and so they can get information back about the effectiveness of their choices over time".

The author (Steele 1986, p. 22) discusses the importance of flexible enabling acts and the relationships between the act of enabling and organizations' long-term strategies:

I have come across a few organisations whose leaders have attempted to develop and operate an overall facilities design/management process that helps people at different levels to influence their own settings.

Their approach is to do this in the context of (or be 'nested in') a longer-term strategy that defines several factors: facilities management goals, basic assumptions about the basic organisation's appropriate physical shape and relationships with its environment, types of decisions that are possible and appropriate for different levels of the organisation, and how the quality of fit between settings and user groups that can be monitored on a regular basis.

A Shared Work Environment should be responsive, transformable, personalisable, soft, open to receiving imprints, enabling "different ways of inhabitance and use during the course of the day and with the passing of time" (Ceppi and Zini 1998, p. 17).

The inhabitants of a Shared Work Environment *construct its identity on a daily basis* – if something has to be designed and managed, it will have to accommodate this characteristic.

At the same time the Shared Work Environment that such inhabitants created will influence their ways of being and relating to each other. A loop is created between people and the Shared Work Environment they co-inhabit (see Figure 1).
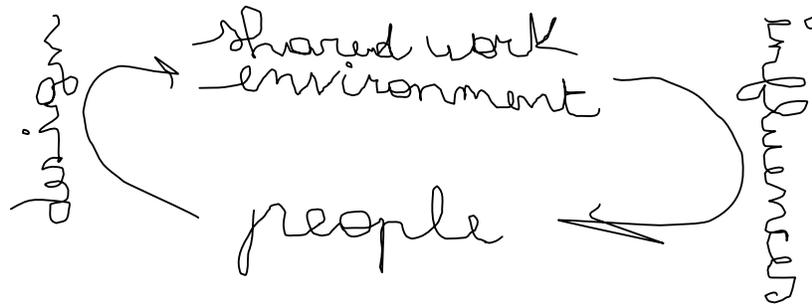

Figure 1 - People-Shared Work Environment Loop

People's practices contribute to the design of a Shared Work Environment. Somehow people design that place. The design of that Shared Work Environment follows its users and uses. At the same time users and uses are influenced by that Shared Work Environment that will evolve and morph consequently (see Figure 2).
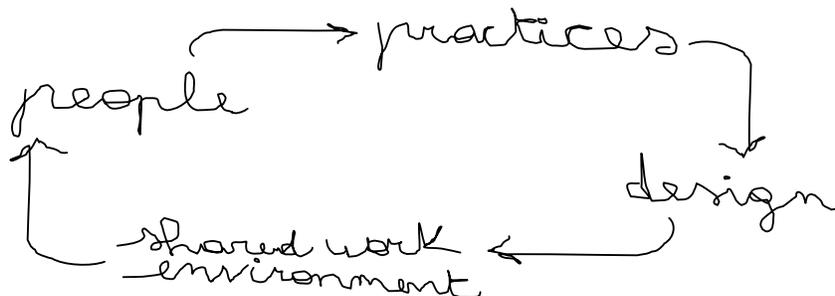

Figure 2 - The people-design loop

If Shared Work Environments behave like ecologies, a design methodology capable of addressing the complexity of such systems - in particular the role of users within the system - should be identified.

It is proposed that to a design Shared Work Environment one should:

o Acknowledge its complexity and the fact that space should follow practices, understandings and observation;

o Observe the space - its dynamics and characteristics;

o Understand users' practices and acknowledge their impact on the ecology in which they are embedded;

o Encourage and enable users' practices, trying to develop an understanding of how the Shared Work Environment's characteristics we discussed could manifest themselves within a specific context;

o Involve users in the design process – both on an organizational and spatial level;

o Iterate all previous points as a Shared Work Environment evolves in time.

One methodology what would suit this proposal is Participatory Design[5] (Ehn 1992; Emery 1993; Henderson Chatfield, Kuhn and Michael 1998; Sanders 2000; Sanoff 1990; Schuler and Namioka 1993).

Participatory design allows users to contribute to the design process, by recognising the importance of people's practices, and by enabling and empowering them.

The use of these methodologies opens up however an issue: understanding users, being able to *ask the right questions*, listening to their answers and interpreting responses are not easy tasks. Questionnaires and similar tools are often unsuitable if we want to *illuminate* everyday practices and users' feelings and views about space and use of that space.

If the role of designers within the described context is to utilise participatory practices, then the question of how to properly understand users' practices on one side and of how to maintain a sense of continuity via iterative processes must be asked and discussed more widely and deeply.

Conclusions and Some More Questions

Shared work activities between organisational members are increasingly required within a climate where such activities are often jeopardised by economical, political, ethical and social crisis. Shared work activities concentrate in and around Shared Work Environments that need to be carefully enabled, designed and managed.

As discussed, Shared Work Environments dynamically grow via evolutionary mechanisms. They are fluid entities constantly morphing, growing, and changing and they cannot be managed or designed in the traditional sense. I suggest that users should have a key role in

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[5] Other important resources about Participatory Design can be found in the Participatory Design Conferences Proceedings, organized by CPSR (Computer Professionals for Social Responsibility – http://www.cpsr.org).

the shaping of these spaces, although the issue of how to approach this notion methodologically requires deep and further investigation.

Opportunities for a substantial shift in the notion of design and management could be considered and discussed. Such opportunities see design and management blurring to create new figures that, within organisations, can act as enablers for users' practices to emerge and for Shared Work Environments to be sustained and co-developed.

Further reflections on the disciplinary territories within organisations could provide useful insights to understand how to enable users' practices and design appropriate spaces to house such practices.

Shared Work Environments are complex ecologies where each actor represents a necessary condition for the system to be sustained. The notion of ecology offers a new way of conceptualising work and shared workspaces and opens up the issue of the methodological approach to undertake.

This paper proposes Participatory Design as an interesting option to address users' practices and requirements within a Shared Work Environment. Such options unlock questions on how to create an appropriate dialogue with users, how to decode and use such dialogue, and how to iterate it.

These issues unchain several questions about the role of design and management in the context, including:

o Should a designer be a present/constant figure within organisations to ignite and maintain a Shared Work Environment?

o Where does the role of a designer end and that of a manager start?

o Are the role of design and that of management so different within the discussed context?

o Where does the role of a designer end and that of a users start?

It is proposed that opportunities for a substantial shift in the notion of design and management should be considered and discussed. Such opportunities see design and management *blurring to create new figures* that, within organisations, can act as *enablers for users' practices to emerge* and for Shared Work Environments to be sustained and co-developed.

A reflection on the *disciplinary territories* within organisations could provide useful insights to understand how to enable users' practices and design appropriate spaces to house such practices.

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