Why space matters for collaborative innovation networks. On designing enabling spaces for collaborative knowledge creation

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2014

Why space matters for collaborative innovation networks

On designing Enabling Spaces for collaborative knowledge creation

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Version: 4.2 | September 10, 2015

Abstract. As opposed to managing or controlling innovation processes, this paper proposes the notion of *enabling* as a more suitable approach to innovation. As a consequence, the concept of Enabling Spaces is introduced as a space that is designed in such a way that it enables and facilitates processes of collaborative knowledge creation and innovation. In that context a rather broad notion of space is applied: It goes far beyond architectural/physical space by integrating social, cognitive, emotional, organizational, and epistemological dimensions in an interdisciplinary manner. Both the theoretical background and the methodological approach and design process will be presented. Furthermore, we will discuss a case for an Enabling Space which functions as a collaborative innovation network. It will turn out that Enabling Spaces and Collaborative Innovation Networks (COINs) share a lot of characteristics, attitudes, and values.

Keywords: cognition, collaboration, design, Enabling Space, extended cognition, innovation, knowledge creation, space.

1 Introduction

How do "new insights" and innovations come about? What are the conditions and contexts that enable these processes of knowledge creation? What is the role of the social system and the epistemological conditions for these processes? What are the enabling factors for successful processes of knowledge creation on an epistemological, social, technological, as well as cognitive and emotional level?

Although knowledge creation and innovation are at the heart of any knowledge driven organization, economy, or even society, there are only a few approaches taking seriously the holistic nature of innovation processes; i.e., the fact that innovation is not only about a small hand-picked group of persons in an organization, about an isolated and abstract process of innovation taking place in a remote R&D-lab, or about a rule-based innovation process IT-tool, etc. We are proposing that innovation is about attitudes, skills, and an epistemological perspective on products, services, or business models, which have to be adopted by most members of an organization or even society. More generally, innovation is about creating a multidimensional space in order to provide an environment that enables processes of knowledge creation and innovation—they are referred to as *Enabling Spaces*.

Collaborative Innovation Networks (COINs) (Gloor, 2006; Gloor et al., 2004) are good examples for such environments for collaborative knowledge creation. According to Gloor (2006) one can find the following characteristic features in COINs: they allow for innovation in a highly collaborative setting. Furthermore, this collaboration is embedded in a social environment that is characterized by direct-contact networks which are based on high ethical standards. Both the communication and the knowledge work of these networks of collaboration for innovation are supported by sophisticated information and communication technology (ICT). Gloor (2006, p55) stresses the fact that these technologies, and more specifically, the tools provided by the internet, have brought about an unmatched level of transparency into collaboration processes—and, as one consequence, true meritocracy.

In this paper we will develop the concept of *Enabling Spaces* and show how it is related to the COINs approach, as COINS realize and illustrate very well many aspects of the more general approach of Enabling Spaces. One of the main objectives is to develop both a *conceptual* and *theoretical* framework for the questions stated above—not primarily for giving final answers, but for providing a basic understanding and framework, design principles, as well as a suggestion for a design process, of how one could come up with a theoretically informed and practically functioning innovation environment in the sense of Krippendorff's "ecology of artifacts" (Krippendorff, 2006; Krippendorff, Butter, 2007, p5). It will be shown that Enabling Spaces provide an interesting conceptual perspective on COINs and that share a lot of common characteristics, attitudes, and values.

This paper is organized as follows: In the first part this paper has a strong *theoretical* focus. Section 2 develops the notion of *enabling* as opposed to classical approaches in management and leadership which are based on the regime of control and "mechanistic production" (of new knowledge). It will be shown that, in the context of innovation, and more specifically, collaborative knowledge creation, this managerial mechanistic approach fails and has to be replaced by the regime of enabling. The concept of enabling and its relationship to innovation will be developed in detail. Furthermore, we will focus on the epistemological consequences of the "enabling approach". The focus of this paper is on the front-end of innovation, namely on the processes of *knowledge creation* although the authors are aware of the fact that for newly created knowledge to be an innovation it necessary to be successful in the market and in the domain of exploitation of this knowledge (Schumpeter, 1934; Corso et al., 2009; Gupta et al., 2006; March, 1991).

The second part of this paper develops the concept of *Enabling Spaces* and their relationship to COINS as an implication of the theoretical considerations of part one. Enabling Spaces (Section 3) are multidimensional spaces facilitating and supporting knowledge- and innovation work by providing a "container" in the form of a well balanced set of constraints and interventions enabling (and not forcing) these processes. In Section 4 the design process for such Enabling Spaces and a concrete case study will be presented. Finally, the implications and the relationship between COINs and Enabling Spaces will be discussed (Section 5).

Terminological remarks

This paper stresses the epistemological, cognitive, as well as social processes and structures as being essential for most innovation processes. That is why we give a short terminological introduction to these terms:

- *Epistemology*: is a subfield of philosophy which is concerned with the study of *knowledge* in general and with knowledge as "justified true belief" in particular (Churchland, 1981; Steup, 2012). It focuses on the questions of what is knowledge, what are necessary and sufficient conditions of knowledge, what is its source, how does knowledge come about, how is it created and how is it disseminated. In our approaches we will go far beyond these classical notions of knowledge taking a more dynamic, process and constructivist oriented perspective (Varela et al., 1991; Maturana, Varela, 1980; Glasersfeld, 1984, 1995; Nishida, 1999).
- *Cognition and cognitive processes*: In general cognition is considered to be a mental process that transforms perceptual input into motor behavior by making use of knowledge/representations. Cognitive processes comprise perception, reasoning and planning, decision-making, memory, embodied processes, motor behavior as well as

cultural and social processes. Cognitive Science is the interdisciplinary field in science studying cognitive processes (Bechtel, Graham, 1998; Bechtel, Abrahamsen, 2002; Clark, 2001, 2008; Friedenberg, Silverman, 2006; Thagard, 2005; Wilson, Keil, 1999). It comprises both human and animal cognition. Recent approaches in cognitive science also take into consideration the dimensions of emotions, the body (embodied cognition"; e.g., Clark, 1999; Varela et al., 1991), and cultural and social phenomena (e.g., Tomasello, 1999; Tomasello et al., 2005).

- *Social or collective processes*: Social phenomena are processes *emerging* from cooperation and interaction between single cognitive systems (and the natural and artifact environment). They comprise small groups and teams up to whole societies and cultural systems. As collective emergent phenomena they follow their own (social) dynamics which is completely different form the dynamics of single participating cognitive systems; it opens up completely new behavioral and epistemic spaces. That is why it is so important to consider this level in the context of innovation, because—due to its emergent character—it may contribute to the creation of new knowledge.

2 Collaborative innovation work as socio-epistemological process—conceptual backgrounds for the paradigm of enabling

As is shown in the COINs approach (Gloor et al., 2004) it is not sufficient to study the phenomenon of innovation by only taking into account economic or technological issues. Rather, Gloor and many others point at social as well as ethical aspects as being at least as important. We suggest going one step further by shifting towards an understanding that any kind of innovation activity—in its very core—is based on *epistemological, cognitive*, and *social* processes. They are the foundation for the economic and market dynamics, for any kind of interaction between people, artifacts, and technology, as well as for organizational processes and structures. This implies that, if we want to understand, *what* profound, sustainable, and at the same time game-changing innovation is and *how* it can be brought about and facilitated, we have to start our investigations on the level of these essential cognitive, epistemological, as well as social processes. The goal of this section is to give a short *theoretical overview* over these questions as a foundation for the sections to come where these insights are applied.

Consequently, if we want to develop a sound concept of enabling innovation be it in COINs or in any other Enabling Space, we have to tackle at least the following questions on a theoretical level, before we can go into more practical issues: (a) what kind of knowledge processes do we have to consider for bringing forth (radically) new knowledge?—and, closely connected with this question, (b) what are the value systems as well as epistemic attitudes which have to be applied in that context. These questions have direct implications on the way, how conventional approaches of management, organization, and leadership have to change, if one wants to be successful in the field of game-changing profound innovation.

2.1 The attitude of enabling or on the importance of giving up control

Deterministic production of new knowledge?

COINS are about self-organization, emergence, offering and sharing information, and openness. Contrary to these characteristics classical management approaches to innovation consider predicting things and keeping them—at least to some degree—under control among their key success factors. From that perspective, innovation, and even more so COINS, seem to be an "enemy" for organizations as they aim—on an superficial level—at destroying or destabilizing established, predictable, as well as controllable routines and structures. As an implication, in most organizations one can find a "domesticated" version of innovation in the form of incremental regimes of innovation, CIPs (continuous improvement processes; e.g., Dodgson, Gann, 2010), or Kaizen (e.g., Nonaka 2008) processes. In these approaches, innovation is reduced to a more or less *mechanistic process* producing new insights, knowledge, and, finally, new products, services, business models, etc. on the basis of applying rules and algorithms.

These approaches are based on the assumption that, if one applies these rules faithfully, this will lead to new knowledge in a *deterministic* manner. Such a perspective has several advantages: employees just have to follow the given rules and procedures in order to come up with successful innovations; furthermore, innovation could get rid of its unpredictable nature and, thus, become a well calculable and controllable factor. Both experience and logical reasoning show that the opposite is true. Controlling, making, or "managing" innovation by applying rules or recipes turn out to be a *contradiction in itself*. Looking more closely from the perspective of logic reveals that knowledge resulting from such a process of applying rules cannot be really new in a more profound sense. In a formal system applying rules, running an algorithm, or following a recipe only makes explicit what is already implicitly given in this set of rules and, thus, is not really new.

Enabling—an alternative for a deterministic view on innovation

What is an alternative for using rule-based innovation processes? First of all, one has to see that bringing forth new knowledge does not imply that there are no rules allowed at all for structuring and organizing these processes. As will be shown the difference lies in the *attitude* towards the role of these rules and how these rules are applied. While in the classical perspective the attitude of control and making was in the fore, the authors suggest to replace this position with an attitude of *enabling*.

What does "enabling" mean in the context of generating new knowledge and innovation? The answer covers two aspects that are crucial: (i) On the one hand we have to give up on the regime of control, determinism, and making. (ii) On the other hand enabling means to *provide a set of constraints* or a *facilitating framework* supporting the *processes of bringing forth new knowledge*. The challenge is to theoretically identify the necessary dimensions of this framework of constraints, to integrate these dimensions into a unified concept, as well as to develop a design process for creating such frameworks. Before we will do that one has to understand what kind of knowledge processes are involved in the enabling approach.

2.2 Enabling and a new type of knowledge

Facilitating the breaking forth of new potential qualities

Behind an approach of enabling to knowledge creation and innovation one can find an important epistemological assumption. It is based on the premise that there is something *latent* in reality or in the domain of knowledge which wants to *break forth*. This is closely related to a rather old concept from metaphysics, namely Aristotle's concept of "*potentia*" and "*actus*" (Aristotle's Metaphysics [2007], De anima [2000] or Stein (1986)), where "potentia" means potentiality, an aptitude to change, a possibility which is dormant in a phenomenon/object, to act or to be acted upon, something that might change or emerge (into a new form). We refer to this type of knowledge "*in potentia-knowledge*". "Actus", on the other hand, can be translated as actuality and means the actualization, completion, or fulfillment of such a capacity.

Why are these concepts of interest for our context of innovation and enabling? If we are interested in radical, yet "organic" and sustainable innovation we have to think about it in terms of something, which is "in potentia", something which is *not directly visible or obvious yet*, which is hidden, but which is already there as a germ. Something that wants to *break forth*, but which is *highly fragile* and which is too weak to break forth by itself in most cases. This is also closely related to what C.O.Scharmer refers to as *self-transcending knowledge* (e.g., Scharmer, 2001, 2007; Senge et al., 2004; Kaiser, Fordinal, 2010). Therefore, it is necessary to *facilitate* this process of shifting this object/phenomenon from being in a state of

"in potentia" into being "in actu". This process of shifting is what we refer to as *enabling*: facilitating the process of breaking forth of (new) latent qualities and dynamics, facilitating to "give birth" to a new form, new knowledge, etc.

Comparing this process to traditional approaches of innovation and knowledge creation, it is clear that this goes far beyond classical "out-of-the-box thinking" or creative tools (e.g., Kelley, 2004; DTI, 2005; Shneiderman, 2007). Peschl and Fundneider have developed a whole innovation paradigm and a systematic innovation process around this approach which is reffered to as *Emergent Innovation* (Peschl, Fundneider, 2008a, 2008b; Peschl et al., 2010).

Enabling entails an alternative set of attitudes and values in innovation work

As a consequence, the enabling approach requires an alternative set of attitudes, values, habitus/habits, as well as epistemic practices: first of all we have to (re-)acquire "epistemological virtues" of openness, being able to reflect, to radically question ourselves, and to let go. Furthermore, we have to (re-)learn to listen and observe closely; to let im-press ourselves, meaning that we are open to something that is changing us (even if it means that we have to give up on well established and dear patterns of thinking). We have to cultivate our patience, our ability to wait for the "right moment" ("kairos"), to listen to weak and fragile signals and cultivate/incubate them, to let come, to follow the flow of reality. Finally, we have to learn how to provide an ecosystem or "living ambiences" of cultivation, facilitation, incubation, and enabling, rather than a regime of control and forced change.

In conclusion enabling requires a high level of humbleness giving reality priority (for a process of innovation "from within") over one's own projections and ideas. From these considerations it is clear that many of these epistemological attitudes are not only important for Enabling Spaces, but have to be considered to be the epistemological background for COINs as well. Gloor (2004, 2006) stresses trust, for instance, as a premise in the social dimension of a network or team; however—on a more fundamental level—trust is based in an epistemological understanding which is close to many of the attitudes having been developed in the enabling approach (e.g., joint knowledge construction processes, negotiation of meaning, jointly developing standards and criteria for the validity of knowledge, etc.).

2.3 Cognitive foundations of Enabling Spaces: the extended cognition approach

As far as the cognitive processes being involved in innovation activities goes, we cannot enter deeply into these questions in this paper. From a cognitive science perspective (Bechtel, Graham, 1998; Clark, 2001; Friedenberg, Silverman, 2006; Stillings, 1995; and

many others) it has become clear that an adequate understanding of innovation and knowledge creation processes can only be achieved by following the approaches of *situated* and *extended cognition* (Clark, 1997, 2008; Hutchins, 1995; Menary, 2010; Varela et al., 1991): namely, by limiting cognition not to the brain, but by *extending* the notion of cognition to the *body* as well as to its *environment* ("mind leaks into the environment"). Hence, cognition is understood as a process of *interaction* between internal cognitive/neural processes and the cognitive system's environment—there is a closed feedback-loop between processes of perception, (internal) cognition, action, and the environmental dynamics. The environment includes other cognitive systems, and, by that, the whole social dimension is introduced as well. Furthermore, it comprises the whole world of *artifacts*. An artifact is an environmental (physical) structure which is the result of a cognitive activity. In other words a cognitive system changes the environment in some aspect according to his/her plans or knowledge by using his/her motor systems or other tools. Hence these environmental changes are stable or transient manifestations of this knowledge. The interesting property of artifacts is that they are influencing (other) cognitive systems. The notion of artifacts is crucial for our understanding of innovation (compare Krippendorff, 1989, 2006; Krippendorff, Butter, 2007; Norman, 1991). In our context of innovation artifacts play at least a twofold role: (a) innovations themselves are artifacts and (b) artifacts are necessary in order to create innovations (e.g., Enabling Spaces).

As an implication, studying innovation processes cannot be limited to only investigating cognitive processes within the brain, but we have to understand how these cognitive processes are embedded in the physical and social environment and, through that interaction, bring forth (radically) new knowledge leading to innovations. Hence, both Enabling Spaces and COINs have to consider this physical and social environment as an essential factor for successful innovation processes. In the context of Enabling Spaces, what we are looking for are "enabling structures" facilitating these processes. These structures are, of course, themselves artifacts: i.e., enabling artifacts facilitating the creation of new knowledge themselves leading to innovation artifacts. That is why we are speaking of *socio-epistemological technologies*: Enabling Spaces are *social*, physical, as well as *technological* spaces enabling processes of *knowledge creation*.

3 Enabling Spaces: a framework of enabling constraints and interventions/facilitators

Similarly as COINs an *Enabling Space is a space supporting, enabling, and facilitating processes of innovation and knowledge creation* in teams and networks. According to the insights from the extended and situated cognition approach (Clark, 2008; Menary, 2010) the

concept of Enabling Spaces takes the following issue very seriously: for successful innovation work it is necessary to provide specific enabling environments in order to satisfy this need for supporting the cognitive and knowledge processes being involved in this kind of work. In this section we are going to take a brief look at the most important conceptual roots of Enabling Spaces and develop their dimensions.

3.1 Conceptual roots of Enabling Spaces

The concept of Enabling Spaces has many roots, which can be traced back even to ancient times: whenever spaces were needed where some kind of knowledge work (be it intellectual, educational, philosophical, religious, practical, artisanal, etc.) took place, people were considering the specific design of such a space (e.g., a liturgical space, a space for philosophizing, educational settings, workshops, ateliers, etc.). In the philosophical context, for instance, Nishida's (1999) work on the logic of place had a strong influence on understanding the role of place and space on processes of thinking and knowing.

Similar concepts have been developed in the context of knowledge management: for instance, Nonaka´s et al. (1998; 2003; 2008) concept of "*ba*"; it has been developed further by Krogh et al. (2000) who have utilized it in the context of knowledge creation; Moultrie et al. (2007), Lewis et al. (2005), and Kristensen (2004) have come up with theoretical as well as practical results in the field of theory and technology for spaces for creativity. There are several examples in the field of architecture (e.g., Allen, Henn, 2007) and designing educational settings (e.g., Oblinger, 2006; Peschl, 2006a).

Enabling Spaces are multi-dimensional spaces (architectural space, social space, emotional space, epistemological space, etc.) that are orchestrated in an integrated manner in order to best possibly support innovation activities with a focus on game-changing, profound (Peschl, Fundneider, 2008a) or radical innovations.

The concept of Enabling Spaces follows a rather *broad understanding of space*: space is understood as a *container* providing a set of *constraints* which is responsible for holding this container together as well as giving it a minimal structure, interventions, and dynamics. It is a space providing enabling structures, elements that facilitate and smoothly intervene, as well as constraints allowing knowledge processes to flow and to develop their own dynamics in such a way that radically new knowledge may break forth in the sense of brining in-potentia knowledge into act (see section 2.2).

Enabling Spaces are interdisciplinary: It is necessary to consider *constraints* and forms of *enabling interventions* from many different disciplines, such as social, emotional, cognitive, cultural, technological, epistemological, organizational, and, of course architectural constraints and interventions. The challenge is to integrate these aspects into a holistic

ensemble which functions as an Enabling Space. It is the *interdisciplinary* interaction between these elements that brings about a seamless flow of knowledge and interaction between the participating cognitive systems and their environment. This is a typical *design process/task* which does not have one "best solution", but has to be approached in a "designerly manner" (Dorst, 2003, 2006; Glanville, 1998, 2007; Cross, 1982, 2001).

As opposed to many other approaches the USP (unique selling point) of Enabling Spaces is to *integrate* (knowledge/innovation) *processes* and *structures*/constraints in a highly consistent manner. This can only be achieved, if one assumes a radical epistemological perspective: namely, if one *starts* with studying the *knowledge- and innovation processes*, which are involved in the prospective Enabling Space. Beyond that it is necessary to dive into the culture and the internal structures of an organization in order to gain a profound understanding of its *core*. This can be achieved by a design process which will be described after having taken a closer look at the dimensions of Enabling Spaces.

3.2 Dimensions of Enabling Spaces

The framework of Enabling Spaces acts as a container holding innovation processes and activities. The Enabling Space is designed as a multi-dimensional space, in which architectural/physical, social, cognitive, technological, epistemological, cultural, intellectual, emotional and other factors are considered and integrated, aiming to support innovation activities.

Roots of dimensions of Enabling Spaces

These dimensions have their roots in several areas—they have been extracted form a comprehensive survey of these fields as well as from practical work: field of innovation studies (e.g.,
Fagerberg et al., 2006; Fagerberg, Verspagen, 2009; Tsoukas, 2005; Dodgson, Gann, 2010; Schnetzler, 2005, theory of creativity (e.g.,
Amabile, 1996; Sternberg, 1999; Shneiderman, 2007; Kelley, 2004), from the field of technology supported education, knowledge management and organizational learning (e.g., Nonaka, Konno, 1998; Nonaka, Toyama, 2003; Nonaka et al., 2008; Easterby-
Smith, Lyles, 2003; Krogh et al., 2000), from the fields of office design and creative space design (e.g.,
Allen, Henn, 2007; Lewis, Moultrie, 2005; Moultrie et al., 2007; Kristensen, 2004; Fayard, We eks, 2007).

In the following sections, these dimensions will be characterized in more detail.

Architectural and physical space

This dimension refers to the physical space, or the Euclidean space in which the innovation- and knowledge processes are taking place. It is an intentionally designed and built physical environment that surrounds the users with its concrete physical structure(s). These structures comprise all elements in the space and its context, be it walls, furniture, windows, etc. This space is mainly characterized by two elements: architecture (as built structures) and design. Examples of what the authors see as architectural spaces are: offices, spaces for creative and knowledge work, workshops, (knowledge) ateliers, concrete physical places for COINs, urban places, or urban settlements, etc.

The challenge is to design this space in such a way that the flow of knowledge and social interaction is supported in the best possible way for the specific (knowledge or innovation) task at stake. In most cases the today's architecture leads to "disabling spaces" rather than enabling or even actively supporting knowledge and innovation processes. Allen and Henn (2007), Krogh et al. (2000), and many others give good examples of how to solve this architectural design challenge.

Social, cultural, and organizational space

Knowledge (creation) processes are always embedded in social processes; social interaction is a *conditio sine qua non* for the emergence of (radically) new knowledge in a collaborative setting. As is shown in the field of, for instance, science and technology studies (e.g., House, 2003; Latour, 1987; Cole, Derry, 2005) or of creativity (Kelley, 2004; Peschl, 2009; Sternberg, 2005) and by many others social groups are essential for bringing forth innovation and new knowledge. From an epistemological perspective we know that the knowledge processes, which are involved in the course of radical/game-changing innovation are highly fragile—the new is unknown, it cannot be planned, there is lot of intuitive knowledge involved, in many cases one expresses very personal and existential thoughts and intuitions during such a process. Therefore, there has to be a "social container", a (social) atmosphere, in which these processes can develop their own dynamics, can gain their own strength. Apart from other aspects, trust and openness are key enablers for the social dimension, which have to be established before any kind of innovation work can start. That is why it is necessary to spend much energy in selecting the "right" members of an "innovation team" and to find a socially as well as functionally well-balanced constellation.

Above that, innovation is always embedded into the culture and organizational structures of an organization. They heavily influence the enabling or disabling effects on innovation- and knowledge creation processes and have to be considered and designed accordingly.

Cognitive space

Every innovation has its origin in the individual brain and in cognitive processes. Cognition (and its interaction with the environment; cf. Clark's (2008) extended cognition approach; (Varela et al., 1991)) is the source of new knowledge. Hence, it is the cognitive space which has to be taken into account when thinking about Enabling Spaces. What are the key cognitive enablers among the cognitive activities which are provided by our brain? The capability to observe closely, to "listen to what wants to emerge" (cf. Scharmer 2007), to reflect one's premises, to sense and to understand one's own patterns of thinking and perception, to enter into a "real" dialogue (Bohm, 1996; Isaacs, 1999b), practical intelligence/phronesis (φρόνησις) (e.g., Nonaka et al., 2008), learning processes in a prototyping setting, etc.

Emotional space

Cognition is always embedded into *emotional states* (e.g., Gazzaniga, 2000; James, 1884; LeDoux, 2000; Damasio, 1994, 1995; Bechara et al., 2000; and many others). An Enabling Space has to take into consideration this dimension and offer features triggering emotional states supporting processes of knowledge creation, such as security, protection, openness, etc. However, the emotional dimension of Enabling Spaces is not only about "feeling well". In some cases it is necessary to push oneself into an emotionally *uncomfortable* situation in order to leave behind one's well-established and dear patterns of thought and perception.

Epistemological space

Besides behavioral action cognitive processes bring forth *knowledge*: both internal and external knowledge (i.e., in the form of artifacts). Dealing with innovation processes always involves a wide spectrum of different types, categories, styles, or genres of knowledge processes: there is a huge difference between the knowledge being involved and created in a process of ideation, of close observation, of intuitive reasoning, of deep understanding, of sense making, of prototyping, of letting-come, of reflecting, of implementing, of executing a routine, etc.

Hence, in order to establish an epistemologically enabling eco-system, one has to first identify the knowledge processes, which are relevant for the particular phase of the innovation process (compare also the organizational epistemology approach by Tsoukas 2005). One has to understand the very nature of these processes. Finally, it is necessary to create an enabling environment in the sense of boundary conditions, constraints, attractors, etc., in which this knowledge dynamics can develop, can grow and flow. From these considerations it becomes clear that the resulting spaces will look very differently according to the supported knowledge process and organizational culture and social setting.

Technological and virtual space

Innovation processes are always embedded in a technological environment. This comprises a wide range of technological means ranging from "low-tech" tools, such as white boards, flip charts, light ambiences, etc. to high-tech tools such as computers, the internet, social media, (knowledge) visualization tools, simulations, complex software, knowledge displays, etc. (Shneiderman, 2007).

In most innovation processes, technological support from the area of *design (thinking)* has turned out to be highly productive (e.g., Brown, 2009; Sanders, Stappers, 2008). These tools comprise mapping technologies, knowledge technologies, observation technologies, or simulation and prototyping technologies.

Innovation and knowledge creation does not necessarily have to take place always in a face-to-face setting. Much of the work can be done in the virtual realm, such as in COINs (Gloor, 2006). Hence, virtual tools enabling these processes may support the process of observation, collecting and ordering data and knowledge (e.g., electronic journal and work spaces), documenting, prototyping, simulating, collaborative knowledge creation, etc.
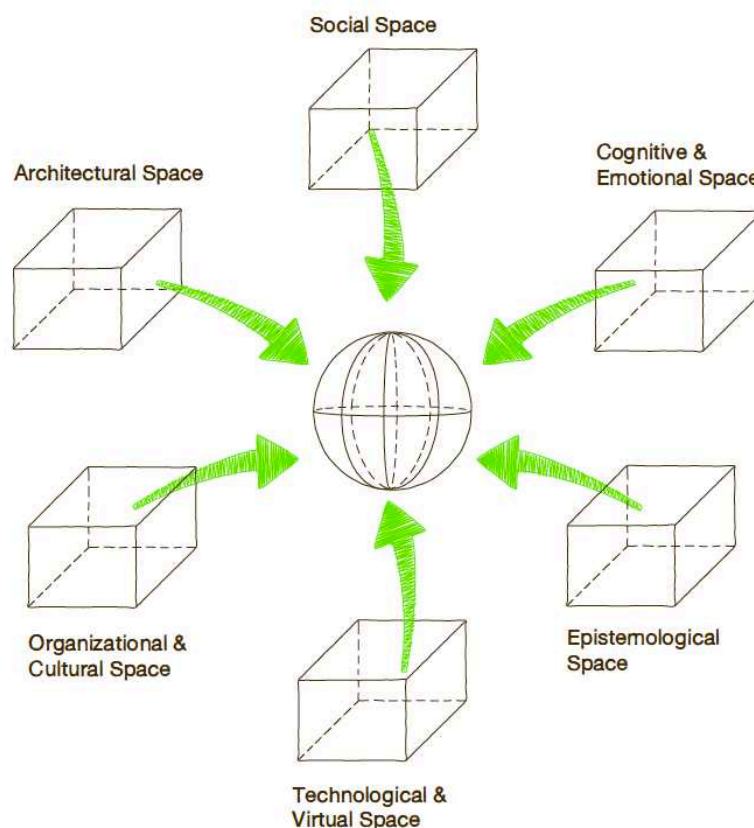

Figure 1: Integrating the dimensions of the Enabling Space creates an emergent space with new qualities which cannot be found in the contributing aspects.

4 Integration and interdisciplinarity as design principles for Enabling Spaces

From what has been said above, it follows that these dimensions cannot be seen separately from each other—rather, the very goal of Enabling Spaces consists in *integrating* these aspects in a *radically interdisciplinary* manner into an integrated design (see Figure 1), into a whole, like a composition, a piece of art (a "Gesamtkunstwerk" in German). In this section we will show (i) the necessity of integrating knowledge processes and structures, (ii) present a well-proven design process leading to such an integration and to creating a concrete Enabling Space, and (iii) finally, present a case study.

4.1 Necessity of interdisciplinary integration of knowledge processes and structures

Especially in the context of collaborative processes of knowledge creation and innovation it is necessary to integrate social, cultural, emotional, physical/architectural, as well as epistemological issues: bringing forth new knowledge is a highly fragile knowledge process, which is about intuition, listening to weak signals, deep thinking and understanding, incubating vague knowledge, prototyping, etc. Due to the fragility and vulnerability of these processes it is necessary to create a kind of *container*, an Enabling Space, providing *qualities* like offering an environment of *protection*, of being able to hold and cultivate epistemological and social fragility, of enabling the free flow of knowledge, of silence, of openness for error, openness for change, etc.

These design qualities have to be translated into integrated and interdisciplinary concepts, which—in their wholeness—form a concrete Enabling Space. In this context this means that, for instance, *trust* is a major issue: trust not only between the team members (i.e., in the concrete social domain), but also as a cultural value in the organization, which does not only exist on paper, but is practiced in every routine and social interaction, such as meetings or decision making processes. Furthermore, there has to be established a shared epistemological understanding that the knowledge and processes that the team is dealing with here are highly fragile and need completely different mindsets and attitudes: a different mode of operating, of talking, "negotiating" meaning, dialoguing, and interacting with each other, novel criteria of evaluating and judging, etc. The (interior) design of this space has to reflect this vulnerability and fragility on the one hand and the openness on the other hand. This dichotomy can be solved, for instance, by a semi-transparent "interface" (e.g.,

semitranslucent glass walls, etc.) towards the inside of the organization and with big windows to the outside. The interior design of this space has to be characterized by a relaxed atmosphere and non-hierarchical layout enabling the free flow of knowledge.

Apart from these elements one has to consider the corporate/organizational *culture* as a key constraint as well as potential enabler. Enabling Spaces receive their "flavor" by the organization's culture and might differ considerably according to these constraints. From these considerations, one can see clearly that the creation of Enabling Spaces is a real *design challenge*; it has to be done for each organization *individually* and there do not exist standard solutions and simple rules which one just has to follow in order to come up with a ready-made and fully functioning Enabling Space fitting organically into the organization.

Hence, it was necessary to develop a *design process* translating these rather abstract innovation-, knowledge-, and core processes of an organization along with its culture into design qualities/patterns and, in a next step, into concrete elements integrating above dimensions into an Enabling Space.

4.2 Designing and realizing Enabling Spaces for collaborative knowledge creation

This integration and orchestration of various space-dimensions is one of the most challenging problems, yet powerful features of the Enabling Space approach. One has to follow a design process for achieving this integration. The design process being proposed in this section is the result of five years of the authors' interdisciplinary research (in the fields of cognitive science, theory of innovation, epistemology, and innovation spaces) and of a large number of applied projects that have been realized in different industrial and cultural contexts (for examples see Peschl and Fundneider (2012b, 2012a; 2010) and http://www.theLivingCore.com).

The staring point of such a *design process* is always the identification of the *core knowledge and innovation processes* of an organization; they are embedded and—most of the time—hidden in its organizational and cultural context and in its systemic environment. The objective is that these core processes represent the essence of the organization. They are a common foundation for the design of the Enabling Space; in other words, they act as the source for the unity in the diversity of concrete realizations in the diverse dimensions of the Enabling Space. This "unifying source" has to be developed and tapped during the design process for Enabling Spaces.

Methodological foundations

First of all, one has to differentiate between the methods applied in the design process and the methods that were used in the accompanying research process developing, observing and, documenting the concrete projects and the design process, although there are some methodological overlaps between these two domains. In this section we are going to focus on the methods being applied in the design process itself.

The proposed design process has roots in several fields, mainly from design approaches, "designerly way of doing things" (Cross, 1982, 2001; Dorst, 2006; Gedenryd, 1998) and design theory/thinking (e.g., (Brown, 2008, 2009; d.school, 2010; Glanville, 2006, 2007; Krippendorff, 2006; Laurel, 2003)). Furthermore, the observation phase applies mostly methods from qualitative and participative research, such as qualitative interview approaches (Kawulich, 2005; Spradley, 1980; Jaworski et al., 2004; Scharmer, 2007b; Hoepfl, 1997) and mostly ethnographic techniques (Laurel, 2003; Spradley, 1979, 1980; Tedlock, 2005).

C.O.Scharmer's (Scharmer, 2007a, 2007b) Theory-U or "Presencing"-approach is one of the key methodological sources for the development of this design process. Scharmer offers a framework for a genuine innovation process in which he focuses on the issue of "learning from the future as it emerges" which he describes as follows: "…learning from the future as it emerges is based on the process and practice of presencing (suspending, redirecting, letting go, letting come, envisioning, enacting, embodying)" (Scharmer, 2007a: S. 467). Furthermore he writes: "…I began to call this operating from the future as it emerges "presencing." Presencing is a blending of the words "presence" and "sensing." It means to sense, tune in, and act from one's highest future potential—the future that depends on us to bring it into being." (p8) Without going into the details, it is evident that the complexity of the design process, as we are confronted with in the context of Enabling Spaces, can be treated very much like an innovation process. An Enabling Space is not so much about an esthetical creation, a "design" or a purely functional structure which just depicts the status quo. Rather, it is about an entity that is deeply rooted in the very core of an organization and at the same time has not only to anticipate what will emerge in the future, but also has to provide the necessary enabling structures and processes for coping with and even co-creating these emerging future issues (be it new services, markets, social structures, business models, etc.). One can clearly see that it is necessary to integrate design and innovation approaches in order to successfully meet this highly challenging task of creating Enabling Spaces.

The Enabling Space design process took several elements from Scharmer's (2007a) which will be explained in detail below: two key elements in this approach are *precise observation* and *developing a profound understanding* of the organization, the people, the culture, or the innovation object (in our case the future Enabling Space). From an intellectual perspective,

this is a highly challenging task, because it does not suffice to just closely observe and describe, but one has to reflect one's own observations in order to discover patterns, the essence, and—most importantly—future potentials.

Furthermore, the concept for this design process has been developed by bringing together theoretical research results, methodological considerations, and practical experience from the following fields: (a) Interdisciplinary research in the above mentioned areas and dimensions of an Enabling Space (e.g., the relationship between space and cognitive, social, and emotional processes (Fayard, Weeks, 2007; Harvey, 2010), the relationship between space and creative processes (Kristensen, 2004; Moultrie et al., 2007; Lewis, Moultrie, 2005), space syntax (Sailer, 2011; Sailer, et al., 2010), etc.); (b) Design patterns for innovation- and knowledge processes (e.g., Scharmer, 2007; Verganti, 2006; Kelley, 2004; Brown, 2009); (c) the action research or action science approach has been applied as a main tool for developing and doing research on this design process (compare Argyris et al., 1985; Ballantine, 2004; Senge, Scharmer, 2001; Scharmer, 2007); (d) Finally, experience from a large number of applied projects helped to shape and adjust the details of this design process.

The Enabling Space design process

The Enabling Space design process is carried out by an interdisciplinary team having competences and experience in the fields of innovation- and knowledge work, cognitive science, organizational studies, sociology, philosophy, ethnographic studies, information and communication technologies, as well as architecture and design. Generally speaking, the whole process is divided into three large phases: (i) research and sense making, (ii) concept creation, and (iii) designing, planning, and realizing.

In the very beginning the interdisciplinary design team is primarily responsible for doing the research, for the sense-making process, for creating the conceptual design for the Enabling Space, as well as for facilitating the knowledge dynamics of this interdisciplinary design process and team. Although architects are involved from the beginning, their role is minor in this initial phase, because this phase is primarily concerned with studying and understanding issues concerning the knowledge-, innovation-, and core processes of the organization and—on this basis—developing conceptual designs in the form of design patterns. Architects, designers, and technology people are playing a leading role at a later point in time when it comes to translating these abstract concepts into concrete designs and realizations.

The whole process is designed as a multi-stakeholder and participative approach having a strong focus on closely observing and "listening" to what is there and to "what wants to emerge" (Scharmer, 2007: p. 33). Both quantitative and qualitative observation methods are

applied with a clear emphasis on qualitative methods in the beginning. In short, the design process comprises the following steps (see also Fig. 2):

Fig 2: Overview of the Enabling Space design process.

1 | Deep observation and going out into the field

The first phase of the design process is referred to as "*Deep Observation*". In this phase, the design team conducts an in-depth research and observation process; it comprises various mostly qualitative, ethnographic, and participative observation techniques (Denzin, Lincoln, 2005; Kawulich, 2005; Hoepfl, 1997; Spradley, 1979, 1980), such as qualitative interviews with a wide spectrum of relevant stakeholders of the collaborative process of knowledge creation. These interviews aim at establishing deeper insights into the organization and its systemic environment in order to develop a profound understanding of its core processes. These interviews are valuable as they do not only generate a lot of information and knowledge about what makes this organization unique, but also represent *seeds* for *new solutions* or for indentifying potentials for innovations.

Besides the interviews it is necessary to make on-site observations by visiting the organization several times and conducting ethnographic studies observing and investigating the context, urban setting, cultural issues, etc. (Laurel, 2003; Spradley, 1979, 1980; Tedlock, 2005). This is done by observing people in their concrete working environments, in meetings, in various communication contexts, in collaboration settings, in cooperation with clients and external stakeholders, etc. Methods from participant observation approaches (Kawulich, 2005; Spradley, 1980; Senge, Scharmer, 2001; Tedlock, 2005; Denzin, Lincoln, 2005) are applied by taking and analyzing field notes, videos, and audio data. Above that the design and research team collects artifacts and takes cultural probes (Graver et al., 1999).

Furthermore, these observations are complemented by quantitative surveys and data. Depending on the concrete project these quantitative data concern communication patterns and communication frequencies between emploees (and external stakeholders), means and culture of communication, patterns in work-processes, patterns of using different physical spaces and knowledge technologies, satisfaction with the offerings of the particular office space, patterns of innovation, etc. Apart from these human-centered quantitative data "hard facts", such as financial data, office space designs and square footage data, data about the organization and its structure, etc. are collected.

The overall goal is to gain a picture of the organization which is as comprehensive as possible in order to understand its core processes and (innovation and change) potentials.
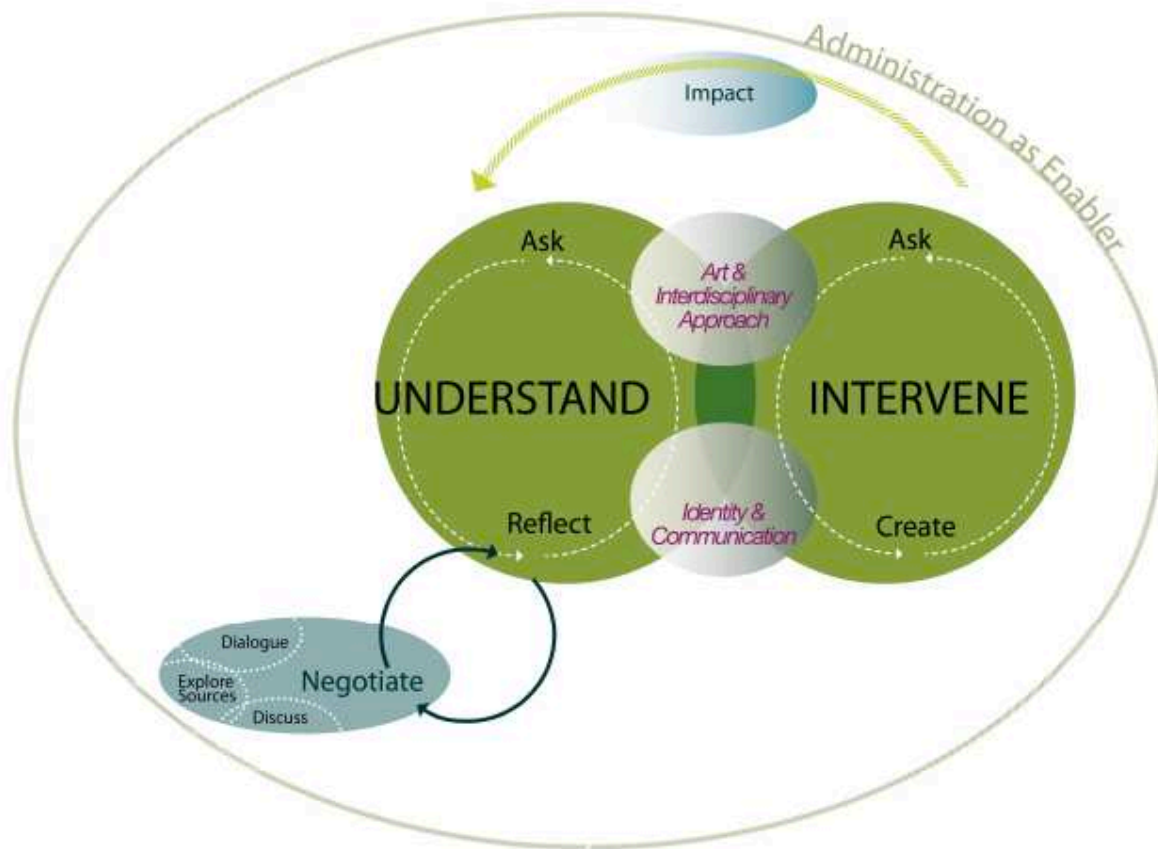
Fig 3: Example for structure and interactions of the core knowledge, collaboration, and innovation processes of a knowledge driven university campus.

The next phase of the design process consists in "*Sense-making*": here it is necessary to handle and order these vast amounts of information collected in the field. The aim of this step is to *identify patters* within this information in order to come up with the most important processes or activities ("core processes") that define the organization. This is a highly challenging inductive process with several feedback "hermeneutic" loops of interpreting and re-interpreting, re-arranging, and reflecting the observation results. Methodologically, content analysis tools are applied for analyzing the interview data in a first step (Krippendorff, 2004; Zhang, Wildemuth, 2009). By that relevant semantic categories and thematic issues and recurring patterns are identified. Furthermore, it is possible to *uncover hidden premises*, which are not directly visible in the interview data. These premises are extremely important as they point to the interviewees' mental models that are responsible for their attitudes and behaviors. This analysis serves as a basis for integrating the results with the rest of the collected data, observations, and information in a comprehensive picture.

In most cases, it is necessary to work on big tables and literally/physically move items around, arrange them physically, (re-)group, develop semantic fields, and relate them. Furthermore the design team identifies polarities in the observation material; these polarities span a field of topics which acts as a semantic container in which the identified topics, themes, and potentialities are ordered and negotiated. The result is a highly condensed model of the core processes of the organization or the issue at stake; an example is depicted in Figure 3.

3 | Design patterns

A detailed description of each core process and the relations between each other is the start of the next phase of the process: "Design Patterns". This is done by means of a sophisticated form of mind maps, since these allow a quick grasp of the relevant issues. These maps have the format of *design patterns* (Alexander et al., 1977). Design patterns have several functions in the Enabling Space approach: (a) they provide a comprehensible representation of the design qualities and basic functionalities for the Enabling Space; (b) they are responsible for the unity in the diversity of the various dimensions of the Enabling Space and its concrete realizations; (c) finally, design patterns serve as a kind of *language for bridging the (cognitive/language) gap between the relatively abstract and highly condensed research results* (e.g., core processes) and the involved partners (e.g., architects, designers, trainers for specific skills, etc.); they *translate and transform the concepts into concrete constraints and suggestions* for architecture, social interventions, organizational changes, etc. Developing this "translating language" was a key for the interdisciplinary collaboration with the architects. Furthermore, scenarios, illustrations, as well as story-telling/-boarding tools (Truong et al., 2006) are used to support the comprehension and communication of the concepts.

4 | Interdisciplinary design

The design patterns are transformed into an interdisciplinary design in this phase: the results of this step are concrete plans, designs, views, and concepts for organizational interventions. This is achieved by a series of interdisciplinary workshops in an *atelier*-like setting. The aim of these workshops is to use the core-process model and the design patterns as a basis for developing concrete concepts, designs, and realizations for the Enabling Space. This step requires intense communication, prototyping (Houde, Hill, 1997; Coughlan et al., 2007), and adjustments between the Enabling Space team and the architects, urban/landscape planners, designers, ICT specialists, etc.—the configuration of the "executive team" depends on the particular context and challenges of the project.

5-7 | Joint Vision, Co-Creation & Realizing

In the subsequent phases the client(s) are (re-)involved in a process of co-creating a joint vision out of the proposed design. After several feedback-loops the project is transferred to the realization phase.

In the joint vision phase the interdisciplinary design is condensed and developed into a vision expressing the goals and the deeper purpose of the project. This vision reflects both the core processes and the concrete interdisciplinary design and concepts. These steps are looped through in a process of co-creation including the design & research team, the architects and designers, as well as the client(s) (and other relevant stakeholders, if necessary). The function of the resulting joint vision is not only to keep together the project (ad intra), but also to ac as a means for communicating this Enabling Space project to the outside world.

All these products (joint vision, interdisciplinary design, etc.) are the basis for entering into the phase of realizing the Enabling Space: this means that the architects start with the detailed plans, technology people set up their hard- and software, human resources people start their interventions and organizational change processes, etc.

Designing Enabling Spaces vs. classical architectural design processes

Enabling Spaces are primarily about supporting knowledge and innovation processes. Hence, these processes act as the starting point for the Enabling Space design process. It is this knowledge oriented staring point and the goal of an overall holistic organizational change which differs profoundly form the classical *architectural design approach*. The Enabling Space design process goes much deeper with respect to what is the "meaning" and the core of the work being done in an organization and to explore the innovation potentials whereas in classical architectural approaches purely functional analyses or studying psychological issues are used as the conceptual basis for the design. The goal of an Enabling Space is not only to shape the architectural space, but also to deeply integrate these physical changes with changes in the organization, in its social structures, (working) processes, IT-structures, as well as in its cultural atmosphere. It is a much broader and more holistic approach to architecture as compared to classical architects. It is about knowledge-, innovation, and organizational architecture with an implication on physical architecture.

Realized projects and accompanying scientific research (methods)

Several projects in various industries and organizational settings have shown that both the Enabling Space approach and design process are sound and stable. They have turned out to be quite generic and can be applied to a variety of fields and industries. Among others the authors (and their team) applied the Enabling Space approach, for instance, in a large Swiss bank for creating a "smart working and innovation environment" (including both radical

architectural and organizational changes), for developing a master plan for a university campus in the southern part of Germany (a knowledge creating campus; see also (Peschl, Fundneider, 2012b)), for a radical organizational and architectural change process in an IT division of a worldwide operating engineering and automotive supplier company, or for developing an urban innovation concept for a creative settlement in Russia.

All of these projects have been accompanied by research activities in which the authors have been involved. The research has been done in order to validate and to improve the design process in a feedback-loop between theory, applying this theory in real world projects, observing the processes and results and changing or improving the theoretical foundations. The authors were present in two roles: (a) moderating and leading the design process and (b) with the help of a small research team, observing this process. That is why, mostly participatory methods from the field of *action research* were applied (Reason, Bradbury, 2001; Rapoport, 1970; Argyris et al., 1985; Lewin, 1946; Susman, Evered, 1978). In brief, action research "aims to contribute both to the practical concerns of people in an immediate problematic situation and to the goals of social science by joint collaboration within a mutually acceptable ethical framework."(Rapoport, 1970: S. 499). Action Research [AR] methodology is "open-ended and iterative. ...AR utilizes cycles of inquiry that include planning, action, and reflection, in which the action being undertaken is continually designed and evaluated with research results emerging throughout these cycles. AR can incorporate multiple methods and welcomes the use of both qualitative and quantitative methods. The only methods not applicable to an AR approach are those that distance the researchers from problems and questions of inquiry to ensure "objectivity" or avoid "contamination."" (Hayes, 2011: S. 15:4).

We are following the reflection-in-action approach propagated by D. Schön (1983, 1984) in which the researcher is both intervening in the system and studying it by applying mostly participatory research tools (Susman, Evered, 1978; Senge, Scharmer, 2001; Kawulich, 2005; Reason, Bradbury, 2001). As suggested by Susman and Evered we are understating our action research approach as a "cyclical process with five phases: diagnosing, action planning, action taking, evaluating, and specifying learning" (Susman, Evered, 1978: S. 588) A continuous process of reflection is accompanying this research process—reflection on premises, observations, on our tools of observations, interventions and tools of interventions. Above that, we are applying *pre- and post-occupancy evaluations/studies* (Sailer, Et al., 2010) in order to achieve a more profound understand of the effects of the interventions by comparing conditions at the beginning and after the end of our interventions and change processes.

4.3 Case Study: A1-InnovationDays

Besides the Enabling Space projects mentioned above, we present a case of an innovation process which has taken place in a semi-virtual network-setting, because it has some similarities with a COIN. The architectural dimension is not developed so prominently in this case; as one can see from the example to come, this low focus on architecture shows the strength of the Enabling Space approach, which is normally covered and drowned by the visibility of architecture and design (of offices, etc.). The focus of this example will be on the enabling qualities of an appropriate innovation- and social architecture.

Context

Being inspired and alarmed by recent technological and sociological developments as well as changes in the WWW and the challenges the telecommunication industry is facing as an implication of these transformations, the leading Austrian mobile carrier (mobilkom Austria/A1) intended to organize an open innovation process (compare also Chesbrough, 2003; Chesbrough et al., 2006). Moreover, this initiative, which is referred to as "A1 InnovationDays", aimed at better understanding the value systems, behaviors, and needs of the so-called "digital natives", since they are the most active and avant-garde users of the company's technologies and services. "A1 InnovationDays" is an innovation-format that was designed as an Enabling Space in the form of an international innovation and software developer contest comprising both virtual and physical spaces and processes. The grand theme of the open innovation project was "Open Communication by Open Standards": as we are becoming increasingly connected, communicate faster, are independent of time and place, the various means of communication (phone, email, instant messaging, etc.) are not yet integrated well—the challenge was to enable a space and process for coming up with innovations for integration on various levels.

In a period of six weeks open-source software programmers, concept developers, and designers submitted—mediated through an internet platform—more than 50 high-quality ideas on the topic of the open innovation challenge. During this period, the ideas were publicly discussed and evaluated by this community on the platform. This led to the invitation of the 5 best-ranked ideas for a 3-day prototyping sprint (a format that brings together programmers and designers to very quickly realize functional software prototypes) in a former monastery. It was a precondition for participation that for each idea a team of at least 5 people had to be built. After three days of working, conceptualizing, and programming, 5 functional prototypes have been developed and presented with one team winning the innovation prize. After the initiative officially ended further talks between representatives of the mobile telephone company and the developers took place aiming at transferring the knowledge, expertise, and prototypes having been developed in these days into concrete

business cases. One result of this collaboration is a 3rd place in the RCS Developer Challenge 2010 in Madrid (one of the most important conferences in this domain).

The "A1 InnovationDays" Enabling Space approach and design process

"A1 InnovationDays" were realized as an innovation ecosystem for digital natives following the Enabling Space approach: a well orchestrated set of activities, process innovations, technologies, social interventions, as well as physical and virtual locations was applied in order to explore potentialities that build on the technologies of the mobile carrier. Although—superficially—one could quickly conclude that this initiative was primarily about technology, it turned out that for the design of the Enabling Space social, epistemological and physical spaces are paramount. The following sections give a comprehensive overview of the design process and how the Enabling Space was realized in its diverse dimensions:

1 | Deep observation and going out into the field

Before starting the innovation and design process the team comprising the authors, one manager from the telecom company, and an expert for interior and communication design was arranged. In a first phase 10 qualitative in-depth interviews were conducted with stakeholders in order to achieve a profound understanding of the relevant issues of the relationship between a big corporation and so-called "digital natives". These interviews were conducted by members of the design team with a selected group of stakeholders representing the relevant players in this systemic context: so-called digital natives, experts from the mobile telecom industry and university, management people from the mobilkom/A1 (from various departments: research and development/innovation, customer relationship, human resources, and marketing), social and technology trend people, as well as customers and an expert for spin-offs from big corporations. As discussed in the section about methods, mainly qualitative interview techniques were applied, in-depth interviews leading into generative and dialogue-like conversations (Senge et al., 2004; Scharmer, 2007a; Isaacs, 1999b; Bohm, 1996).

These interviews led to insights that were specific with respect to the topic of the developer contest; for example, a high level of distrust of the digital natives and the corporate world. Hence, before the official start of the initiative, partnerships and relationships with the most important stakeholders have been established (universities, technology providers, media, etc.). This led to an increase in the trust-level and a vivid participation right from the beginning resulting in high quality content. This is important as the quality of the contributed content is often a major issue with public participation processes which was also uttered in the interview process: as soon as low quality content is posted, the quality of the subsequent content is—in most cases—following this trend. Especially digital natives are very sensitive

about this issue and leave the scene in the moment they have discovered low quality content.

Besides the interviews and the prior knowledge, ethnographic studies have been conducted: at several major (semi-)public places in Vienna, the handling and usage of technology among young people has been observed. One key insight from these observations was the dual nature of technological devices: on the one hand, they enable communicating with remote friends, looking up information that serves as input for face-to-face communication, on the other hand, these devices hinder face-to-face communication, since individuals are permanently distracted.

2 & 3 | Sense making & deep understanding & design patterns

In the sense-making phase it is necessary to handle and order the vast amounts of collected information and integrate them into coherent patterns and a systems design. The focus in this phase is not so much on details, but rather on the relationships between the different parts and designing an integrated model. Questions that we dealt with were: what does it mean to the digital natives to be valued and appreciated (monetary prizes, media exposure, non-monetary recognition, etc.)? What are differences in value systems between a big corporation and digital natives? How could we transfer the results of the contest into the sometimes rigid and purely business driven structures of a telecom-organization? How could the observed topics be brought to the digital natives community?

These questions had to be answered first, and then—like a red thread—be woven into the design of the Enabling Space (structure, processes, spaces, etc.) for the developer contest. Take the following example: *appreciation* has been identified as one of the core qualities in the sense-making process. For the Enabling Space design team the challenge was to break down this core quality into design patterns for being able to implement it in every detail as an enabler for fostering innovation, cooperation, and openness. As an implication, for instance, the developers were invited and accommodated in a 4-stars design hotel for the prototyping sprint; they were welcomed by top-managers from the initiator; several employees from the mobile carrier company attended the prototyping sprint during the weekend since they wanted to learn and engage with the digital natives; the working spaces were stunning—a former monastery; at first, only the opening and the award show were planned to be hosted in the chapel, leaving the developers only small rooms for prototyping; however, we convinced the client to also host the working sessions in the chapel; this led not only to overwhelming feedback regarding appreciation, but also contributed to a social place of cooperation in a competitive setting: i.e., the teams competed against each other, but also helped each other throughout the entire three days. Here one can see the importance of how the overall core quality of appreciation finds its realization in various dimensions of this

Enabling Space: social welcome by the management, emotional atmosphere of appreciation, architectural support by a very special place, etc. It is the combination of these interventions which brings about the overall quality of enabling innovation processes.

4 | Interdisciplinary design & realization

A detailed description of the whole design and its realization would be out of scope for this paper. Rather, we want to highlight two important issues. The first one relates to teams and team building. In the sense-making phase, we found out that interdisciplinarity is one of the core qualities/processes. Hence, the whole competition requires an interdisciplinary approach. While all ideas were about some kind of technological solutions, it should also be possible, for example, for a business student to propose an interesting idea without necessarily being equipped with the technical programming skills required to realize the idea in the form of a (software) prototype. For this reason, we demanded that at least 5 people with different backgrounds joint as a team in order to be qualified for invitation for the prototyping sprint. Based on this, we implemented a special functionality on the Internet platform that allowed for team-building: a software developer could search for a designer, a compelling idea from a non-programmer could be joined by a programmer, etc. This function was semi-automatic: it showed the status of expertise already attached to an idea (are we complete or are we looking for someone?) and triggered automatic requests; after that, the potential team members communicated directly via their preferred means of communication.

The second issue, which was crucial for the success of the "A1 InnovationDays", was the combination and balance between the *virtual platform* and *face-to-face working settings.* During the preparation phase the online platform supported the objective of the competition, to generate five functional prototypes, very well: collecting ideas and discussions about them, ranking them, etc. However, when it came to collective design and co-creation processes, another mode of cooperation was needed: a creative field, where a person's performance is the condition for the creativity of another person. I.e., one has to see, feel, smell each other! Here architecture is an important part for establishing such an Enabling Space, but other dimensions are at least as important: trust (to allow intuitive understanding), mutual recognition, a culture of "gift economy", etc. All these issues were taken into account for an integrated design allowing an atmosphere of openness within the boundaries of a competition. This social environment shares the same foundations as COINs, as both are based on high ethical standards: issues of trust and coherence are more important than a quick personal gain or a purely competitive attitude. Any violation of these ethical standards would very quickly exclude members from the community.

A quote from a journalist of the Austrian Broadcasting Corporation, who attended a full day during the prototyping event, illustrates this setting: "Although this is a contest with intense

time pressure, at which the teams after all competed for a one-week sailing trip in the Mediterranean, there was considerable fluctuation between them. If a team had troubles, they asked around, until the required specialist was found. This early Christian ethos, attitude, and way of working caused some attendees from the circuit-switching industry audible surprise." (Erich Moechel, 1.9.2008, ORF Futurezone)

Results & Reflection

The whole process has been accompanied by a research process following an action research approach (Reason, Bradbury, 2001; Susman, Evered, 1978; Argyris et al., 1985)(see above for details). For example, a survey conducted during and after this open innovation initiative showed that (a) 75% of the developers judged the contest as excellent; (b) almost 100% of the respondents reported that they would highly recommend the "A1 InnovationDays" format as appropriate for these kinds of innovation and social challenges. Qualitative interviews (after the event) showed that both the digital natives and the corporate people were not only impressed by the high level of social coherence, but also—and mainly—by the high level of mutual learning both on a technological and on a social level. These very positive feedbacks are remarkable, since digital natives are often very skeptical about larger companies and have strong reservations about them.

For the mobile carrier, the "A1 InnovationDays" were the first open innovation initiative. Our research showed that it generated strong ties between the company and digital natives, it built relationships with key players and it anchored the company in technological topics related to mobile telecommunication. The qualified feedback of the software developers to the technicians and marketing people triggered an intensive learning process, which in turn lead to product and service improvements.

Furthermore, the "A1 InnovationDays" communicated the mobile carrier as a service provider that enables developers/users to exploit its technological base in order to develop new services. This image is in contrast to the commonly held picture about the company, as it is usually seen as pushing its own services and products into the market. The bottom-up engagement with key players in digital natives´ communities supported to communicate this new image.

Another interesting learning is that it is possible to generate high-quality functional software/hardware prototypes within 48 hours.

One could argue that this case does not have a lot in common with Enabling Spaces. Rather the opposite is true: the purpose of this case was that it shows impressively how the dimensions for enabling an integrated innovation space are interwoven with each other and depend on each other. Architecture is only a very small component in this broad perspective

on space. Normally it covers all the other dimensions as it is visually so dominant that it becomes very difficult to discover the social or epistemological processes which are present as well; and most probably, they are more important.

From the examples given above one can see clearly that what makes an Enabling Space interesting is the well-balanced and well-chosen set of processes, structures, and interventions in the various dimensions. This can be only achieved, if one starts with extensive research and rigorous sense-making from the very beginning; it is the basis and source for the unity in the diversity of interventions. The "A1 InnovationDays" case also shows, how an intelligent enabling social design does not only bring about technological innovations, but—what seems to be at least as important—new impulses for a big corporation in the cultural domain, in its self-understanding, in its abilities to innovate, and in its exterior perception by potential external innovators as well as customers. It truly acts as an enabler for this variety of tasks going far beyond an innovation process. This case shows that Enabling Spaces and, similarly, COINS can also act as socio-epistemological innovation technologies "infiltrating" established big companies with new and leading-edge ideas bringing them radical innovation.

5 Implications and conclusions

We started off with claiming that profound and radical innovation cannot be achieved, if one only follows a recipe or executes rules. We found that many innovation processes are not successful because the management assumes that knowledge creation and innovation can be achieved in a more or less mechanistic, deterministic, and controllable manner. It has been shown that the regime of control has to be replaced by an attitude of *enabling*. In the context of innovation enabling means to *provide a set of constraints* and/or a *facilitating framework* supporting the *processes of bringing forth new knowledge*. We have seen that the enabling approach requires an alternative set of attitudes, values, as well as epistemic practices: openness, being able to reflect, to radically question ourselves and our assumptions, and to let go. Furthermore, we have to learn to listen and observe closely, to listen to weak and fragile signals and to cultivate/incubate them, to let come, to follow the flow of reality, to understand our own patterns of perception and thinking, to let impress ourselves (even if it means that we have to give up on well established and dear patterns of thinking), and to cultivate our patience, our ability to wait for the "right moment". These are basic epistemic practices which are necessary for successful innovation- and knowledge work.

As a consequence, we had to ask ourselves how this set of enabling constraints and interventions as well as these epistemic practices could be realized. We referred to this realization as *Enabling Spaces*. The concept of Enabling Spaces is a result of taking seriously that innovation is not only a cognitive activity being located inside the brain or purely virtual between people, but it is intrinsically coupled with the environment (also including the social environment). Innovation is heavily dependent on the interaction and immersion with the environment, be it in the process of close observation, of interaction with other persons of the innovation team, or in the process of fast-cycle learning through prototyping, which is a kind of "thinking-with-the-object"-process. Hence, artifacts play a twofold role: first of all, they are the result an innovation process, they are the innovation; secondly, we are always using artifacts as instruments for supporting these (cognitive) innovation processes. These facilitating artifacts are *Enabling Spaces*.

Accompanying research in the projects has shown that the Enabling Spaces concept is a powerful approach, as it embodies the characteristics of an enabling attitude by integrating a large number of dimensions, processes, as well as cultural factors of an organization. We focused both on the epistemological and on the social factors. That is the point where they become interesting for COINs understood as technology-driven spaces for innovation and knowledge creation work. As is shown by Gloor et al. (2006; 2004) COINs are emergent collaboration spaces and networks. Both in Enabling Spaces and in COINs the goal is to create an environment integrating these dimensions into a facilitating network/structure. While COINs have a strong focus on the enabling functions of technology and, more specifically, on internet technologies and on social enablers, such as trust or transparency, Enabling Spaces also integrate architectural, cognitive, emotional as well as epistemological issues.

COINs and Enabling Spaces share a lot of characteristics, attitudes, values—although their focus is somewhat different in details they aim for a similar goal: namely the collective creation of new knowledge and innovation in an enabling, inspiring, as well as socially trustful environment. The following subsections summarize the most important implications and derive principles which are relevant both in the design of Enabling Spaces and COINS:

Importance of epistemological issues and interdisciplinarity

For designing Enabling Spaces it is essential to take knowledge- & innovation-processes as the point the of departure. Apart from classical parameters, such as organizational structures, cultural processes, or social issues knowledge processes reveal the very deep "secrets" of the organization or of an innovation team. A *profound understanding* of the content, the assumptions, the ways how they deal with knowledge, etc. is a key for designing such enabling environments. This can only be achieved by an in-depth qualitative analysis—

especially, if one wants to use such environments also as a chance for changing an organization into an innovation driven system. Only if one profoundly understands what the organization is about, one will also be able to start discovering its latent and hidden potentials for change and innovation.

Apart from epistemological issues such spaces are *interdisciplinary* in nature with respect to several dimensions: in their design, their teams, and their innovation results. Hence, it is necessary to be aware that the knowledge processes taking place there always have to be organized in a highly reflected manner focusing on making explicit and negotiating the assumptions behind the topics, phenomena, etc. under discussion—this can be achieved in a dialogue oriented setting (Bohm, 1996; Isaacs, 1999b, 1999a). The new always emerges at the borders of disciplines and is the result of frictions between these borders. In this context one has to emphasize the increasing importance of the approaches and skills provided by the humanities (e.g., tools for reflection, sense making, or creation of meaning) and arts (e.g., design thinking; Brown, 2008, 2009; d.school, 2010).

Enabling socio-epistemological interfaces

Enabling Spaces are an integration of *social, epistemological, as well as technological spaces*. COINs as well as Enabling Spaces have to be seen as technologies integrating various fields: epistemology, social systems, and ICT. They are an ecology of artifacts (Krippendorff & Butter 2007, p.5), *socio-epistemological technologies* enabling collaborative creation of new knowledge and innovations.

In this context enabling means to facilitate processes of interaction and the function of an interface. Following Norman's (1991) focus on stressing that we must not misunderstand (cognitive) artifacts as tools primarily amplifying already existing cognitive (creative) abilities, we have to start understanding both Enabling Spaces and COINs as spaces facilitating a change in the mode of knowledge creation itself: it is the *interaction* between the enabling artifacts and the participating cognitive systems that gives rise to a change in the way of bringing forth new knowledge. Furthermore, it is not primarily the materiality of Enabling Spaces (including ICT tools) but its *social utilization* by *interacting* with them that is of importance (e.g., Krippendorff 2011). We have to focus on the process and the functionality of an *interface* that is offered by this integration of (ICT) tools forming an Enabling Space or COIN. They act as an *interface* enabling a smooth interaction with the potential object of innovation. Therefore, it is not only about an interface in the sense of a human-computer interface, but we have to start thinking about the *whole Enabling Space/COIN as an interface* coupling the users, technology, physical and non-physical, as well as social structures of the Enabling Space/COIN with the object of innovation.

Analytic vs. "designerly" approach in Enabling Spaces

As the term "knowledge *creation*" suggests, we are confronted with a process of creating something new (not only) at the front-end of every innovation. Hence, it seems wise to adopt principles and techniques from the field of arts, as they are mainly concerned with processes of creating something (new). This applies both for the process of constructing such enabling environments and for working in/with them. In both domains we are confronted with hyper-complex problems that normally cannot be solved by purely analytical tools and strictly scientific methods. There is no single "best" solution for an Enabling Space or a COIN. Neither are there predictable "best solutions" for innovation problems in most cases. Hence, classical systematic, very precise, mechanistic, or purely scientific or analytical tools will not suffice, as, in most cases, these problems are tough and wicked *problems* (Dorst, 2003, 2006; Gedenryd, 1998; Stokes, 2007)—they are typical *design problems*. For instance, "Thinking from the future" (e.g., Peschl & Fundneider 2008a; Scharmer 2007) requires a completely different set of tools, competencies, as well as enabling contexts compared to classical extrapolation from the past. Design theory (e.g.,Krippendorff 2006; Krippendorff 2011; Glanville 1998; Glanville 2007; Laurel 2003), theory-U (Scharmer, 2001, 2007a; Senge et al., 2004; Peschl, Fundneider, 2008a; Kaiser, Fordinal, 2010) or design thinking (e.g., Brown 2008; Brown 2009; d.school 2010; Sanders & Stappers 2008) provide tools which are suitable for such problems and for solving them in a more "arty"/designerly way—it is a different way of approaching problems and a different way of thinking which is based in the arts, design, and humanities style of thinking. Of course, this does not exclude analytic tools—by combining these approaches they are offering alternative methodological strategies opening up new solution spaces.

Importance of physical space—why space maters for innovation work

Physical space is not only about the (social) quality of face-to-face collaboration in innovation work, but also about epistemological quality in the processes of knowledge creation. It is in the nature of our mind as well as of the epistemological domain that we need some "direct resistance" from the environment for most of our learning- and knowledge creation processes. This is well known form (philosophy of) science: whenever we are doing empirical experiments we are confronted with the limitations of reality and, by that, we are learning by applying a trial-and-error strategy. This process of verification/falsification (Popper, 1959, 1962) is at the heart of any process of knowledge construction as well as of innovation (e.g., in a prototyping setting). In most cases these things cannot be solved by only applying virtual methods (e.g., simulations), as the "resistance" is rather limited in the virtual realm. These things have to be done in "real world" in order to avoid the problem of theory ladenness (e.g., Fleck 1947; Fleck 1979; Godfrey-Smith 2003) and the production of artifacts.

Apart from this aspect, space in its broad understanding being propagated by the Enabling Spaces approach provides a helpful notion for processes of collaborative knowledge creation: innovation and knowledge work does not take place in a sterile and abstract cognitive realm. Rather, these processes are always bound to a concrete space and context in which they are taking place. We have seen that this does not have to be necessarily only a physical space, but it is important to be aware that these kinds of processes need some kind of concrete substratum in which they are realized and in which they can interact. It is the enabling quality of the surrounding artifacts which does not only "extend" our cognitive abilities in the sense of the extended or situated cognition approach (Clark, 2008; Menary, 2010; Varela et al., 1991) in processes of knowledge creation, but also may allow for completely new knowledge dynamics.

Future research is directed towards a more profound understanding of the concept of enabling in an inter- and transdisciplinary context (e.g., from the perspective of educational sciences, systems theory, physics, theory of emergence, etc.). This will allow for a more stable and robust design process in various fields of application. Furthermore, it is planned to explore and apply this approach to related fields, such as creative settlements, creative cities, innovation clusters, etc.

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