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September 2008

Peschl, M.F. and T. Fundneider (2008):

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In M.D. Lytras, J.M. Carroll, E. Damiani et al. (Eds.), The Open Knowledge Society: A Computer Science and Information Systems Manifesto, pp. 101–108. New York, Berlin, Heidelberg: Springer.

Emergent Innovation and Sustainable Knowledge Co-Creation
A Socio-Epistemological Approach to "Innovation from Within"

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Abstract. Innovation has become one of the most important issues in modern knowledge society. As opposed to radical innovation this paper introduces the concept of *Emergent Innovation*: this approach tries to balance and integrate the demand both for *radically new knowledge* and at the same time for an *organic development from within* the organization. From a more general perspective one can boil down this problem to the question of how to cope with the new and with profound change (in knowledge). This question will be dealt with in the first part of the paper. As an implication the alternative approach of *Emergent Innovation* will be presented in the second part: this approach looks at innovation as a socio-epistemological process of "learning from the future" in order to create (radically) new knowledge in a sustainable and "organic" manner. Implications for knowledge society will be discussed.
Keywords: Knowledge society, (radical vs. incremental) innovation, emergent innovation, knowledge creation, change.

1 Innovation as a Key in a Knowledge Driven Society

Innovation has become one of the most important issues in modern knowledge society—not only in the context of business and technology, but also in many fields of science and (higher) education. What makes successful radical innovations so fascinating? What does creating "radically new knowledge" mean in the context of the so-called knowledge society? What would be the implications, if a whole society would understand itself as a *society of knowledge creators and innovators*? How can a *culture of radical innovation* be introduced into an organization or in a society, in its processes, educational systems, services, and business models which—despite their radical nature—fit into the existing structures of the organization/society?

Innovation is among the most challenging processes in the context of knowledge work. Nevertheless the creation of (radically) new knowledge is the key for almost every domain in a society, business or organization—even more so, if the main product or service is focused on knowledge. What makes innovation processes so

difficult and challenging? Primarily, because they have something to do with the future and how to "behave" in the future; more specifically, with constructing knowledge which has to fit both into external future changes (including the resulting new requirements) and to what and where the organization will be at this point in time (e.g., concerning its technology, knowledge, human resources, etc.). In most cases these future states are almost impossible to predict accurately, because the underlying social, economic, technological as well as knowledge dynamics is too complex. In a way we are in a similar situation as science and technology always is: one is trying to predict an aspect of reality in order to increase the level of control over this aspect—the only way one can achieve this is to create new knowledge and apply it in various contexts. Hence, *innovation* and *knowledge* are intrinsically coupled in a complex knowledge process of: (i) acquiring knowledge (via observation, etc.), (ii) abstracting and constructing knowledge (understanding), (iii) creating new knowledge, and (iv) realizing this knowledge in concrete prototypes; (v) after fast cycle learning processes on these prototypes (vi) this newly generated knowledge gets embodied in the organization.

Hence, if a society understands itself as a knowledge society and if it puts innovation as a core issue on its agenda (e.g., European Commission [7]), we will have to find ways of integrating the processes of creating (radically) new knowledge into all levels of society—most importantly in the educational system, in the fields of ecological and climate issues, in the way how we do science, as well as business.

2 Innovation as a Process of Knowledge Creation

2.1 Classical Perspectives on Innovation

In the field of classical innovation management one differentiates between processes of *incremental* and *radical* innovation (e.g. [6] and many others). Incremental innovation is characterized by minor changes and optimizations which do not touch the underlying concepts; "…incremental innovation refines and extends an established design. Improvement occurs in individual components, but the underlying core design concepts, and the links between them, remain the same." (Henderson [8], p 11).
"Radical innovation, in contrast, is based on a different set of engineering and scientific principles and often opens up whole new markets and potential applications... Radical innovation often creates great difficulties for established firms and can be the basis for the successful entry of new firms or even the redefinition of an industry". ([8], p 9). While incremental innovation goes for optimization (see also level 2 of Figure 1) the focus of radical innovation is on changes in the more profound domain of core concepts or base principles. In most cases, making changes in these fundamental domains implies radical changes in the whole structure, society, product, or service (plus its context; e.g., by opening up completely new markets). In other words, radical innovation starts off with changes in the assumptions (see also

level 3 and 4 of Figure 1). „A change in principle, then, fits with our intuition of what constitutes a novel technology. I will therefore define a new (radically novel) technology as one that achieves a purpose by using a new or different base principle than used before." ([2], p 278)

2.1 Strategies of Creating New Knowledge in a Changing Environment

Taking the radically knowledge oriented perspective on innovation having been laid out above seriously one can boil it down to the question of *how to cope with the new and with change by creating (radically) new knowledge*. After taking a look at possible strategies of knowledge creation in this section an alternative approach to innovation will be presented in the second part: *emergent innovation*. This approach looks at innovation as a socio-epistemological process of "learning from the future as it emerges" instead of imposing some external and artificial solution to a problem.
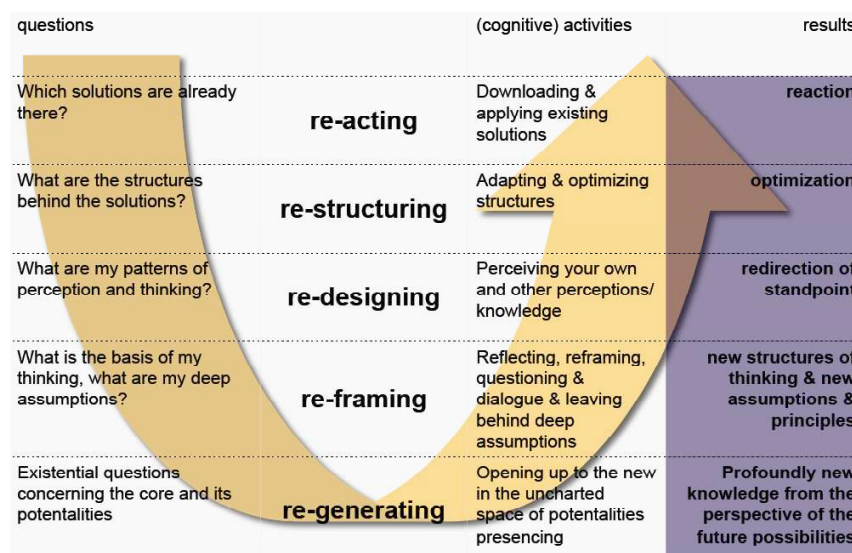
questions	(cognitive) activities	results
Which solutions are already there? **re-acting**	Downloading & applying existing solutions	**reaction**
What are the structures behind the solutions? **re-structuring**	Adapting & optimizing structures	**optimization**
What are my patterns of perception and thinking? **re-designing**	Perceiving your own and other perceptions/ knowledge	**redirection of standpoint**
What is the basis of my thinking, what are my deep assumptions? **re-framing**	Reflecting, reframing, questioning & dialogue & leaving behind deep assumptions	**new structures of thinking & new assumptions & principles**
Existential questions concerning the core and its potentalities **re-generating**	Opening up to the new in the uncharted space of potentalities presencing	**Profoundly new knowledge from the perspective of the future possibilities**

Fig. 1. Strategies of how to cope with change (adapted from Scharmer [14])

Coping with change (see Fig. 1) is at the heart of any innovation process. In most cases the challenge is how to react to this change with a strategy which is based on new knowledge or—even better—to *anticipate* this change and proactively *shape the future* by developing and applying new knowledge. From a knowledge perspective this is a triple challenge: one has not only to react to a change which has occurred already; rather, (a) one has to *anticipate* this change and (b) to *relate* it to a possible future state of one's own knowledge (be it in one's own society, business, human resources, technology, etc.). (c) Above that, one has to *shape* a whole future scenario which integrates these domains in a (radical) innovation (radically new knowledge,

business model, service, product, etc.). Of course, this is the most sophisticated form of dealing with the challenge of knowledge creation and change. In the following paragraphs we are going to discuss different levels and strategies of how to deal with change (see Figure 1; see also [14, 15]):

1. *Reacting and downloading* is the simplest way of responding to change. Already existing and well established behavioral, organizational, perceptual, or cognitive patterns are applied to solve the problem or the learning/adaptation task. This is the most convenient and most economic way of reacting to change, because it requires only downloading of already prefabricated solutions, knowledge, patterns, etc. The price of this simple response is quite high: (i) the reactions are highly rigid and (ii) the resulting solutions or changes do not go very deep and in most cases do not even scratch the underlying issues of the problem. However, this mode of dealing with change is what most cognitive systems and organizations do most of their time.

2. *Restructuring and adaptation* goes one step further by not only applying already existing knowledge patterns, but to use these patterns as a blueprint which is *adapted* slightly to the current situation. From a cognitive perspective this is a highly efficient learning strategy, because it is not as rigid as downloading, but it can be done with minimal cognitive effort; namely, to make use of already existing knowledge, patterns, change them slightly and apply them to the new situation, task, etc. From the field of cognitive (neuro-)science these processes are well understood—these are the classical learning and adaptation processes well known from the domains of connectionism or computational neuroscience (e.g., [3, 10, 13] and many others). From this perspective it becomes clear that these processes are mathematically equivalent with processes of *optimization*. I.e., we are searching for an optimum in an already pre-structured space (of solutions). These processes of optimization normally lead to *incremental innovations* [6].

3. *Redesign and redirection*: The focus of this strategy to cope with change is to primarily explore one's own patterns of perception and thinking in order to be able to assume *new perspectives*. In that process the focus of attention shifts from the external object to the source of one's cognitive and perceptual activities—this shift is referred to as *redirection* (e.g., Depraz, Varela; [5, 16]). This can be done individually, however, it is much more effectively in a collective setting. The goal is to arrive at a position from which it is possible to take different standpoints and to understand what one's own patterns of perception and thinking are—these insights act as a starting point for creating new knowledge and for the following level of reframing.

4. *Reframing*: The process of redirection does not touch the domain of assumptions in most cases; downloading, adaptation, and optimization are sufficient for mastering everyday problems and challenges. In a way these solutions are not very interesting from the perspective of radical change, because they do not bring forth fundamentally new knowledge, insights, or understanding. Fundamental change is always connected with reflection of *deep assumptions* and stepping out of the—more or less consciously—chosen framework of reference. I.e., going beyond the boundaries of the pre-structured space of knowledge and "reframe" it in the sense

of constructing and establishing new dimensions and new semantic categories. This process concerns the level of mental models, premises, deep assumptions and their change. In dialogue-like settings (e,g., Bohm; Isaacs [4, 9]) these assumptions are explored in a double-loop learning manner [1]. Going one step further, this process of reflection leads to the construction of completely new conceptual frameworks enabling the reframing of already well established cognitive structures. These are the basis for *radical innovations*.

5. *Re-generating, profound existential change, and "presencing"*: On a more fundamental level, change goes beyond reframing; it is not only concerned with intellectual or cognitive matters and modifying assumptions any more. In that more fundamental context, questions of *finality, purpose, heart, will*, etc. come to the fore—what they have in common is that they concern an *existential* level rather than a cognitive level. From a learning perspective these processes are realized in the *triple-loop learning strategy* (Peschl [11]). In this mode of learning change is not solely based on cognitive reflection any more, but more importantly on *existential reflection* and learning. In a way the goal is to bring the existential level of the person and the organization/society (i.e., its acting as well as its core) into a status of inner unity/alignment with itself and with its future potentials as well as with future requirements. What might sound esoteric is in fact a very old theme and philosophical issue going back at least to Aristotle's philosophy. Very often these questions concern the domain of the core/substance of the innovation object and of *wisdom*. Due to its existential character [11, 14, 15] refer to this mode of change/learning as "*presencing*". It represents an approach to innovation which does not primarily learn from the past, but which shifts its focus towards "*learning from the future as it emerges*". I.e., the goal is to be very close to the innovation object and at—the same time—completely open to "what wants to emerge" (out of the surrounding, out of the organization, its humans and its knowledge)—the difficult part in this approach is (i) to profoundly understand the situation (i.e., the core of the innovation object) plus its context, (ii) to match these insights with the potentials which want to emerge, and (iii) to bring them into a consistent and integrated picture. In short the process of presencing is about a fundamental examination of the *core* of the innovation object leading to a profound, holistic, and integrated understanding of this object including its context— only a highly nurturing environment for generating profound new knowledge may give rise to *radical innovations* which are not only radically and fundamentally new and completely "out of the blue", but which are also *fitting well* into what emerges in society, in the organization, and in culture in general.

These strategies of coping with change and innovation do not exclude each other; in most cases aspects of almost every level are present in one or the other way in innovation processes—the interesting question for an organization or society is where it shifts its focus to.

It is clear that levels 3–5 are *intellectually challenging* and demands for an explicit culture of openness, knowledge creation, and real commitment to (radical) innovation both on an individual and a collective level. From an innovation perspective, these levels are most interesting—hence, the question: how can these innovation processes

of levels 4 and 5 be realized in organizational settings or in a whole society? Besides their manifestations as entirely new, surprising, and convincingly coherent innovations, services, products, or business models the fascinating aspect of "real" fundamental innovations are the "mental innovations" and the "mental change processes" of knowledge (creation) having led to these manifestations. How can they be brought about?

3 Emergent Innovation

We are suggesting a newly developed concept as one possible answer to these questions: *Emergent Innovation*. this approach has been empirically tested in several educational and business settings. It follows a fundamentally different approach: it is a *socio-epistemological technology* focusing on the cognitive, epistemological, and social processes leading to a "*radical yet organic innovation from within*".

Profoundly Understanding the Core as Prerequisite for Emergent Innovation
This kind of *innovation emerges* out of a process of (i) a profound understanding of the innovation-object and (ii) reflecting and letting-go of predefined patterns of perception and thinking (compare also U-Theory [14]). This leads to *radical, yet "organic innovations" in the sense of both respecting and developing/changing the core/essence of the innovation-object* (be it an aspect of society, business, service, product, idea, etc.). This socio-epistemological technology of emergent innovation is a highly fragile and intellectually challenging process which has to be held in a container which we are referring to as *enabling space* [12]; it is a multi-dimensional space enabling and facilitating these processes of knowledge creation. This enabling space comprises of a physical, social (trust, etc.), mental/cognitive, epistemological, as well as technological dimension.

"Innovation from Within" and Thinking from the Future
Seeing, profoundly understanding, reflecting, and respecting what is (already) is at the focus in the first phases of the process of Emergent Innovation; it regards what is already there as a chance rather than an obstacle. Instead of imposing external and/or inadequate patterns or "wild ideas" to the object of innovation Emergent Innovation tries to respect and at the same time explore and develop the most radical and unforeseen potentialities of the (profound understanding of the) core/essence of what is already there. In other words, it explorers the space of *what is present in a latent manner* and what wants to emerge. In this sense emergent innovation is a kind of "*radical innovation from within*".

Exploring this space of potentialities implies that Emergent Innovation looks at innovation as thinking from the perspective of future potentialities rather than of repeating, adapting, and extrapolating patterns from the past. The question "*what wants to emerge?*" is a clear pointer into the future and implicitly instructs the whole process of Emergent Innovation/knowledge creation. As an implication of the points above the knowledge being created in such a process of Emergent Innovation is not

some kind of superficial innovation artificially grafted onto an organization by some external forces (or consultants); rather, it is an organically grown, yet radically new knowledge both fitting into the existing structures and bringing forth something radically new.

Emergent Innovation as a Collective Socio-epistemological Process of High Quality Knowledge Creation

In most cases, innovations do not just happen by chance. A culture of openness, learning, creativity, readiness for error, etc. must be fostered and rewarded in order to make innovation happen in an organization or even in a whole society.

Regardless of the many techniques available to stimulate innovations, most innovation processes are based on the classical process steps of: idea generation, idea selection, idea management and realization of plans. In many cases the techniques being used in this process are massive brainstorming sessions (quantity first), market research, user testing, external studies etc. Most outcomes of such an approach are *incremental* innovations, as the basic thinking behind these processes does not go beyond level 2 (see Figure 1). They are implicitly based on the assumption that radical innovation is based on "far out", "creative", and completely orthogonal ideas (grafted onto the business from the outside), on a high quantity of—in most cases low quality—ideas going through a rigorous selection/evaluation process, etc. which makes the whole process even more erratic and unpredictable.

The core idea is that *emergent innovation* is not primarily dependent on exceptional individuals who are supposed to create radical innovations, but that a larger number of members of an organization acquire the understanding and skills in the basic thinking that underpins the processes of levels 4 and 5 in Figure 1.

Emergent Innovation—Aspects for Knowledge Society

If innovation is a top priority in a knowledge society, it will have to find ways of integrating these issues into its most basic systems, such as the educational system, the way we do business, science, the way we deal with ecological issues, etc. Taking the approach of Emergent Innovation into account the following selection of points has turned out to be crucial with respect to questions of knowledge society:

- There has to be a clear focus on the processes of cognition, perception, and reflection as well as on training and changing them profoundly (via techniques of radical reflection, questioning, dialogue, deep observation, etc.).
- As Emergent Innovation primarily looks at and values what is already there society has to "relearn" to be more attentive, to listen and observe more deeply, to understand profoundly, etc. instead of hoping to find its fortune in only generating completely shrill and "far out" ideas which do not really fit their needs and desires.
- We have to learn to be silent and to wait: i.e., sometimes it is necessary to take some time of doing—superficially seen—"nothing" and listen to what wants to come forth instead of forcing some pseudo innovative activity. In other words, the focus is shifted towards the process of *emergence* of innovation (from within) and towards *enabling* this process (instead of imposing or forcing it; see "enabling space" [12]).

- If something new comes up in this process, we have to be prepared to act quickly and in a determined manner, however.

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