Innovation 3.0: Embedding into community knowledge

- The relevance of trust as enabling factor for collaborative organizational learning[1] -

Joachim Hafkesbrink

Innowise GmbH, Bürgerstr. 15, 47057 Duisburg, Germany.
E-mail: jh@innowise.eu

Janina Evers*

Innowise GmbH, Bürgerstr. 15, 47057 Duisburg, Germany.
E-mail: je@innowise.eu
* Corresponding author

Abstract: The paper describes a conceptual approach for a next-generation innovation paradigm in the Digital Economy called ***"Embedded Innovation"*** (Innovation 3.0). The notion of ***"embeddedness"*** is introduced to mark the increasing challenge of ***integrating firms into their surrounding communities*** to assure the absorption of their exploitable knowledge. Trust is supposed to be the enabling parameter in balancing multiple relationships with communities.

In the paper the evolutionary steps from Closed via Open to Embedded Innovation in SME are described. On the basis of the firm's different relationships and knowledge flows with respect to its surrounding communities different modes of how to cultivate trust are defined and how this may unfold leverage effects for organizational embedding into communities. Finally, hypotheses on different organizational antecedents are developed that may be appropriate to embed the firm into communities with the aim of ensuring knowledge absorption and collaborative learning.

Keywords: Innovation 3.0; Communities; Collaborative Learning; Trust; Open Innovation; Embeddedness; Organizational Change; Digital Economy.

1 Introduction

This paper[2] describes a conceptual approach for a next-generation innovation paradigm in the Digital Economy called ***"Embedded Innovation"*** (Innovation 3.0). The approach is based on the observation that, in order to survive, SMEs – especially those operating in an increasing dynamic and digitalized environment, with knowledge being the most indispensable and important resource for innovation -- need to establish trusted relations to aligned communities, networks and stakeholders (Hafkesbrink and Schroll, 2010). The notion of "***embeddedness"*** is introduced to mark the increasing challenge of substantially ***integrating firms into their surrounding communities*** so as to assure the absorption of their exploitable knowledge. In this context, Innovation 3.0 goes beyond Open Innovation (Innovation 2.0). It does so as it conceptually embraces specific ambidextrous organizational capabilities[3] (O'Reilly and Tushman, 2008) of using dedicated institutional arrangements to accomplish the embedding process. This may be implicit (e.g. trust culture) or explicit (e.g. formal contracts), explorative or exploitative, organic or mechanic (Tushman et al., 2002), depending on the nature and phase of the innovation process and the characteristics of relationships. Hence Innovation 3.0 should provide the ground for strategies based on an eclectic choice of advancing innovation management practices from the Innovation 1.0 and 2.0 paradigms. Innovation 3.0 is expected to evolve as the third way for SMEs to synergetically combine closed and open innovation. Trust is supposed to be the enabling parameter in balancing necessary multiple relationships with communities, a hypothesis that is investigated further in this paper.

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[3] Ambidextrous capabilities "are rooted in building organizational forms that match the complexities of the firm's environment" (Tushmann et al. 2002, p 8).

Open Innovation to date is mainly discussed in large-scale companies which display numerous examples of successful strategies of knowledge absorption from external sources, as well as inside-out technology transfer and knowledge exploitation (Chesbrough, 2003; Chesbrough, 2004). In contrast, the Innovation 3.0 paradigm relates to experiences from in-depth case studies on Open Innovation in SMEs of the Digital Economy (Hafkesbrink, Stark, and Schmucker, 2010; Hafkesbrink and Scholl, 2010; Hafkesbrink, Krause, and Westermaier, 2010; Hafkesbrink and Schroll, 2010). These SMEs are, by nature, more open to collaborate in innovation processes, because knowledge is widely distributed and knowledge cycles are extremely dynamic. There is no "big player"[4] who is able to sophisticatedly 'manage the open innovation process', by, for example, applying "Lead-user approaches", or by using "Open Innovation toolkits", or by organizing "Innovation contests" (Diener and Piller, 2010) to develop enough gravitational force to attract additional knowledge providers. Instead, the generation of innovation in this sector is based on multiple interactions. However, individual and decentralized SMEs which share (pre-competitive) knowledge have to maintain multiple relationships with communities to create innovation. From a bird's eye perspective, these SMEs act like a swarm, searching for a positive-sum game since they successfully exploit knowledge collectively in networks, communities etc. Thus, in the Digital Economy, "Open Innovation" (aka Innovation 2.0) appears to be a more or less natural procedure, and an evolutionary intermediate step towards the new "Innovation 3.0" paradigm. This establishes collaborative SME clusters/networks with communities which are sufficiently flexible and stable enough to embed knowledge, and to make use of, and exploit, collective learning in multi-agent systems.

In these multi-agent systems, a multitude of principals (trusters) and agents (trustees) exist on both bilateral and multilateral levels. Hence, "Embedded Innovation" is in need of trusted relations within a firm's surrounding communities. Depending on the characteristics of different communities, the means to establish trust vary considerably. Concerning these characteristics, empirical findings from earlier research (Hafkesbrink, Stark, and Schmucker, 2010; Hafkesbrink and Scholl, 2010; Hafkesbrink, Krause, and Westermaier, 2010; Hafkesbrink and Schroll, 2010), reveal that organizational adaptability balances out flexibility and stability in community and network relations so as to ensure long-term knowledge integration and competitiveness.

This paper is organized as follows: first we will describe the evolutionary steps from Closed via Open to Embedded Innovation in SME networks of the Digital Economy following the development of its most distinguished enabling technology – the Internet. Second, we will sketch the firm's different relationships and knowledge flows in the Digital Economy with respect to its surrounding communities. Third, we will define different modes of how to cultivate trust and how this may unfold leverage effects for organizational embedding in communities. Finally, we will develop open research questions and a set of hypotheses on different organizational antecedents that may be appropriate to embed the firm into communities with the aim of ensuring knowledge absorption and collaborative learning.

2 The Paradigm Shift from Closed via Open to Embedded Innovation

The so-called 'Digital Economy' embraces all actors in digital value creation processes and includes multi-media agencies, e-commerce, interactive online marketing and mobile solutions providers, games developers, social media providers etc. The Digital Economy had to open up its innovation processes very early, when faced with, first, the high velocity of on-going technology and media convergence processes (see Fig. 1), and, second, a broad distribution and variety of specialized knowledge throughout industry and society.

Figure 1 Technology-/Media Convergence in the Digital Economy

	Games	IPTV	Mobile	Web X.0	eLearning	eCommerce
Games		Lifelike animated games	Multiplayer Mobile Games	User-generated games	Serious Gaming	In-Game Advertising
IPTV			Mobile live blogging	Personal Shopping	Business TV	In-Video Advertising
Mobile				Smart Objects Content	Context-aware Learning	Geo-tagged shopping
Web X.0					Web 2.0 based learning	Social Shopping
eLearning						Nine Sigma experts systems

[4] Like the well known examples of Intel, BP, Lego, Nike, P&C, IBM etc.

The main enabling technology for the Digital Economy is the Internet (see Fig. 2[5]). From 1990 onwards, based on *Web 1.0*, new digital services were developed as industry discovered the Internet to be primarily an additional resource for providing marketing information (as an "information web"). Later the first ecommerce business models introduced interaction and transaction into the Web ("transaction web"). The main properties of Web 1.0 were initially static -- and later -- dynamic information. The prevailing innovation paradigm was ***"Closed Innovation 1.0"*** based on an internal accumulation of certain IT, media and ecommerce competences, protection of *IPR* (Intellectual Property Rights (IPR)), and formal/explicit contracts such as *NDA*s (Non-Disclosure Agreements (NDAs).

With the emergence of Web 2.0 in 2004, a *"collaborative turn"* occurred with new, interactive web-based tools that facilitated collaboration with end-consumers (B2C), between end-consumers (C2C), and in business-to-business (B2B) contexts. Since then ***'Open Innovation 2.0'***, has been on the agenda, with specific characteristics in the Digital Economy complementing the old Innovation 1.0 paradigm.

Figure 2 Co-evolution of the Web and Innovation Paradigms in the Digital Economy

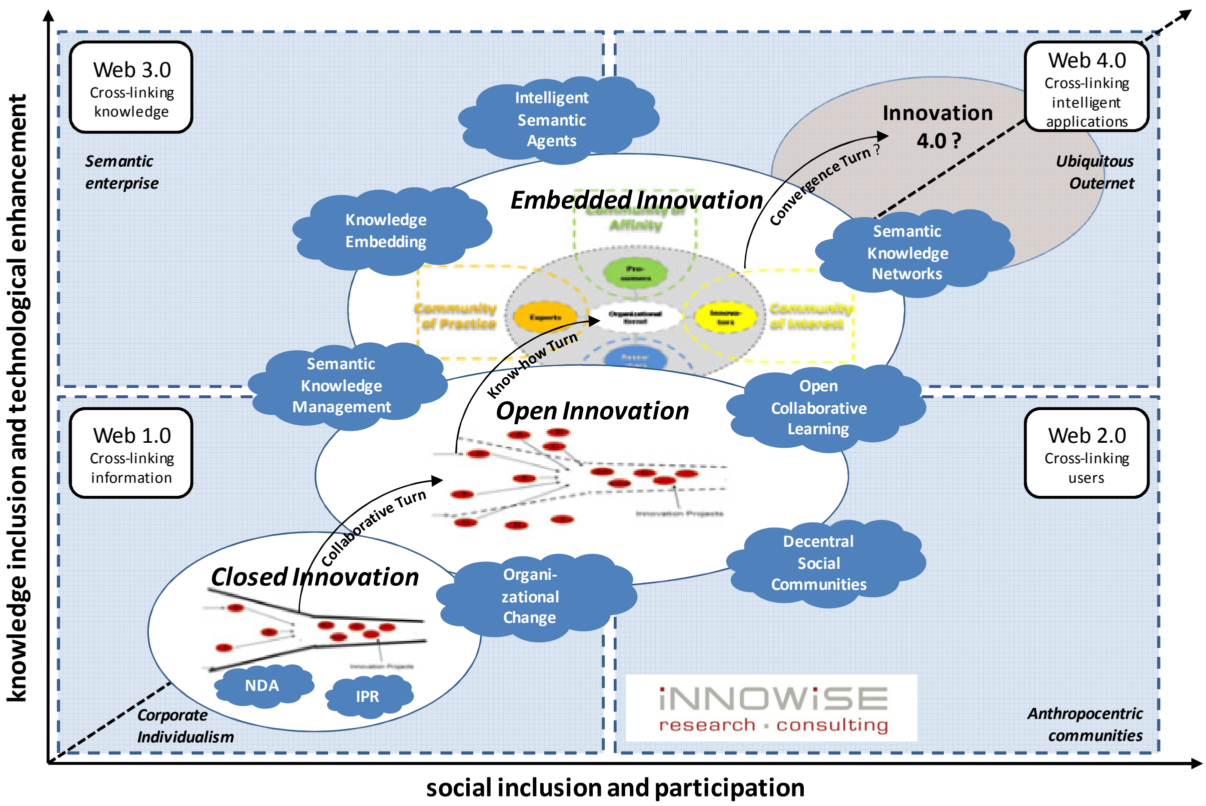


Figure 3 demonstrates that ***Open Innovation 2.0*** in the Digital Economy can be described with respect to, (a) the main product/technology related characteristics (which we call "Open Technology" and "Open Content") and, (b) two generic principles to boost innovation ("Top-down" and "Bottom-up"). This yields four quadrants, for each of which we will illustrate certain Digital Economy Open Innovation activities.

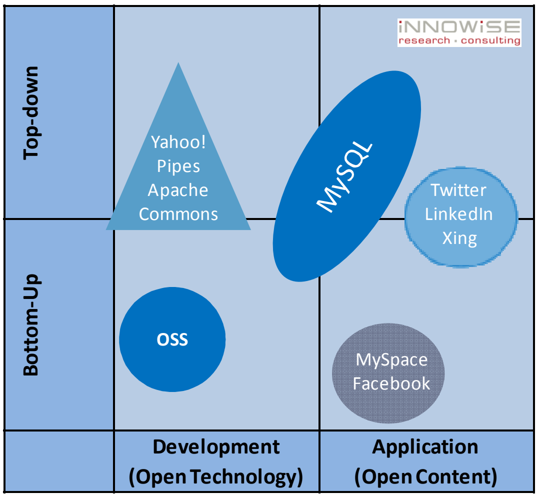
One type of Open Innovation process that starts from scratch, is predominantly ***"Bottom-Up"*** oriented. Here we find, for example, a starter-kernel or a common programming context (e.g. tools, languages, environments, goals, etc), but no pre-defined common project, common goal or common organizational context of production. *"*Open Source Software*"* (OSS) Innovation is probably the best known Open Innovation process that has been running successfully for many years (e.g. LINUX). Other Open Innovation processes have a decisive common project context, a centralized authority with control over the code base, and are typically organized in star-

[5] *Italized terms* serve as a comment to the following Figures.

shaped networks with developers only communicating to one central hub. These collaborative development communities are more or less organized in a ***"Top-Down"*** manner with a specific, e.g. programming, goal.

The main characteristic of OSS is that it aims towards an ***"Open Technology Innovation"***. We will define this as a technological development, in which collaboration is more or less open to all, and the innovative source technology is shared, licensed etc. between stakeholders to develop software programs or applications for different fields. ***"Open Content Innovation"*** is more an application of technology, e.g. to enable and stimulate collaborative innovation and open business models that, amongst other things, allow for crowd-sourcing in different application fields, such as social software applications like Web 2.0 platforms. Wikipedia, which itself is an Open Content Innovation, defines this term as "…any kind of creative work, or content, published in a format that explicitly allows copying and modifying of its information by anyone, not exclusively by a closed organization, firm or individual."[6] Social networking websites (like Facebook, MySpace) were initially examples of Open Content projects, since they allow users to share their information with each other and through other websites.[7] While these platforms are organized on a more or less bottom-up basis, there are also social networking sites that comprise more top-down elements like LinkedIn and Xing -- the former being more platforms to maintain circles of friends, the latter being more platforms to organize business networks.

Figure 3 Open Innovation facets in the Digital Economy



Source: Hafkesbrink and Schroll 2010

While Web 1.0 more or less **cross-linked information** and concentrated on *"corporate individualism"*, Web 2.0 (the 'Collaboration Web') **cross-links users**, promotes *social inclusion and participation* (see the horizontal axis in Fig. 2) and has an *anthropocentric* nature. It strongly supports one of the famous 95 theses of the early days of the Internet's Cluetrain Manifesto[8] that "markets are conversations". *Decentralized social communities* emerged that already turned some conventional marketing strategies and business models upside-down. On the one hand, firms had to listen to the voice of their clients more intensively. On the other hand, they began to make use of their complaints, ideas etc. to improve products and services. The term 'crowd-sourcing' was born, one of the essential ingredients of 'Open Innovation'.

In contrast to the anthropocentric nature of Web 2.0, a more techno-centric matter additionally drives the innovation landscape of the Digital Economy (see again Fig. 2), the so-called "Semantic Technologies" (Stark, Schroll, and Hafkesbrink, 2010). Web 3.0 (the "Semantic Web") is based on the attempt to capture the meaning (semantics) of information and to **cross-link knowledge** by using so called meta-data (*context-data*) making it possible for the Web to "understand" and satisfy the requests of people and machines to use its content[9] (see Stark, Schroll, and Hafkesbrink, 2010). Semantic Technologies are the most prominent enablers for the transition from data and information to knowledge.

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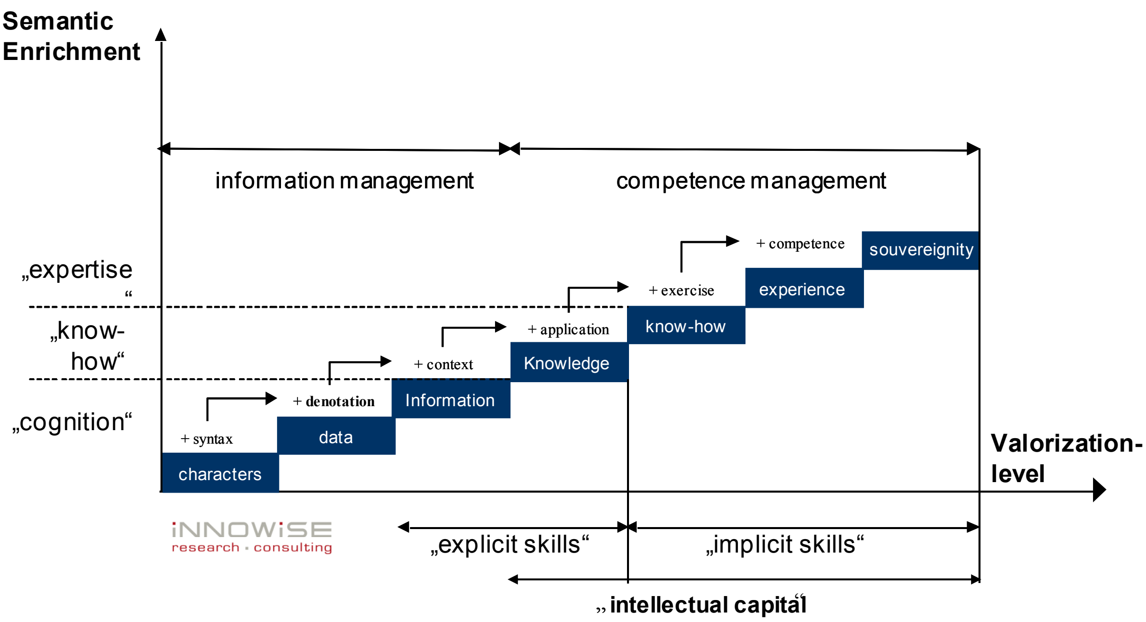
[6] See 'Open Content'. In: Wikipedia, the free encyclopedia.

[7] Behind these networks one also finds Developer Platforms (like the MySpace Developer platform) that support the development of applications based on, e.g. the "OpenSocial model", by providing a standard set of open source APIs that allow developers to build applications that work with any OpenSocial-enabled Web site. These APIs enable social networking Web sites, such as MySpace, to share their social data across the Web. See http://wiki.developer.myspace.com/index.php?title=Category:OpenSocial

[8] See http://www.cluetrain.de

[9] See 'Semantic Web'. In: Wikipedia, the free encyclopedia.

Figure 4 Evolution from characters to sovereignty: the up- and downstream artefacts of knowledge



Source: inspired by Auer-Consulting (n.d.)

When we talk about *"knowledge inclusion and technology enhancement"* (see the vertical axis in Fig. 2) as drivers of the Digital Economy's innovation landscape, we have to consider first the evolutionary steps of semantic enrichment and valorization (see Fig. 4). By using sophisticated knowledge representation, annotation and management technologies, the Semantic Web facilitates:

- the selection of *data* and *information* on a specific subject (by increasing the efficiency and effectiveness of selective searches) for recognition purposes. 'What do I need to recognize?', is the background question that must be asked here;

- the absorption of *knowledge* and *know-how*, which includes context-related information and application-oriented understanding of a specific subject. 'What specific information is valuable for my application context, and where can I apply it?'

- the exploitation of *expertise*, by establishing a *"Semantic Enterprise"*, which includes the advancement of exploiting hands-on *experiences* and *sovereign capabilities* for innovation. 'How do I manage accumulative semantic cognition and relevant know-how absorption to support innovation over time?'

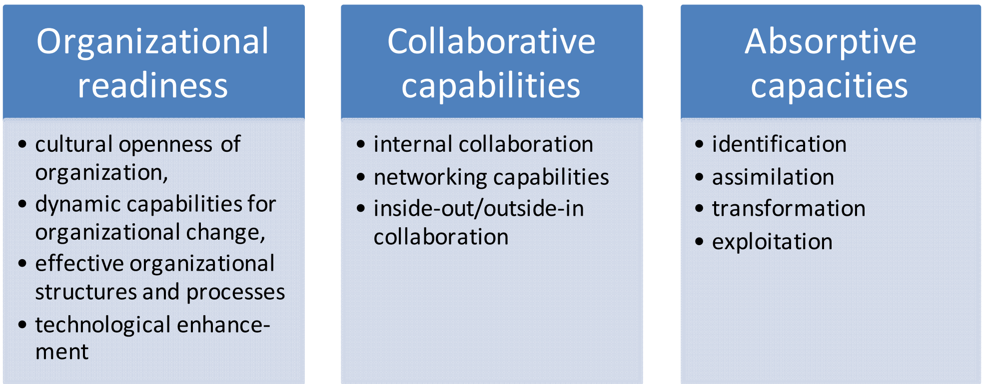
Within this context, Web 3.0 will enable a better adoption of context-related information and application oriented knowledge (*know-how*). This technological enhancement will help to develop more targeted innovation related expertise and improve the *competence management* necessary for innovation (Hafkesbrink, Hoppe, and Schlichter, 2010). In future, Web 3.0 may be supported by "Semantic Agents" that help knowledge workers to better find tailored information in the billions of repositories of the Internet.

The next evolutionary step in Web development (again see Fig. 2) already becomes apparent when observing the technological and business model trends of the so-called "Outernet" (http://www.trendone.de/outernet.pdf). Innovation 4.0 will further leverage the convergence between technologies and will bring the Internet into the real world (Internet of Services; Internet of Things (Stark, Schroll, and Hafkesbrink, 2010)). We call this *"Convergence Turn"* , since technologies, the media, markets and actors' configurations will fuse together beyond the already fuzzy sector boundaries of the Digital Economy, and thereby integrate most parts of the conventional "Analogous Industries". Thus Web 4.0 will **cross-link intelligent applications** with products, services, locations, etc. of the real world in transforming the Internet to – what we call – a *"Ubiquitous Outernet"*.

3 Characteristics of Community Learning Processes for Innovation 3.0

The *"Collaborative Turn"* from closed to open innovation (again see Fig. 2) will not be possible without *organizational change*. Organizational antecedents to enable Open Innovation have been investigated in-depth (Hafkesbrink, Stark, and Schmucker, 2010; Hafkesbrink and Scholl, 2010; Hafkesbrink, Krause, and Westermaier, 2010; Hafkesbrink and Schroll, 2010), and empirical findings from case-studies in the Digital Economy have shown that a set of specific pre-conditions in an organization's structure, processes and culture are conducive for 'Open Innovation' (defined as "organizational competences"; see Figure 5).

Figure 5 Organizational Competences for Open Innovation



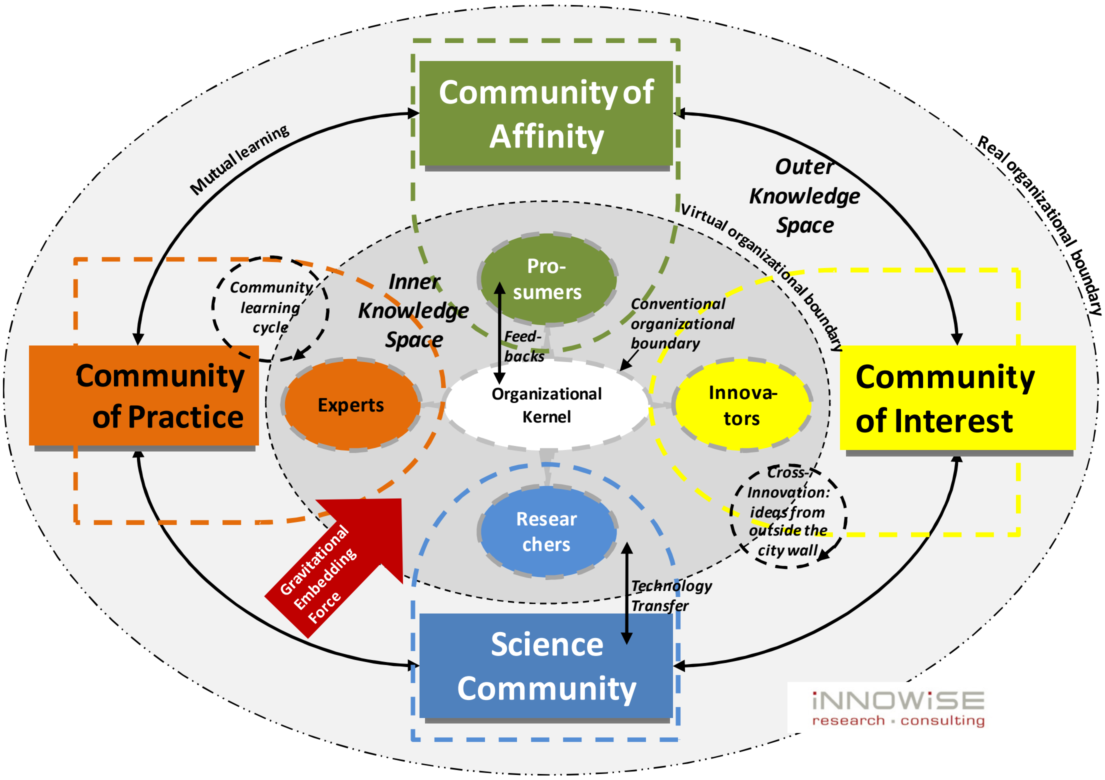
Source: Hafkesbrink and Schroll 2010

At the heart of Open Innovation is *"Open Collaborative Learning"*. This is an essential component of 'dynamic capabilities for organizational change', which we define as interleaved, entangled loops to acquire new knowledge, behaviors, skills, values or preferences within and between a minimum of two entities, i.e. persons or institutions, and which constitutes an on-going feedback mechanism between an open business case and its organizational consequences (Hafkesbrink and Scholl, 2010). At the same time, 'Open Collaborative Learning' marks the bridge to what we call *"Embedded Innovation"*.

We define "Embedded Innovation" (Innovation 3.0) as the fundamental ability of a firm to synchronize organizational structures, processes and culture with open collaborative learning processes in surrounding communities, networks and stakeholder groups so as to ensure the integration of different external and internal knowledge, i.e. competences or technological capabilities, and to exploit this knowledge to commercial ends.

With this definition of *"Embedded Innovation"* (Innovation 3.0), we extend the common definition of 'Open Innovation' (Lazzarotti and Manzin, 2009; Svensson and Eriksson, 2009) by introducing the notion of integrating the organization into communities to ensure knowledge absorption instead of just managing inside-out and outside-in processes. The decisive difference between Innovation 3.0 and the Open Innovation paradigm is the new modeling of learning processes (see Fig. 6). This differentiates *Embedded Innovation* from its predecessors with respect to the transition from single-agent to multi-agent based innovation processes:

Figure 6 Innovation 3.0: Collaborative Learning and Embedding into Communities



Source: inspired by Konstapel, H. (n.d.)

As already discussed, knowledge generation and knowledge flows in the Digital Economy are widely distributed throughout the entire innovation system. Corporate innovation and long-term competitiveness depend on the ability to integrate these knowledge flows into an organization. Knowledge generation usually takes place in different communities throughout the innovation system. Supported by new interactive Web 2.0 based tools, knowledge, behavioral attitudes, skills, values and/or preferences are articulated and shaped continuously as a result of human interaction, whether in a working or leisure context. We call this **'Community based learning'**, as the social interaction delivers a mutual progress in knowledge accumulation within the social community (Hafkesbrink and Scholl, 2010).

Four different archetypes are important for embedding the firm for a successful implementation of the Innovation 3.0 paradigm:

In ***Communities of Affinity*** (CoAs), cohesion between agents is motivated by a similar inherent attitude towards a firm's products and services. Consumers are typical members of these Communities, expressing their values and beliefs in social networks by giving feedback such as reviewing products, exchanging experiences about using the services, or chatting on social fora about related, even peripheral, matters. The new species of *"Prosumers"* are of special interest for an innovating firm, since these agents provide substantial contributions to alter or improve the firm's products and services. They *pro*duce and con*sume* at the same time. Thus, co-production involves a continuous process of semi-automatic, seamless revising of resources through feedback. This mode of 'swarm intelligence' provides the ground for numerous ideas, both for incremental improvements in existing product/service portfolios and for new product and service development (NPSD) processes. Learning within the CoA is an intensive process. By using services and products, and by exchanging experiences, consumers and prosumers learn from interaction and can initiate collective learning through *Community Learning Cycles*. Since easy communication is enabled by digital connectivity, the magnitude of learning is theoretically endless and potentially global (Komoski, 2007). Modern fora or blogs in the Web 2.0 Internet are global operating platforms with contributions from all over the world. Knowledge generation in these social communities follows an exponential function creating a demand for, amongst other things, new evaluation methods for trend spotting (Harrer, Zeini, and Ziebarth, 2009). Learning in CoAs needs to be supported by the use of interactive tools to maintain customer relationships, as well as the transition of customer contributions into the organization and into the innovation funnel.

"Communities of Practice" (CoPs) are pooled by agents having mutual interests in problem solving (Wenger, 1998). "CoPs consist of practitioners who work as a community in a certain domain undertaking similar work." (Fischer, 2001) The similarity of agents emerges because they are facing similar tasks. The agents are usually called *"Experts"*. They act in a more or less self-organized manner, and exchange knowledge, behavioral attitudes, skills, and values in ways similar to the already mentioned "*prosumers*", although their social background is different (Wenger, 1998). They:

- share historical roots
- have related enterprises
- serve a cause or belong to an institution
- face similar conditions
- have members in common
- share artefacts
- have geographical relations of proximity or interaction
- have overlapping styles or discourses
- compete for the same resources
- sustain mutual relationships – harmonious or conflictual
- have an absence of introductory preambles, as if conversations and interactions were merely the continuation of an ongoing process
- can very quickly set up the discussion of a problem
- know what others know, what they can do, and how they can contribute to an enterprise
- have specific tools, representations, and other artefacts
- share a local lore, shared stories, inside jokes, jargon and shortcuts to communication as well as the ease of producing new ones (see Wenger, 1998, p. 127).

For firms, learning in, and from, CoPs is different from those learning in CoAs, since the anchor of exchanging knowledge, behavior, skills, values and/or preferences varies substantially, depending on the respective Community. Looking at the open innovation funnel (Hafkesbrink and Schroll, 2010), *prosumers* in CoAs usually play a decisive role downstream in giving feedback to products and services already placed on the market, and upstream in the design of new products and services (Piller, 2008) as a result of ideas coming from user panels, etc. The collaboration is narrow, less embedded, and more or less non-technical, but is nevertheless invaluable for marketing purposes in learning about the needs of the market. Thus, the gravitational force to be cultivated in order to attract *prosumers* in CoAs follows dedicated -- but easy to implement -- incentive-systems like a "reward for the best idea". Of course some *prosumers* may be 'experts' as they are specialists in a certain domain of interest for the firm. As such, experts probably play additional roles in CoPs as they are able to have more in-depth engagement in the new product and service development-process.

In CoPs the situation is different. Here we find technical experts who usually deliver substantial contributions (e.g. in software programming, ontology design etc.) that are based on specific expert communities, such as OpenSIM or OSS (see Fig. 2). A significant number of CoP agents are freelancers or consultants, and are self-employed or partners/members of a micro-enterprise. In the Digital Economy, these freelancers play a decisive role in the innovation system, since they deliver indispensable complementary knowledge in innovation processes (Hafkesbrink, 2009). To attract freelancers, firms may use different incentive systems than in CoA relations, including flexible, temporary employment to maintain at least weak ties to (re-)activate relevant complementary knowledge when needed. As an act of embedding into CoPs, members of the firm are usually seconded as CoP agents or they act as CoP agents based on intrinsic motivation. In the latter case, knowledge -- or even know-how and expertise -- (see Fig. 3 again) from CoPs for innovation is supposed to easily match with the internal competences of the firm, since the knowledge-bridge is based on inter-personal transfer. However, knowledge streams from CoPs are expected to be far more applicable to technical new product and service development steps than from CoA agents, since the level of resolution is more tailored to the level of innovation problems.

In contrast to a CoP, members of ***"Communities of Interest"*** (CoIs) are under no compulsion to solve a common problem, although they may in practice do so. They have common interests, such as how to develop standards or how to innovate. "CoIs bring together stakeholders from different CoPs to solve a particular (design) problem of common concern. They can be thought of as "communities-of-communities"…or a community of representatives of communities. CoIs are characterized by their shared interest in the framing and resolution of a (design) problem. CoIs are often more temporary than CoPs: they come together in the context of a specific project, and dissolve after that project has ended. CoIs have great potential to be more innovative and more transformative than a single CoP if they can exploit the "symmetry of ignorance" as a source of collective creativity. Fundamental challenges facing CoIs are found in building a shared understanding of the task at hand, which often does not exist at the beginning, but evolves incrementally and collaboratively and emerges in people's minds and in external artifacts. Members of CoIs must learn to communicate with and learn from others…who have different perspectives and perhaps a different vocabulary for describing their ideas. Learning within CoIs is more complex and multi-faceted than *legitimate peripheral participation [...]* in CoPs, which assumes that there is a single knowledge system, in which newcomers move toward the center over time." (Fischer, 2001).

In the Digital Economy, CoIs are initiated especially by the sector's professional association, in Germany by the BVDW (Bundesverband Digitale Wirtschaft). The association is organized by different sector-specific CoIs which address innovation problems. Members of CoIs usually exchange experiences in a pre-competitive way. Knowledge that is generated in CoIs can usually be exploited for innovation purposes very effectively, since a lot of cross-fertilization takes place *('cross-innovation'* or: "innovations come from outside the city wall" (Fischer, 2001). Thus, learning in CoIs can be characterized as "learning from heterogenous experiences".

In ***"Communities of Science"*** (CoSs), reliable knowledge is expected to emerge continuously. "The scientific community consists of the total body of scientists, its relationships and interactions. It is normally divided into "sub-communities" each working on a particular field within science […] Membership of the community is generally, but not exclusively, a function of education, employment status and institutional affiliation"[10]. Knowledge generation usually follows the paradigm of "technology push", i.e. that inventions in the scientific community are pushed forward to business, subsequently leaving the commercial exploitation of inventions to firms (see Fig. 7).

Though the description of pitfalls and problems in technology transfer is endless (Krause, 2003), knowledge from CoSs is an increasingly important source for the development of innovative products and services for SMEs in the Digital Economy. In view of a multitude of technologies serving the digital infrastructure (telecommunication, media, IT, electronics etc.), and a complex melting and convergence process from vertical supply-chains to horizontal markets (TIME[11]-markets), knowledge streams from CoSs can offer SMEs manifold options to extend the upstream innovation process to technology knowledge sources (see Fig. 1). While the Digital Economy is at the heart of the melting process (see Fig. 7), CoSs have to ensure a steady knowledge flow along the upstream technology supply-chain to gain momentum in exploiting technology driven innovation more downstream on the TIME markets.

Thus, learning from CoSs may be characterized as "Learning from Technology Transfer". CoS-learning, however, follows different paths and rules compared to CoA-, CoP- and CoI-learning. While learning in CoAs and CoIs requires little structural organizational adaptation, learning in CoPs and CoSs needs a synchronization of processes, an integration in organizational structures, and a culture that fits with the CoP/CoS properties. However, the organizational adjustments for being embedded in CoSs need to overcome the semantic misfits between scientific results and SME requirements for applicable knowledge. These are deeply rooted in the following problems:

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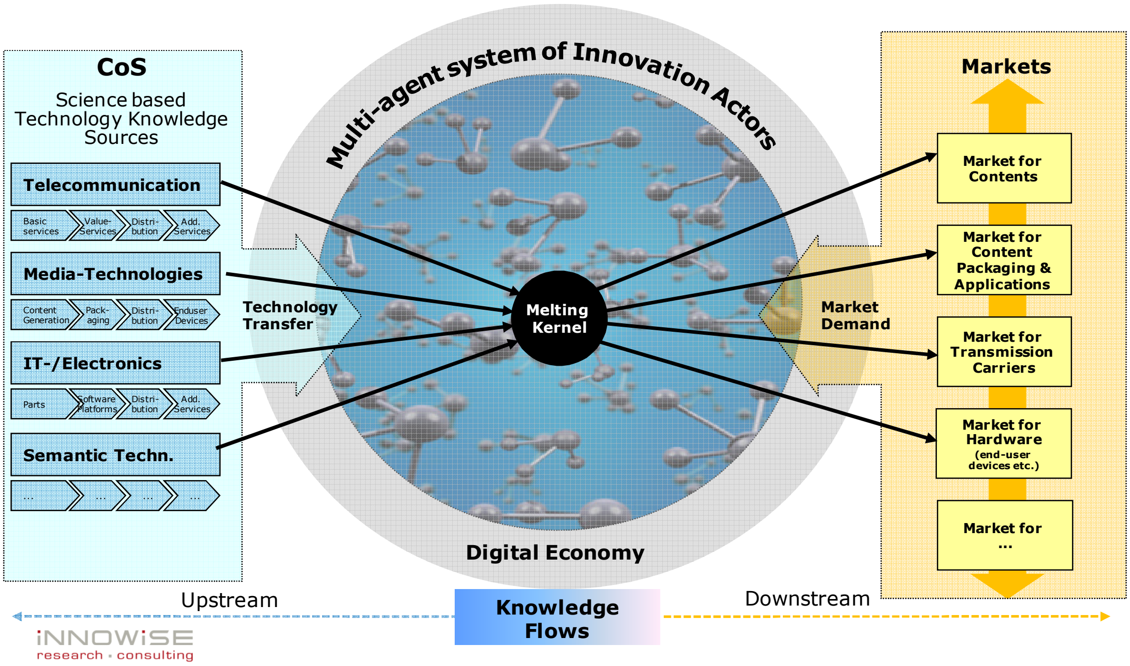
[10] ‚Scientific Community'. In: Wikipedia, the free encyclopedia.
[11] TIME = Telecommunication, Information, Media, Entertainment

- technology transfer is usually in the hands of people whose skills, knowledge and priorities are R&D and scientific perception, not business opportunities, product innovation and marketing etc.
- because of the need to invest time, personnel and money – which they typically do not have -- SMEs are skeptical about adopting the results of R&D projects, and need practical advice to meet their operational needs.
- the lack of professionalism in disseminating R&D results to SMEs in a way that they can be easily read, understood and exploited.

Figure 7 Knowledge flows from Science to Markets



Thus, learning in CoSs is – in contrast to learning in CoPs – usually an exhausting and troublesome exercise which needs specific organizational antecedents and personal competences to bridge the semantic gap between science and business, so as to transform scientific knowledge into applicable knowledge that can be exploited (Güttel and Konlechner, 2007). From experience, we may say that incoherent information search and exchange (e.g. browsing scientific papers, interacting in case of need) and occasional CoS-interaction (e.g. visiting conferences) will have little, if any, synergetic effect on innovation. On the other hand, joint R&D collaboration -- from small-scale heuristic trials via project-based collaboration to regular, routinised cooperation -- may raise a firm's intellectual capital significantly, and provide the ground for numerous product and service innovations.

4 The relevance of trust in Community relations and collaborative learning for innovation

If we now shift the relationships between a firm and its surroundings in one of the four Communities described so far on a rather static level to the dynamic context of its social environment, we may experience additional reciprocal relationships between the different Communities (e.g. *'mutual learning'*) as there are heterarchical links based on agents acting therein (see above for the example between CoPs and CoIs). This introduces specific incentive mechanisms concerning the preconditions of embedding knowledge substantially into an SME's organizational structure and its processes. The main task within the management of this "multi-agent system" is how to develop a substantial amount of "*gravitational embedding force"* to significantly absorb and exploit knowledge for commercial ends (see again Fig. 2).

We will initially focus on the issue of ***trust***. Based on the description of specific characteristics of relationships in the multi-agent system of learning loops (see again Fig. 6), we will elaborate on specific organizational antecedents designed to tailor and establish trust mechanisms to support efficient and effective collaborative learning and knowledge integration in the firm's organization.

Trust between organizations and their surrounding Communities can be described as a coordination mechanism to reduce uncertainty and risk in non-formal collaboration for innovation:

> "Especially in innovation, firms need to be flexible and fast in their reaction to changes in markets and technologies. For this, they need to collaborate with others, to benefit from their resources, capabilities and knowledge. However, such collaboration brings risks. Especially in innovation there is too much uncertainty to manage risks completely by contract, monitoring and control and for this they need trust" (Nooteboom, 2006, p. 1).

Our hypothesis is that in the transition from *Closed Innovation* to *Open Innovation*, and even more to *Embedded Innovation*, a shift from explicit contracts (the predominant existence of formally written contracts like NDAs, IPR-agreements etc.) to implicit contracts[12] (agreed by non-verbal conduct, rather than by explicit words) is necessary to ensure effective knowledge exchange and transfer. Thus, the question is how can trust be managed in the new Innovation 3.0 paradigm to integrate an organization successfully into its respective Community in order to support knowledge integration? More specifically, is the organization able to establish a trusted collaboration with different Communities of knowledge? Is it able to do so given the specific characteristics where knowledge and information flows are guaranteed by an effective communication between those actors who will profit from the Community-based learning processes?[13]

For this to occur, adaptation, adjustment and "the definition of new organizational roles, reactive and pro-active measures in response or prior to changing environments" (Hafkesbrink and Scholl, 2010, p. 9) are necessary to develop a trustworthy relationship between the organization and the communities.

Interesting approaches towards a comprehensive understanding of trust in the Open Innovation context have been presented at the ISPIM Conference in Vienna (2009). Trust was introduced as having a *'crucial role for the composition of collaborations that are characterized by uncertainty and risk'* (Blomqvist, 2009). Other insights have been put forward, for example of '*trust as being the coordination mechanism in innovation networks where control and hierarchical governance structures are not leading to the desired innovation results'* (Gilbert, 2006). One important conclusion is the recapitulation that what is still missing is '*information for organizations on how to build governance structures to benefit from trust as coordination mechanisms in communities'*, especially *"the empirical research towards multi-level studies on trust and understanding the embeddedness of the relationships"* (Blomqvist, 2009). In view of knowledge-sharing, as discussed here, trust is an organizational mechanism that is "considered as one of the foundations of organizational competitive advantage" (Barney and Hansen in: Sydow, 2006, p. 377). As organizations are active actors that "play a crucial role in initiating, shaping, sustaining and changing trust in the process of interacting and associating with others" (Möllering, 2006, p. 79), they also have the opportunity to create trust as a linkage to communities. An approach towards this understanding will be made in ACHTINNO, the research on which this paper is based (see footnote 2). As ACHTINNO is still at an early phase, and empirical findings cannot yet be presented, we will outline some initial hypotheses that will be expanded and evaluated in the subsequent stages of the project.

In order to develop hypotheses on tools to support organizational adaptation towards integration in the Communities (= embedding), the different trust cultures within the respective Communities have to be considered. As members of Communities have different intentions and expectations on collaboration, one can assume that trust mechanisms differ in each Community due to both the characteristics of actors and to each specific Community culture (see Chapter 3). Given this, and also taking into account the set of differentiations found in the literature and research on trust (i.e. Möllering, 2006; Neuberger, 2006; Götz, 2006), our hypothesis is that the following trust cultures are important for a lively communication and knowledge production with the communities (see Fig. 6):

[12] 'Implicit Contracts'. In: Wikipedia, the free encyclopedia.
[13] For the specific learning processes in the communities for innovation see Chapter 3.

Figure 8 Trust levers for Communities

Trust levers for Communities	Identification -based trust	Institutional-based trust	Competence-based trust	Process-based trust	Calculus-based trust	•••
Community of Affinity	X			X		
Community of Practice	X		X	X		
Community of Interest		X	X		X	
Community of Science		X	X	X	X	

The trust mechanisms, as well as their relation to the respective Communities, can be described as follows:

- ***Identification-based trust*** (i.e. Lewicki & Bunker, 1996; Shapiro, Sheppard & Cheraskin, 1992) emerges in (basically, but not necessarily the long-term) interaction of agents with similar backgrounds who share the same intentions of collaboration. Identification-based trust supports links to CoA, because members of CoAs can identify with themselves and to each other based on their shared interest in giving information on products and services (see chapter 3). Also, links to CoPs can be supported by identification-based trust: knowledge exchange in CoPs is based on the shared social background of agents leading to identification with the community, since the CoP defines itself on shared intentions and the solution of similar tasks.

- ***Institutional-based,*** or system-based, ***trust*** (Möllering, 2006; Luhmann, 1973) refers to the trustworthiness of formal organizational or institutional structures as well as the reliability of the firm as a corporate agent (i.e. Loose and Sydow, 1997). The evolution of institutional-based trust is especially important for CoIs and CoSs, as they need reliable (formal) institutions for their learning processes, whether they be Web 2.0 collaboration tools or specified physical meeting-arenas to support the Community interactions.

- For our purpose, ***Competence-based trust*** has a double intention. First, it develops because information provided by community agents (both individual and corporate) is assessed as authentic and reliable since the actor is supposed to have relevant competence in this specified field. Second, trust in competences also comprises the ability of agents to "act according to agreements and expectations" (Nooteboom, 2006, p. 1). Without reliability of professional competences and the assigned responsibilities of agents in CoPs, CoIs and CoSs, learning processes would be ineffective since the information and knowledge provided would be subject to further (re)evaluation and cause additional control costs. Thus, the assured knowledge and information that is offered needs to be trusted, otherwise the use of control-mechanisms (i.e. the review of information) would advance the costs of cooperation and decelerate the innovation process.

- ***Process-based trust*** is usually based on long-term cooperation, past experiences and routine activities and structures in Communities (Zucker, 1986; Loose and Sydow 1997). It supposes that the modes of cooperation, i.e. the information policy or the use of Web 2.0 tools developed over time, embeds trust into the *operational structure of collaborations*. In CoAs and CoPs, reliable processes of interaction are necessary to build knowledge on the basis of shared expectations. In CoAs the learning processes are based on conversations where *prosumers* share their values and beliefs. In CoPs, learning processes are based on shared expectations on how to solve problems. In CoSs, a shared understanding on how to cooperate and share knowledge is important to secure the interactions of different sub-Communities so as to achieve optimal knowledge output. In all the Communities mentioned, reliable modes of feedbacks are supportive to establish process-based trust.

- ***Calculus-based trust*** (i.e. Coleman, 1990; Nooteboom, 2002) is a mechanism based on rational choice, and depends on cost-benefit presumptions. Calculus-based trust is rational in the sense that everyone in the community depends on the knowledge and innovation outcomes. Negative impacts may arise if trust is abused i.e. by free-riding or other opportunistic behavior. Calculus-based trust can basically be assumed in CoIs, as there is a rational basis for cooperation: every agent wants to benefit from the aims of cooperation as they only come together for a specific project and separate after the project has ended. Also in CoSs calculus-based trust is an important mechanism to support the scientific learning processes.

To install mutual and collaborative learning the organization needs to be reliable according to the trust culture that its specific Community has developed (see Fig. 8). Looking again at Fig. 6, Innovation 3.0 apparently causes extensive challenges for "multi-agent" and "multi-level" learning processes. On the one hand, the organization has to adjust to different cultures prevailing in the different Communities. These cultures are the cumulative expression of views, attitudes, beliefs, and value-systems of the involved Community agents, as well as the ruling (informal) governance. On the other hand, the organization has to match the different levels of Community learning, i.e. within the Community and between Communities, since there is also mutual learning across different Communities as a result of interlocking memberships of individuals being experts, pro- or consumers and innovators at the same time.

The organizational antecedents and arrangements for successful trust management to support ***Embedded Innovation*** are shown in Fig 9:

Figure 9 Hypotheses on organizational antecedents to lever trust and links to communities

Organizational antecedents		Identification-based trust	Institutional-based trust	Competence-based trust	Process-based trust	Calculus-based trust	...
Infrastructure	Interaction arenas (e.g. institutionalized groups)	X	X		X		
	Virtual collab. tools (e.g. computer-mediated)	X	X		X		
	Incentive Systems (e.g. Fame Mirrors)	X				X	
	Heterarchical membership of Individuals	X		X			
	Transactive Knowledge Management System			X			
Policy	Pro-active information policy	X		X		X	
	Consistent IPR (disclosure) policy					X	
	Coopetition Policy				X	X	
	Autonomous Skunkwork			X			
Culture	Encounter daily routines	X			X		
	Common Language & Glossary	X	X		X		
	...						

Levers to cultivate trust

	Identification-based trust	Institutional-based trust	Competence-based trust	Process-based trust	Calculus-based trust	...
Community of Affinity	X			X		
Community of Practice	X		X	X		
Community of Interest		X	X		X	
Community of Science		X	X	X	X	

Trust as the link to communities

Feedback on organizational tools

Figure 9 shows the trust mechanisms and their links to the different Communities. It also advances hypotheses on a portfolio of organizational antecedents in the areas of infrastructure, policy and culture (Hafkesbrink and Scholl, 2010), that reveal leverage effects which support the cultivation of trust in Innovation 3.0. As we are describing a dynamic model, the Communities also give feedback on their trust culture which causes adjustments in organizational antecedents.

5 Hypotheses and Research Questions

From Fig. 9, a set of open research questions become apparent. These will be presented as hypotheses concerning the relationships between organizational antecedents, trust mechanisms and their target Communities.

Infrastructure

Hypothesis 1: Organizational embeddedness in Communities is supported by introducing reliable interaction arenas (i.e. personal workgroups) or virtual collaboration tools where Communities and organizations can constitute shared routines and structures. By offering an arena (e.g. to communicate the aims of cooperation), process-based trust can be established. These organizational antecedents offer a framework for identification-, institutional- and process-based trust. If the collaboration spaces are devoted to "pre-competitive" issues, even competitors can get in contact with each other. In such a case, trust is the result of a (possibly long-term) cooperation which is supported via real or virtual interaction spaces that help to build expectations concerning the transaction partners.

Hypothesis 2: Knowledge-sharing processes in Communities can be supported by providing incentives to strengthen the commitment of Community agents. One example is 'Fame mirrors' (Groh, Brocco, and Asikin, 2010) that stimulates participation by boosting the intrinsic motivation of community agents. Other examples are grants and prices to stimulate ideation processes etc. With these, the organization supports calculus- and identification-based trust.

Hypothesis 3: The appearance of a corporate actor in different Communities has to follow the lines of transparency and consistency. Thus, heterarchical membership of individual agents in different Communities is an important organizational anchor to establish reliability. With active participation in the Communities, the actors support information- and knowledge-flows into the organization. Also, knowledge flows from mutual learning processes between communities into the organization may be supported. A well established transactive knowledge management system (knowing who knows what in the community) will intensify the perception of competence-based trust.

Policy

Hypothesis 4: Knowledge and information on members in Communities is an important aspect to motivate individual and corporate participation (see e.g. Hafkesbrink et al, 2003). By showing organizational transparency (for example, on the aims of cooperation, on the organization's mission statement, etc) via pro-active information policy, trusted links to the Community can be stabilized. This supports identification-based trust. In combination with a consistent (non-) disclosure policy that shows the degree of an organizations´ openness in terms of competencies, research results and aims of collaboration, identification-based, competence-based and calculus-based trust may be strengthened.

Hypothesis 5: Because of its ability to share knowledge and information (even with competitors), cooperation between competitors ("Coopetition") may stabilize the perception of trustworthiness of the organization. Communication on aims and rules for cooperation between competing firms constitutes calculus-based trust. If this is spread e.g. by word of mouth, it may strengthen also process-based trust.

Hypothesis 6: There are problems in defining restrictions on decision scopes for participating agents so that they may be recognized as reliable partners in Communities. Perceived reliability in competences will rise if there is a satisfactory correspondence between programmatic statements and related action in a Community working context. Thus, 'skunk workers' -- who face few hierarchical controls or restrictions, and who work on an autonomous basis with high levels of responsibility -- can support knowledge flows in Communities and integrate the necessary knowledge into the organization. To link to communities via skunk workers, the organization needs to have slack resources and be able to react to information flows.

Culture

Hypothesis 7: Within Communities, the establishment of daily routines, as well as the use of a common language, and, for example, a glossary within communities may enforce identification-based, institutional-based and process-based trust. Routines and shared expectations towards communication help to build a shared identity and stability in the processes of cooperation, as well as promoting stable institutional arrangements.

Conclusion

The hypotheses show some general ideas for trust management in Innovation 3.0 processes. However, SMEs have to consider “community orchestration” in a way that the organization cannot “manage” the collaboration processes hierarchically: “the traditional forms of (top down) management (where one alternative can be relatively easily chosen over another) may be poorly applicable in relation to innovation networks, and instead, orchestration may provide the necessary tools” (Hurmellina-Laukkanen, 2009).

To conclude, different trust cultures influence the application of governance mechanisms and orchestration modes (Hurmellina-Laukkanen, 2009) between organizations and their surrounding Communities. A linkage of the organizational with the Communities´ trust culture, via appropriate organizational antecedent, is necessary to generate the desired “gravitational embedding force” for the organization to attract knowledge. Thus, building a framework embracing trust mechanisms supported by formal and informal institutional arrangements, advances the stability of knowledge transfer and collaborative learning between the organization and the Communities. However, trust cannot be managed top-down in a direct way. But by establishing reliable preconditions for the Communities (Neuberger, 2006), trust can grow and stabilize Community links.

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