

# Organizational Competences for Open Innovation in Small and Medium Sized Enterprises of the Digital Economy

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**Abstract.** In this paper, a conceptual approach to link organizational and individual competences in open innovation processes is presented. Based on a comprehensive system of hypotheses derived from recent literature, the current state-of-the-art in the discussion about organizational antecedents of open innovation is characterized, and further research identified.

**Keywords:** Open Innovation; Open Source Innovation; Open Content Innovation; Outside-in Management; Inside-Out Management; Organizational Competences; Individual Competences; New Business Development

## 1 Introduction

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. This sector – opposed to other branches of the economy in the current financial and economic crisis – is still growing considerably with rates of around 10-15% p.a. Innovation dynamic is very high, and the demand for well-trained and highly competent employees is strong. It is hard to tell which subsectors exactly belong to the Digital Economy, since accelerating technological progress induces an on-going conversion towards digital products and services, accompanied by the dissolution of barriers between formerly separated sectors (e.g. links between the games- and TV-sector).

In this paper, we will demonstrate that the Digital Economy is one of the pioneers of Open Innovation. We will show that the way firms and employees act on different layers of the innovation system is highly influenced by the immense enabling potential of the Internet with open information flows and easy accessibility to knowledge in online-communities, open source communities, etc. as well as supported by a distinct openness in organizational structures and processes. Open Source projects, as well as Web 2.0 applications and business models, are striking examples of this pioneering role. It also appears that the Digital Economy had to open

up its innovation processes very early, when faced with the high velocity of on-going technology and media convergence processes (see Fig. 1), and a broad distribution of specialized knowledge throughout industry and society at the same time calling for manifold hybrid competences as a result of numerous technology linkages. Today, the fight for skilled employees in this fast growing industry is already in its maturity phase.

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
eCommerce						

**Figure 1: Technology-/Media Convergence in the Digital Economy**

Thus, the ongoing, dynamic evolution of new technologies, coupled with the changing context of markets, consumer habits, and regulatory frameworks has resulted in the demand for a breakthrough in developing and monitoring competence profiles that help companies and job-seekers to orientate and negotiate skills for specific industry needs.

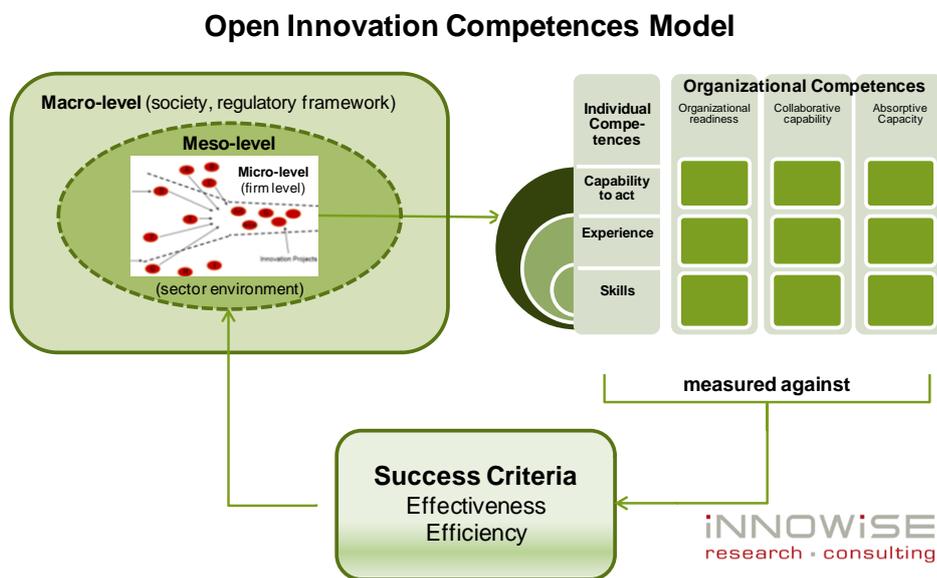
This is the core objective of the joint research and development project KOPIWA<sup>1</sup>, which serves as the research framework for this paper. In KOPIWA, various participants in the Digital economy -- three departments from Universities of Duisburg and Munich, eight companies, one specialized research and consulting service provider and the central professional association BVDW (Bundesverband Digitale Wirtschaft) -- are working together to develop entirely new competence monitoring systems for companies, job-seekers, and professional training institutions. The concepts presented in this paper are taken from ongoing research under the umbrella of KOPIWA.

<sup>1</sup> KOPIWA = Kompetenzentwicklung und Prozessunterstützung in Open-Innovation Netzwerken der IT-Branche durch Wissensmodellierung und Analyse, funded by the German Ministry for Education and Research (BMBF) and EU, Förderkennzeichen 01FM0770

## 2 Linking open innovation and competences

We will begin by describing our own conceptual research model which links the essential dimensions of external driving forces and the open innovation paradigm, as well as the organization and competences model. This will demonstrate a growing need to understand the influence variables, antecedents, parameters, and success factors of Open Innovation.

A ‘birds-eye view’ of our conceptual framework embraces the following dimensions:



**Figure 2: Conceptual research model: linking drivers, open innovation and competences<sup>2</sup>**

The model simply puts forward 3 main blocks of research questions:

- How do external drivers influence the direct environment (meso-level) and the innovation activities at the micro-level of companies? (Upper left box)
- In view of these external drivers, what are the specific organizational and individual competences regarded as antecedents to master changes in the

<sup>2</sup> Source: own compilation on the basis of recent literature. The underlying literature has been compiled predominantly on the basis of recent proceedings of the XIX ISPIM (Tours 2008): *Open Innovation: Creating Products & Services through Collaboration* and XX ISPIM (Vienna 2009): *The Future of Innovation* Conferences on Open Innovation (see [www.ISPIM.org](http://www.ISPIM.org)), as these Conferences represent the most recent state-of-the-art international scientific discussions on the subject of Open Innovation.

environment and in (open) innovation processes at the level of the individual firm? (Upper right box)

- What are the success criteria for open innovation, and which constellations of individual and organizational competences are the most effective and efficient ones to manage it? (Lower central box)

On the **macro-level** we consider the impacts of different drivers on innovation, such increasing globalization, the mobility of human resources and the distribution of knowledge, increasing dynamics in technology convergence, the development of new generic enabling technologies, changes in life styles and consumer habits, etc; These are variables that usually cannot be influenced by a firm.

On the **meso-level** (which can be understood as the direct environment of a firm) we experience new driving forces from communities (e.g. web 2.0 and open source communities) that result from an increasing direct dialogue with end-consumers or *prosumers*, sector specific regulatory frameworks (e.g. regulation on digital rights management, default setting of cookies), and – probably the most important issue – networks, e.g. institutional arrangements on an interfirm or interpersonal level that impact innovation, and raise the question of new organizational and individual competences for open innovation. The meso-level might be indirectly influenced by a company which may participate pro-actively in such tasks, for example as a partner in a network, or responding to Web-communities.

The **micro-level** is the level where corporate innovation happens. There questions arise, such as how to manage the open innovation process, how to develop the organization towards openness, how to acquire new knowledge, how to communicate with end-users, how to collaborate in interfirm networks in pre-competitive joint research and development? At the micro-level, all innovation parameters may be influenced by the company by adjusting the ‘set-screws’ of its organization structures, processes, collaboration issues, absorption capabilities and knowledge valorization.

The core questions at the micro-level – according to our research framework – are:

- (1) How to ‘set the scene’ in terms of organizational structures and processes to switch from closed to open innovation where needed?
- (2) How to train employees in view of their existing competences towards open innovation?
- (3) How to evaluate the setting of organizational and personal competences against pre-defined success criteria for open innovation?

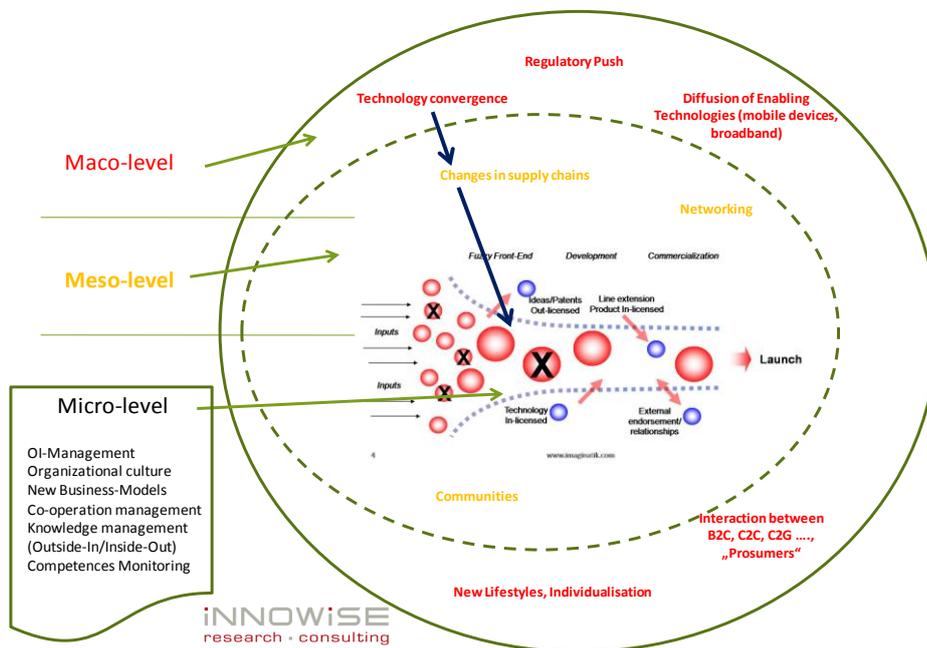
Focusing on the upper left box in Figure 1, we developed several research propositions as an orientation for the empirical work within company case studies. We advanced 36 hypotheses<sup>3</sup> covering the entire innovation system of the Digital Economy which are tailored to the question of “Open Innovation”.

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<sup>3</sup> See <http://kopiwa.collide.info/group/kopiwa/dokumente-daten-etc/-/wiki/Kopiwa%20Wiki/Hypothesen>

For instance, one main hypothesis tackles the interlinks between technology convergence, changes in the value creation in supply chains and the impact on skills developments (see arrows in Fig. 4), is

*“Increasing technology convergence will change the value creation process and with it challenges for innovation management, resulting in increasing requirements for professional IT-hybrid competences, as skills and experiences from applications converge from different technology areas in single applications.”*



**Figure 3: KOPIWA research framework - hypotheses on Open Innovation**

We will not comment on the different hypotheses at this point since they only serve as a general research orientation for the KOPIWA project. In this paper, more detailed research propositions will be developed based on these KOPIWA hypotheses and on the basis of literature screening on the “organizational accomplishment of Open Innovation”.<sup>4</sup>

<sup>4</sup> See Chapter 4.

### 3 Conceptual Approach

#### 3.1 The Open Innovation Quadrant

In the Digital Economy we distinguish the following archetypes of Open Innovation, following a two-dimensional approach:

##### I. Bottom-up versus Top-Down

(1) One type of Open Innovation processes that starts from scratch is predominantly **bottom-up** oriented. Here there is, for example, a starter-kernel or a common programming context (e.g. tools, languages, environments, goals, etc), but no common project, common goal or common organizational context of production. Examples are the Yahoo! Developer Network (YDN), or other networks "...scattered across the web in the form of coding blogs (e.g., <http://alistapart.com/> for CSS developers, or <http://quirk-smode.com/> for JavaScript), programming discussion forums (e.g., <http://php-forum.com/>) and code sharing sites (e.g., <http://snipplr.com/>)" [16]. The characteristics of social interaction in these communities are typically;

- no centralized control over the code base;
- decentralized hubs with a meshed network of interconnections; many-to-many communication with developers independently seeking individual objectives, but interacting with others to achieve their own goals;
- self-organization or self-governance (e.g. peer-reviews as quality control);
- leadership deriving from competences rather than ownership of assets [28].

(2) 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-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.

##### II. From R&D to application

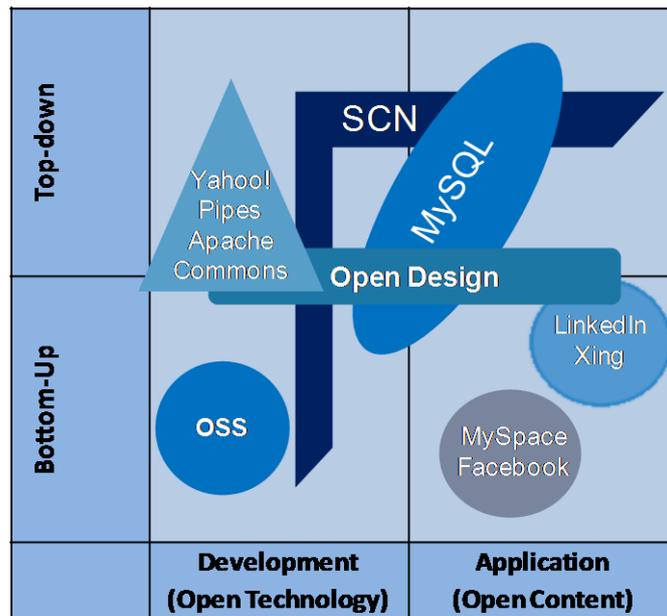
Besides the principal social interaction characteristics, Open Innovation may have different foci in the innovation process starting from scratch (e.g. hobby development), via research and development to market implementation:

(3) The developer communities mentioned above usually have a center of gravity in (software) development either with or without a common project goal or context. Usually there is a non-market transfer of knowledge between the actors involved in invention, with more or less free flows of knowledge within the community enabled by multilateral conversational interaction (e.g. Yahoo pipes).

(4) There are also those Open Innovation processes that are, for example, centered around an existing enabling technology or software, but with a focus on

implementation of an application or business model where there is no further core software development in the sense of altering the code base etc. (e.g. WIKIPEDIA).

At a more or less fuzzy borderline, business orientation arises as an important driver changing the rules of the game. To illustrate our conceptual approach, we cluster different already-known Open Innovation projects or activities along the two dimensions mentioned above:



**Figure 4: Archetypes of Open Innovation in the Digital Economy**

In the matrix there are two main areas (which we call “Open Technology” and “Open Content”) and four quadrants for which we will illustrate certain known Digital Economy Open Innovation activities. “Open Technology Innovation” is referred to as a technological development matter, where the 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.

“**Open Source Software**” (OSS) Innovation which is defined as “... an innovation, which is (1) generated through volunteer contributions and (2) characterized by a non-market transfer of knowledge between the actors involved in invention and those involved in exploitation...” [28] is probably the best known Open Innovation process that has been running successfully for many years. (The best known example is LINUX). These may be considered as predominant bottom-up processes with a

variety of development goals, which are sometimes very fragmented.<sup>5</sup> The typical outcome of OSS is free available software with access to the program code. Yahoo! Pipes and Apache Commons are also development networks that may be characterized as Open Technology Innovation, but which are monitored by a central authority. Here, bottom-up processes are stimulated by continuous community engineering activities. The SAP Community Network (SCN) is following a clear top-down approach to generate solutions for SAP application problems, but still has roots in bottom-up communities with development fractions. MySQLab is marking the transition between Open Source Software and proprietary exploitation since it is distributed with a dual-license approach.

**“Open Content Innovation”** is an analog to Open Source Software and describes “...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.”<sup>6</sup> Examples of Open Content projects are WIKIPEDIA, Open Directory Project, Project Gutenberg, Open Gaming Foundation etc. where one finds free and openly-licensed course materials from university courses (including MIT), as well as other resources, e.g. Digital Peer Publishing (DIPP) NRW, which comprises a series of e-journals with free available scientific content. Social networking websites (like Facebook, MySpace) are examples of Open Content projects, since they allow users to share their information among each other and with other websites.<sup>7</sup> 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 a platform to maintain circles of friends, the latter being more a platform to organize business networks.

### 3.2 Competences Model in the Digital Economy

In short, Open Innovation focuses on how to combine different competences or technological capabilities, whether they are inside or outside the firm, and apply them to commercial ends [21, 35]. In that, context we regard the dynamic status of the organization as a lever for open innovation that connects technology and people from different firms towards new products and services. These levers may be clustered<sup>8</sup> according to three main dimensions (see Fig. 2):

<sup>5</sup> Presently there are some 170.000 open source development projects listed in sourceforge.net

<sup>6</sup> [http://en.wikipedia.org/wiki/Open\\_content](http://en.wikipedia.org/wiki/Open_content)

<sup>7</sup> Behind these networks one also finds Developer Platforms (like the MySpace Developer platform) that supports 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. <http://wiki.developer.myspace.com/index.php?title=Category:OpenSocial>

<sup>8</sup> The clustering is the result of an in-depth literature analysis on “open innovation” including numerous recent publications from international conferences (see for more details Chapter 4). The three dimensions of organizational competences have been developed in an iterative multi-stage process of clustering relevant competences criteria bottom-up from the literature review, combined with a backlash top-down

- (a) organizational readiness;
- (b) collaborative capability;
- (c) absorptive capacity.

Within these dimensions we later will describe organizational antecedents based on the discussion in recent literature that – according to empirical evidence – are supposed to boost successful open innovation processes. These antecedents can also be characterized as specific **organizational competences** reflecting a specific and selective combination of individual competences.

Thus, in our approach we differentiate individual from organizational competences. Individual competences are **skills, experiences and capabilities to act, embedded in a person**, while organizational competences are those **skills, experiences and capabilities to act embedded in an organization**. In addition both competences are not perceived as an inventory of resources, but as resources put into action, constantly in motion and under development [36]. On an individual level and for measurement purposes we differentiate *skills* from *experiences* and *capabilities to act*, reflecting a long tradition in the development of competences models in Germany<sup>9</sup>.

For the definition of “Individual Competences” and “Capability to Act” we characterize “...competences as such abilities or dispositions which enable a meaningful and fruitful action in open, complex, sometimes even chaotic situations, thus afford self-organized action under theoretical or objective uncertainty” [12]. Competences are not just capabilities to act that are valid for specific learning situations (e.g. reading competences), but also embrace those abilities that can be used in different application areas to act despite uncertainty. They refer to competences as “self-organizing dispositions”. Thus ‘competence’ is a psychological construct that cannot be measured directly, but may be observed along a person’s performance when he/she is using competences. Individual competence – in our understanding – is then the result of a visible action of a person through the application of skills, experience and capacity to act.

To define ‘Organizational competences’, we first refer to institutional organization theory (“a firm is an organization” instead of “a firm has an organization”), especially in their facet also known as “new institutionalism” [11]. Thus, there are not only formal institutional structures and processes, but also informal institutional arrangements that constitute an institution or organization [39]. Especially we see ‘new institutionalism’[11] as an emerging perspective in organization theory and sociology that seeks cognitive and cultural explanations of social and organizational phenomena by, “...considering the properties of supra-individual units of analysis that cannot be reduced to aggregations or direct consequences of (single, the author) individuals’ attributes or motives.”<sup>10</sup> Organizational competences in this sense are not

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approach based on recent concepts of the resource-based [40] and competence-based view [36] of the firm. The draft concept was presented within the KOPIWA project group and refined step by step.

<sup>9</sup> We cannot go into details of the entire competence debate at this point. See for more details [12] [33] [34]

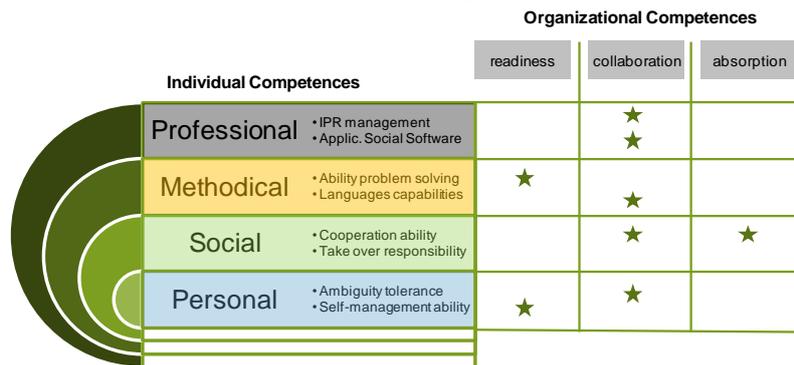
<sup>10</sup> See [http://en.wikipedia.org/wiki/Institutional\\_theory](http://en.wikipedia.org/wiki/Institutional_theory)

static, but a dynamic capability in a constant flux, enabling fast reactions in changing environments [22]. Some authors discuss “organizational competences” in conjunction with the term “core competences”, since there is empirical evidence [see e.g. 25] that those competences that are indispensable for competitiveness (=core competences) can be extracted from organizational competences, as it is in turn clear that not all organizational competences are core competences [30]. With this background, and with this conceptualization of ‘organizational core competences’ we define “**Organizational Competences**” for Open Innovation as:

- (1) “Organizational Readiness”, i.e. structural, process- and cultural readiness;
- (2) “Collaborative Capability”, i.e. the ability to integrate and leverage the organizational and individual mechanisms that govern inter-firm relationships;
- (3) “Absorptive Capacity and Effectiveness of Knowledge Valorisation”, i.e. the ability to recognize the value of new, external knowledge, assimilate it, and apply it to commercial ends [21].

Though we distinguish organizational from individual competences, we see a strong relationship between them (see Figure 5). Our main hypothesis in that respect is: every institutional / organizational setting or arrangement (whether it is of a formal or informal nature; whether it affects a structural or process attribute; whether it be tacit, implicit or explicit, etc.) relies on a combination of different individual competences. In turn, every organizational competence involves one or more individual competences [24].

Figure 5 shows the relationship between individual and organizational competences (and includes examples for illustrative purposes). We think of single individual competences as being applicable to different institutional competences, e.g. the ability to co-operate might be important for both the organizational collaboration as well as for the absorption capacity in knowledge valorization. Figure 5 displays the substantial individual competences (professional, methodical, social, and personal) instead of their evaluation levels (as shown in Fig. 2).



**Figure 5: Relationship between Organizational and Individual competences**

From a more structural point of view we differentiate professional competences from methodical, social and individual/personal competences following the distinction of

- Professional: handling abilities of known fields/issues,
- Methodical: handling abilities of unknown fields/issues,
- Social: handling abilities with respect to other persons,
- Individual/personal: handling abilities with respect to oneself [see e.g. 12]

Table 1 comprises hypotheses of how selected individual competences may leverage organizational competences in the light of Figure 5. Professional competences are not displayed in Table 1 as they have to be selected and adjusted according to the specific industry segment in the Digital Economy:

<b>Individual Competences</b>	<b>Organizational Readiness</b>	<b>Collaborative Capabilities</b>	<b>Absorptive Capacities</b>
<b>Social Skills</b>			
ability to share acknowledgements	X	X	
open-mindedness	X	X	X
empathy	X	X	
ability to integrate opinions	X	X	
ability to cooperate with external knowledge owners		X	X
trust management skills	X	X	
colleagueship	X	X	
ability to communicate	X	X	X
ability to discuss controversial problems	X	X	
ability to reach a consensus	X	X	
willingness to interpersonal knowledge transfer		X	X
(social) networking abilities		X	X
team cohesion skills	X	X	
<b>Methodological Skills</b>			
knowledge management skills (internal/external)	X	X	X
coaching skills	X	X	
diplomatic abilities	X	X	
bargaining & decision power	X	X	
analytical & conceptual skills		X	X
evaluation skills (financial/technical)	X	X	X
workflow management skills	X	X	X
media & presentation skills		X	X
moderation skills	X	X	X
project management skills	X	X	
self-organizing & time management skills	X	X	
co-ideation abilities	X	X	X
network management skills	X	X	
<b>Personal Skills</b>			
ability to self-integrate	X	X	
ability to take-over new tasks			X
ability to recognize innovation skills of employees	X	X	X
ability to implement creative ideas	X		X
ability to identify business options	X	X	X
intellectual/cognitive flexibility		X	X
ability to self-integrate	X	X	
motivational power	X	X	
risk awareness		X	X
self-learning skills	X		X
creativity	X	X	X
reliability	X	X	

**Table 1: Hypotheses on selected Personal Skills leveraging Organizational Competences for Open Innovation** Source: Innovise GmbH Duisburg

Later in the KOPIWA project the hypotheses of individual skills leveraging organizational competences will be tested in more detail. To date we have only examined those individual skills that, according to the literature [see e.g. 16], common sense and good consulting practice, have proven to be good starting points for our in-depth research on competences for Open Innovation.

## 4 Organizational Competences for Open Innovation

The recent debate on Management of Open innovation circles around different aspects, which we have already clustered to our three main dimensions of

- Organizational readiness
- Collaborative capabilities
- Absorptive capacities

We will focus on those organizational competences that are important in the context of Open Innovation, and leave such taken-for-granted competences as unconsidered that mainly refer to “conventional innovation”. Of course, for some attributes there are clear indications that they are important for all innovation activities, since, for example „inter-firm collaboration in R&D or B2Science”, which was highlighted recently by Henry Chesbrough [6], has existed for a longer time.

### 4.1 Organizational Readiness

According to the general challenges of Open Innovation, its organizational antecedents are related to a lively debate on:

- a) the cultural openness of organizations,
- b) dynamic capabilities for organizational change and renewal,
- c) designing specific organizational structures and processes
- d) technological enhancement, e.g. on the use of advanced collaborative and social IC-Technology for Open Innovation.

#### (a) The cultural openness of organization

Cultural predispositions of the organization for Open Innovation include mostly those things that are hidden in the tacit world of organizations. If we talk about “openness of the organization culture, “(W)e may consider the fact that in Open Innovation processes **organizational boundaries** have to be fuzzy and permeable towards the external environment [28, 34], and employees communicating with outside third-parties have to feel comfortable in doing so. Consequently, many authors in the literature refer to a “*culture of open communication*” including the “*ability to establish shared languages, common norms and cognitive configurations to enable open communication*” [10] with information flows that freely may circulate internal, but also ‘outside-in’ and ‘inside-out’ the firm [23].

Also of utmost importance seems to be:

- “*an organization's cultural identity of confidence*” [37], a "safe territory" for employee, that includes attributes such as fault tolerance, trust [23, 34] and reliability;
- “*the ability to create knowledge friendly cultures*” [29], especially when using Web 2.0 tools for knowledge sharing,
- the existence of “*institutionally based trust forming a disclosive atmosphere*” [14], meaning that interaction with third parties is formally approved.

When considering knowledge scanning and valorization (see Chapter 4.3), an important organizational antecedent is “*participative decision making to increase the range of prospective ‘receptors’ to the environment*” [15], as more receptors towards external knowledge sources may catch more ideas that probably can be valorized in the innovation process. In this sense, a participative management style is supposed to promote the outside-in flows of ideas.

Another aspect of an open organization culture is described as, “(A) *culture that is continuously conscious of its emotional responses to situations of uncertainty and ambiguity*” [3, 14], since it is clear that in Open Innovation processes,-- especially in the first phase of the ideation and assimilation of knowledge -- many uncertainties occur which have to be evaluated in terms of transaction costs (for information retrieval) and potential analysis (evaluating the opportunities for the development of business models etc.).

A decisive attribute of an open organization is also the “*ability to intentionally step back from controlling and determining everything*” [24, 28, 30]. Some authors describe this as the consciousness and intention to know when things should happen [14] without being in formal control about everything (which, by the way, is impossible).

Finally there are claims for

- “*design abilities to foster corporate identification*” [37],
- “*identification-based trust to share the same strategic orientation*” [5],
- “*a participative and commitment based management style*” [14, 21] and
- “*a culture of organizational risk awareness, acceptance*” [31] and “*fault tolerance*” [37].

There is obviously also a strong need to open up **people’s mindsets**, specifically to breakthrough cognitive lock-ins and technological paradigms [35] to allow them to detach themselves from evolutionary developed “construction ethics” and other routines which may have evolved over years of organizational memberships. While we talk about such personal attributes as intention and consciousness [14], ambiguity tolerance, serendipity [37], entrepreneurship [5, 20, 34] instinct and ingenuity, and a holistic view [37], this is clearly located on the level of individual competences (see Table 1). The organizational reflection to promote such individual competences, however, is for example:

- *“the ability to strategically anchor Open Innovation within the organization and people's mindset”* [18],
- *“the ability of constantly and intentionally disrupting and transcending, or ending the trance of existing views of normality”* [14],
- *“the ability to weave continuous learning activities into the mindset of workforce”* [29], and
- *“the ability to overcome the NIH syndrome”* [3, 20] and turn it into a PFI (“proudly found elsewhere”) attitude.

### **(b) Organizational Renewal**

For a long time organizational change has been described as an important source of competitive advantage [17]. In the recent debate about ‘organizational renewal’, the main focus is on “dynamic capabilities”. Accordingly, Teece et. al. define dynamic capabilities of a firm as ‘it’s ability to integrate, build, and re-configure, internal and external competences to address rapidly changing environments.’[36] Dynamic capabilities are more or less an abstract organizational competence. They could also be an attribute of an “open organizational culture”, but the importance of dynamic aspects prompts us to discuss this competence attribute separately from the other organizational competences.

In more detail, the different attributes or pre-dispositions of organizational renewal capacities [2, 17] are discussed as

- *“the ability to overcome established routines”* [17],
- *“the ability to organize for constant change”* [29],
- *“the ability for self-organization and organizational renewal”* [2, 17],
- *“the ability to establish collective organizational learning to continuously reinvent the company's core business processes”* [29].

The dynamic aspect of organizational change is also discussed by using the concept of “Organizational Learning” recognized as the *“ability to maintain a continuous process of adjustment of search rules, attention rules, and goals of the organization”* [2], or the *“ability to undergo a continuous process of experimentation, adaptation and learning to pro-actively define the business environment”* [3].

In fact, though the entire discussion on organizational learning and dynamic capabilities cannot be reproduced in this Chapter, we may summarize the debate on organizational renewal as the *“autopoietic adjustability to the external ecosystem”* [37] paired with *“improvisational organizational power”* [14].

### **(c) Designing specific organizational structures and processes**

We now advance from the more informal, tacit or implicit organizational competences to the more formal and explicit attributes that – following the literature debate - foster Open Innovation. Obviously, besides “open culture”, “open mind-set” and “dynamic capabilities”, there are also formal institutions that may boost Open

Innovation. “*Heterarchical structures*” [37] have often been reported as conducive to enable a better cross-lateral communication between innovation actors, as they include a certain formal “*redundancy of available knowledge*” [37] in the sense that the organizational knowledge management systems are freely accessible, and also contain, wherever possible, codified implicit, or even tacit, knowledge.

Also, Open Innovation often makes claims for the “*ability to create ad-hoc organizational structures*” [3], “*cross-functional interfaces*” [15] and “*non-routine and reciprocal information processing systems*” [15].

Since Open Innovation – with a huge communication outreach - seems to be even more interdisciplinary than any other innovation process, another important aspect is discussed with the concept of “*multidisciplinary knowledge layers*” [37] and “*cross-functional coordination mechanisms*” in creating a conducive knowledge context [15].

To promote interdisciplinary and ad-hoc communication other authors recommend the

- “*introduction of physical or virtual cooperation arenas / trading zones*” [32] or
- “*enabling spaces*” [13, 34],
- “*face-to-face communication spaces*” [37],
- “*dedicated rewarding systems*” [21].

Also “*job-rotation to enhance redundancy as well as diversity of backgrounds, to increase problem-solving skills, and to develop organizational contacts*” [15], is recommended as an important lever to promote Open Innovation. Finally, a formally implemented “*strategy of crafting and adaptation with decentralized decision making*”, based on the subsidiarity (Hajek) principal [29], may empower the decentralized innovation actors towards Open Innovation.

#### **(d) Technological enhancement**

Besides the already mentioned organizational competences, there are additionally more visible resources such as the “*ability to use techniques to facilitate adductive thinking*” (e.g. TRIZ) [37], or the “*ability to use interactive IC technology and advanced intelligence tools (infra-technologies)*” [37] in all internal and external communication processes. We will not go into detail regarding these resources. In our underlying research framework KOPIWA, the Technical Group is developing a specific tool to raise the quality of trend spotting as an important means to detect new trends that may influence the competences development in the Digital Economy. For this purpose, a Social Network Analysis is implemented to scan knowledge hot spots in Open Source, Open Content and Open Innovation networks. Also, new incentive systems for community engineering are introduced which should lead to more user participation in the KOPIWA case studies.

## 4.2 Collaborative Capabilities

Collaborative Capabilities are at the heart of the Open Innovation debate, since it is largely agreed that the ability to integrate and leverage the organizational and individual mechanisms that govern inter-firm and community relationships [18] are one of the core organizational competences of Open Innovation.

In looking at the literature, we have clustered the debate into three dimensions:

- (a) internal collaboration
- (b) networking capabilities
- (c) inside-out/outside-in collaboration

### (a) Internal collaboration

In the recent literature on Open Innovation, two concepts dominate the discussion: (1) outside-in and (2) inside-out collaboration<sup>11</sup> which – to put in short and simple form – is, first, the challenge of accessing and using external knowledge or technology, and second the ability to exploit internal knowledge and technology for use through third parties [19]. We have already discussed these processes from a more ‘technical’ perspective (see the discussion in Chapter 4.3 on absorptive capacity and knowledge valorization), and will now examine their organizational antecedents to make use of knowledge and technology in- and outflows.

However, to contribute successfully to the inside-out and outside-in debate, some authors first and foremost stress the point that an efficient and effective internal collaboration structure is supposed to be an important pre-condition. This they define as the “*ability to develop complementary internal networks to acquire external technology*” [21]. To enable these complementary networks, well developed “coordination capabilities to enhance knowledge exchange across disciplinary and hierarchical boundaries and abilities to enable lateral interaction between functional or ‘component’ knowledge, increasing knowledge flows across functional boundaries and lines of authority” [15] should be in place, since if this is not assured, every external communication or knowledge exchange will fail to properly work. On the organizational side, the “*ability to create cross-functional teams and task forces*” [3, 23], and the “*ability to synergetically integrate creative capacities of people*” [14] to promote a “*heuristically enriched cognitive teamwork*” [37] may facilitate the building of the above mentioned complementary networks.

A more technical aspect must also be mentioned: the availability of intranet enabling tools to foster learning and communication responsiveness to customers, supply chains and market opportunities [14, 23].

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<sup>11</sup> We will simply skip the coupled inside-out/outside-in version.

**(b) Networking capabilities**

The literature on network characteristics in the context of Open Innovation has so far mostly concentrated on the number of nodes; the number of external relations to suppliers, universities, and other research institutions, to complementary firms [20], and to intermediaries [27], and on investigating the strengths of the ties between the actors etc. [25]. In fact, networking capabilities seem to be one of the core organizational competences for successful Open Innovation [18].

In the context of Open Innovation, these networking capabilities are manifold. For example, they embrace the notion of management capabilities, of business model development, aspects of trust-based governance, characteristics of global and local connectivity, etc. First, we should mention that a major shift from formerly serial value chains to closer or widely meshed value networks is taking place in the Digital Economy. This is an ongoing change which obtains increasing dynamics as the result of technology convergence and standardization enabled compatibility of different technologies.<sup>12</sup> At the same time this is both a threat and an opportunity: SMEs in the Digital Economy that do not co-operate with innovation partners are under strong pressure, and this pressure will increase with cumulative dynamic of technology.

Since – as Chesbrough [6] puts it – ‘Not all the smart people in the field work for us; we need to work with smart people inside and outside the company’ [20] – a major necessity of working with complementary innovation partners arises. We call this a “*shift from firm-centric to network-centric innovation*” [27], or more sophisticatedly, the “*ability to develop and sustain business models regarded as a systemic interorganizational constructs for creating and capturing value, based on resources and capabilities distributed in the external network of a firm*” [27].

The most important organizational competences that initiate, manage, evolve, maintain or even terminate innovation networks that are discussed most frequently are the ability to:

- “*set up infrastructures and procedures for coordination and standardization of alliance processes*” [18]
- “*leverage the companies and individual networks*” [31]
- “*ability to balance strong and weak ties in relationship to horizontal and vertical actors*” [4, 24]
- “*manage serial, pooled or mutual interdependencies in networks*” [25]
- “*establish reputation and goodwill*” [18], to “*build trust in network management*” [23], and to “*establish process-based trust as a result of repetitive cooperation*” [21]
- “*induce synergetic interactions within and across value networks with universities, suppliers and users*” [3, 14]
- “*balance transaction value and costs in value networks*” [38]

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<sup>12</sup> See Figure 1.

- “*avoid opportunistic behavior in value networks*” [38]
- “*leverage open innovation intermediary services for outside-in and inside-out processes*” [38]
- and “*network-evolution skills*” [3]

Again it is clear that these organizational competences deserve a closer examination, as we consider that all the networking capabilities mentioned above are more or less hybrids of individual competences, and thus a complex psychological construct that cannot be observed directly. We will come back later to this point when discussing the further steps in our KOPIWA research agenda.

### **(c) Inside-out/outside-in collaboration**

‘Inside-out’ as well as ‘outside-in’ are the basic idea of Open Innovation [7, 8]. It covers the proper usage of external knowledge for internal innovation (inflow), and vice versa, to make use of inventions from inside that can only be used for actual innovation projects by “selling it” to the market (outflow), so that it has higher value when it is combined with another firm’s business [19]. This is “openness in two directions”.

Apart from the fact that specific absorptive competences are needed for the knowledge valorization (which we will examine in the next chapter), and apart from the fact that generic networking competences (see the previous chapter) are essential to provide the ground for successful inflows and outflows, there is a need for particular inflow/outflow management capabilities on the organizational level.

If we look at the nature of inflow/outflow processes, we may, at a first glance, mention “*organizational convergence capabilities towards external parties*” (common understanding etc.) [35]. It is a well known fact that within a collaborative situation, firms may not benefit from cooperation when the organizational culture is opposed to it. In business, we often say that “the chemistry was not working”. What we mean is that organizational structures and processes, as well as informal organizational cultures do not fit with each other. A concept that is similar to this notion is the “*capability of bridging the cognitive distance between external and internal knowledge*” [4]. There is not a common language, even if innovation actors have the same background – just let a micro-economist talk to a macro-economist! So a ‘translation’ is needed to bridge the cognitive gaps, and to find a common understanding. What also helps is the “*ability to establish managerial proximity to innovation partners*” [4], by defining dedicated interfaces at management levels. In this context the need for a gate-keeper to “*manage the interface between the firm and its external environment*” is often expressed [3].

In outside-in and inside-out processes, a prominent task is also “*managing knowledge transfer and sharing of intangible benefits*” [27] in order to “*balance values and beliefs inside and among outside parties*” [5]. In the literature these organizational functions are identified as ‘boundary spanning’ [1], although up to now this term has

not been connected to Open Innovation. Again we are talking about an organizational competence for Open Innovation as a cluster of individual competences, consisting of, for example/

- “creating internal and external networks;
- issue identification;
- translating the knowledge back into the organisational culture;
- influencing and educating internal and external stakeholders;
- creating buy-in and support;
- identifying internal senior-level champions” [1].

At the heart of inside-out / outside-in flows are organizational settings to enable:

- co-ideation capabilities
- co-design capabilities and
- co-development capabilities.

To implement these capabilities at an organizational level, we may fall back to the already mentioned enabling spaces (see chapter 4.1 (c)) and other collaborative tools (such as collaborative ontology-engineering etc.).<sup>13</sup>

One of the most interesting phenomena is “*active user involvement capability*”, to gain rich interaction with customers along the innovation process (B2C) [30, 32]. This may be characterized as one of the most novel features in Open Innovation, since B2B collaboration, and even B2Science, collaboration is not entirely new.

Again, more technical aspects in this section are related to issues such as effective contractual governance capabilities and organizational routines of alliance management [18], including:

- “*IPR securement abilities*” [3] and “*apportioning of 'gift-exchange'*” [20, 23]
- “*the ability to manage and use (collaboration) software for web interaction and knowledge elicitation*” [28, 34]
- “*the ability to manage contract research, in-licensing, joint development, joint manufacturing, joint ventures*” [23].

### **4.3 Absorptive Capacity and Knowledge Valorization**

Our discussion of the last dimension of organizational competences for Open Innovation will be kept short, as we have already provided the ground for a better understanding of the underlying questions.

‘Absorptive Capacity’ was first introduced by Cohen and Levinthal with the notion of “a new perspective on learning and innovation – Technology, Organizations, and Innovation” [9]. This paper may be characterized as path-breaking insofar as it first

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<sup>13</sup> More in-depth discussions about these tools can be found in Reinhard et.al. and Brocco/Groh in these conference proceedings

broached the issue of outside-in antecedents. Cohen and Levinthal argue “(T)hat the ability of a firm to recognize the value of new, external information, assimilate it, and apply it to commercial ends is critical to its innovative capabilities.” [9] Later, we learn that “(F)irms differ in their ability to exploit these external technology sources since absorptive capacity can be understood as a firm-specific dynamic capability which is build over time (path-dependency) based on organizational routines...Furthermore, absorptive capacity is crucial in explaining why some companies are much better than others in creating and capturing value from in-sourcing externally developed technology and technological collaboration with innovation partners. Hence, absorptive capacity and the outside-in dimension of open innovation are necessarily linked to each other” [38].

Thus, absorptive capacity and the effectiveness of knowledge valorization are treated by many authors as the key for Open Innovation [3, 21, 23, 34, 35]. The literature usually follows a process-view on the knowledge management process, divided into

- “*identification of technological opportunities*” [23]
- “*elicitation and assimilation*”, including the ability to recognize compatibility of external and internal knowledge/ technologies [3, 9, 23, 30, 31]
- “*understanding / transforming*”, including the ability to acquire, adjust and integrate external knowledge/technology into the product development [21, 23, 31]
- “*sharing / disseminating / exploitation*”, including the ability to valorize integrated knowledge towards the market [3].

The first two phases are usually called “*Potential absorptive capacity*” [15], the latter two phases “*Realized absorptive capacity*”. “*Potential absorptive capacity, which includes knowledge acquisition and assimilation, captures efforts expended in identifying and acquiring new external knowledge and in assimilating knowledge obtained from external sources ... Realized absorptive capacity, which includes knowledge transformation and exploitation, encompasses deriving new insights and consequences from the combination of existing and newly acquired knowledge, and incorporating transformed knowledge into operations...*” [15].

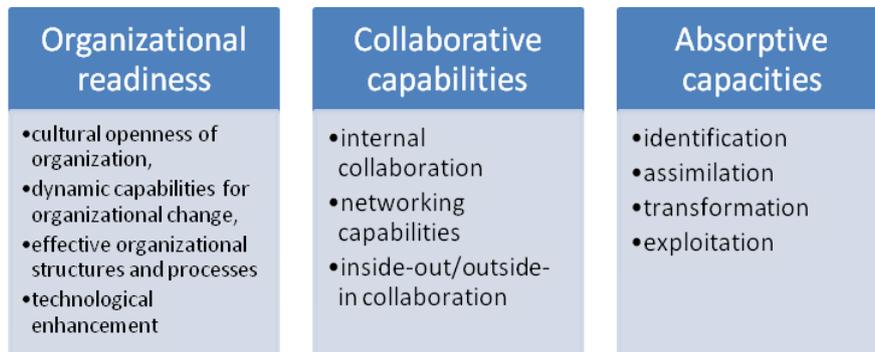
A pre-condition for effective knowledge transfer is also to understand internal and external competencies [23], as well as the identification of gaps in internal competencies and the ability to balance external and internal knowledge [38], and (intra-firm) knowledge dissemination capabilities [23].

With respect to the organizational antecedents of “absorptive capacity”, Jansen et al developed and investigated a set of hypotheses. They researched the impact of different organizational measures and soziazation capabilities on potential and realized absorptive capacities, such as cross-functional teams, participation, job-rotation, formalization, routinization, connectedness, and soziazation. “Overall, our research indicates that organizational mechanisms associated with coordination capabilities (i.e. cross-functional interfaces, participation, and job-rotation) primarily

enhance potential absorptive capacity while organizational mechanisms associated with socialization capabilities (connectedness and socialization tactics) primarily strengthen realized absorptive capacity”[15].

## 5 Results and further research needed

The following figure shows the decomposition of organizational competences for open innovation:



**Figure 6: Organizational Competences for Open Innovation**

Empirical results from three in-depth case studies show<sup>14</sup> that the configuration of these organizational competences already cover the most important items to evaluate organizational framework conditions to step into Open Innovation.

Further research is needed in the following areas:

- (1) empirical testing of individual competences (from Table 1) along different business cases, technology areas, etc. in the Digital Economy that cope with the organizational challenges;
- (2) definition of the levers between individual and organizational competences to identify the most important individual competences in Open Innovation (see Figure 5 and Table 1);
- (3) definition, operationalization and testing of success indicators (see Figure 2) to investigate the leverage effects of combined individual and organizational competences on Open Innovation Effectiveness and Efficiency.

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<sup>14</sup> The case studies are described in more detail in this book: see Hafkesbrink, Krause and Westermaier, ‘Old Wine in New Bottles? A Case Study on Organizational Antecedents for Open Innovation Management; Hafkesbrink and Scholl, ‘Web 2.0 Learning – A Case Study on Organizational Competences in Open Content Innovation; Hafkesbrink, Stark and Schmucker, ‘Controlled Opening in pro-active SME Innovation – a Case Study Report on an ‘Open Innovation Audit’ in the Digital Economy.’

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