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## **Managing Innovation in 'Localities of Learning' in Berlin and Seville**

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### **Introduction**

In the knowledge economy, a complex dynamic and interactive learning process among multiple stakeholders characterizes the innovation process. Being aware of this process, regional government policies aim to stimulate and even plan innovation in designated 'localities of learning' (Dosi 1996) and 'sticky places' (Markusen 1996). In this respect, science parks have become a prominent instrument in regional development in the knowledge economy. They play an important role as organizational links ('territorial innovation framework') between the pillars of the 'triple helix', that is public research and higher education institutions (HEI), businesses, and public administration (Etzkowitz and Leydesdorff 2000). However, not only direct linkages between different entities need to be considered inside the territorial innovation frameworks. We argue that topical links between knowledge organizations and space are of high importance, too (Suwala 2014). Consequently, two central questions arise for 'innovation agents' such as science parks and regional policy makers; how social cohesion and a trustful atmosphere is actively created in specific 'localities of learning' and territorial innovation systems, and how knowledge network management systems have to be orchestrated successfully to promote interactive and collective learning, respectively. In this chapter, we apply concepts of knowledge creation and management, currently mainly associated with organizational learning in firms and inter-firm collaboration, to the management of such territorial seedbeds of innovation. Here, we elaborate the impact of distinct dimensions of knowledge network management (KNM) instruments – relational (individual–individual) practices and, introducing a new dimensional strand, primarily topical (individual–space) mechanisms.

The chapter is organized as follows. The next section provides a brief overview of the literature of territorial innovation systems (TIS) and introduces approaches of knowledge management (KM) with an emphasis on the *ba* (basho) as a genuine setting for relational and topical learning. Then, we elaborate on our definition and the different conceptual strands of knowledge network management (KNM) on the spatial scale of regional innovation systems (RIS) and 'localities of learning'. The following section presents our case studies and the gathered results. Finally, we draw conclusions.

### **Theoretical Background**

As the theoretical framework, we refer to the well-known concepts of territorial innovation systems (Moulaert and Sekia 2003) and the central findings of the knowledge management and knowledge creation literature and apply them to distinct 'localities of learning' (Dosi 1996). We predominantly consider the spatial scale of specific localities such as science parks as the favourable framework for knowledge creation and learning. The concept of 'localities of learning' explicitly underlines the

importance of a localized ecosystem of HEI, research institutions, high-technology firms and skilled talent (Kujath and Stein 2011).<sup>1</sup> These elements also are widely discussed on various geographical scales in related concepts such as innovative milieu (Aydalot 1986), localized production systems (Bouchrara 1987), new industrial spaces (Storper and Scott 1989), clusters of innovation (Porter 1990), regional innovation systems (Lundvall 1988, 1992, Braczyk, Cooke and Heidenreich 1998) and learning regions (Florida 1995, Asheim 1997, Morgan 1997). All of them emphasize the importance of spatial proximity next to locational factors in generating production, knowledge, learning processes and/or innovation (Kulke 2008). Locational factors like qualified talent, local culture and infrastructure are now considered as embedded into TIS with different stakeholders. Notwithstanding, the firm – and not individuals – still is considered to be the nucleus for the economic progress (Moulaert and Sekia 2003). The ‘triple helix’ (for example Etzkowitz and Leydesdorff 1997, 2000) is the most popular metaphor for these approaches and takes a closer look at the innovation dynamics based on inter-linkages between the private sector, HEI and R&D centres as well as public administration (Etzkowitz and Leydesdorff 2000, Youtie and Shapira 2008).

However, recent research in territorial innovation systems in general and localities of learning, in particular, focuses on the detailed analysis of the relationship between knowledge, learning, innovation and the interplay of the multi-dimensional set of proximity such as cognitive, social, institutional and organizational proximity (Boschma 2005, Torre and Rallet 2005, Knoben and Oerlemans 2006, Thune 2009, Brinkhoff, Suwala and Kulke 2012). The role of science parks as territorial innovative seedbeds and interfaces between industry, universities and other research institutions is heavily examined (Vedovello 1997, Siegel et al. 2003, Siegel, Waldman and Link 2003, Siegel, Westhead and Wright 2003, Kulke 2008, Brinkhoff, Suwala and Kulke 2012, Huber 2012). In the global knowledge economy, science parks have to redefine their role within the learning environment substantially. Hansson (2007) identifies several differences between knowledge organizations and science parks. Knowledge organizations (‘child of the knowledge society’, Hansson 2007: 362) often focus on intangible knowledge, that is the management of knowledge creation through networking, learning, boundary-crossing, team-based cooperation, as well as internal and external interaction. In contrast, most classical science parks are characterized as ‘children of the late industrial society’ (Hansson 2007: 362). Here, science parks primarily focus on locational factors, material products and act as intermediary frameworks between companies, products and innovation.

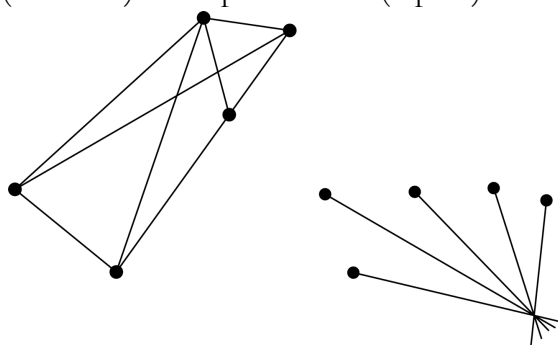
In the knowledge economy, science parks are currently experiencing a revival as organizational links between scientific institutions, the private sector and public administration institutions within the regional ‘triple helix’ (Hansson 2007). Consequently, modern science parks have to evolve to active coordinating institutions by creating and managing direct relationships to other entities or by promoting indirect linkages among knowledge organizations via space (Suwala 2012). This setting allows the establishment of an enabling context, space and environment, where the creation of *ba* (Nonaka, 1991, 1994, Nonaka and Konno 1998) stimulates inter-organizational links among a variety of knowledge organizations. But what is *ba* exactly? Essentially, the concept of *ba* describes physical (for example a café), social (for instance conversation), cultural (for example customs), mental (for instance shared personal experiences and ideas), economic (for instance trade) or virtual (for example web chat rooms) spaces or interactive platforms (similar to communities of practice), but entails an idiosyncratic feature that enables knowledge creation. At the same time, *ba* exists at different levels (individuals, groups and organizations).

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<sup>1</sup> 1 For these reasons and our purpose of investigating science parks in particular, we prefer the notion of ‘localities of learning’ with its idiosyncratic emphasis on knowledge and learning to other mentioned concepts, which centre production and innovation (for instance localized production systems and innovative milieus) or larger spatial scales (for example learning region).

When different bas overlap, they amplify and accelerate the process of knowledge creation and constitute a greater ba, which is called basho (Nonaka and Konno 1998, Senoo et al. 2007, Choo and Alvarenga Neto 2010). Therefore, ba represents a shared context, where knowledge is created, shared, and utilized. These settings may evolve into very creative environments and highlight the two characteristics of interaction and space-dependent, enabling contexts (Suwala 2014). The concepts of ba and basho have been introduced into management literature by the seminal contributions of Nonaka and colleagues (Nonaka 1991, 1994, Nonaka and Takeuchi 1995, Nonaka and Konno 1998). However, the idea was only – even very extensively – applied to the process of knowledge creation (Haarmakorpi and Melkas 2005, Hansson 2007, Senoo et al. 2007, Hautala 2011). The very fundamentals of ba or basho as introduced by the Kyoto School of Psychology (Nishida 1970, 1999) and refined from the perspective of systems theory (Shimizu 1995), however, have hardly been investigated. Exceptions only exist in scarcely accessible Japanese literature from Psychology (Latka 2003) and Systems Sciences (Katai et al. 2007). Nevertheless, Nonaka's contributions resulted in a shift of understanding of information processing to a knowledgecreating management within enterprises by overcoming substantial and static conceptions of knowledge. Not surprisingly, the managerial focus of the respective studies put less emphasis on the spatial foundations of the ba.

Returning to the ba's two outlined properties of interaction and space-dependency and applying them to the dominating agent-based perspectives in economic geography, we conclude that the ba includes the well-examined different natures of proximity (social, cognitive, organizational and geographical) (Boschma 2005, Knobens and Oerlemans 2006). From this perspective, space is constructed as relational. Alternatively, we want to break new ground and introduce a new way of representing space as a topical phenomenon (as an important attribute of ba) (Latka 2003, Pfister 2007, Suwala 2012) besides the common absolute, relative, and relational understandings of space (Couclelis 1992). Parts of this topical understanding refer to fundamental behavioural features of Japanese society and its predominant organization into small groups, which constitute 'protected spaces'. There, individuals are indirectly bound to each other via the ba (Nishida 1970). This results in prevalent direct relationships of individuals and organizations towards enabling spaces, which we call topical relationships (adapted from Latka 2003). If we investigate more accurately and take a closer look at the etymology of ba and basho, it becomes evident why it makes sense to differentiate between relational and topical relationships. Ba has a variety of meanings in Japanese. It symbolizes different spaces: a) place, b) built form and seat, c) situation and context, d) scene in a theatre play, e) area and sphere of activity, f) arena, g) market at the stock exchange, and h) physical field (Latka 2003). The meaning of basho also has multiple facets. It is understood as a) place, b) position, c) seat, and d) space. However, the current Japanese understanding of basho refers either to a place, where an agency is directed to, or to a location, where something or somebody is located (Latka 2003). While the second meaning stresses a static and substance-based location of existence, the first understanding clearly visualizes an individual-to-space relationship. Figure 1 indicates the difference between relational and topical links by means of a poly-centric (relational) and topical-centric (topical) network (Latka 2003, Suwala 2012).



**Figure 1. Poly-centric (relational, left) and topo-centric (topical, right) networks.** Own elaboration based on Latka (2003) and Suwala (2012).

Both understandings of space will be applied in the context of knowledge management (KM) and knowledge network management (KNM) in science and technology parks. Knowledge management measures and instruments are distinguished according to their mode of operation between relational (individual–individual) and topical (individual–space–(individual)) relationships. In particular, the latter opens up a new perspective on genuine spatial properties of KNM. As a broad concept, knowledge management originates from the business management literature. In the scientific debate, it is referred to as the whole life cycle of knowledge processing, that is knowledge creation, validation, presentation, distribution, sharing and application (Bhatt 2001, Gloet and Terziovski 2004, Scholl et al. 2004). Active knowledge management practices are defined as organizational routines, as well as control and coordination mechanisms that organizations use intentionally to govern knowledge processes and to influence knowledge management outcomes; respectively in order to create or sustain competitive advantages (Quintas, Lefrere, and Jones 1997, Meier 2011, Scholl et al. 2004). Knowledge management varies in terms of systematization, normalization, complexity and relevance in the decision-making process. Today, it is generally understood as an organizational challenge to coordinate individual knowledge carriers, apply knowledge in business processes and to utilize technical support instruments as facilitators (Bullinger, Wörner and Prieto 1998). Several scholars identify two different KM strategies: codification, that is knowledge management based on IT solutions, through which knowledge is codified, stored and made accessible to anyone; and personalization, which centres on the promotion of direct personal interaction as knowledge is strongly linked to the individuals that have created it (Revilla, Acosta and Sarkis 2005).

At the beginning of the twenty-first century, a shift from technical-oriented knowledge management to personalized approaches was observed. Tacit knowledge and personal interaction have become the central focal point in the knowledge society (Meinke 2012). In today's Internet era, knowledge management is regarded as people management, which aims to connect people around the world based on ICT and the Internet as communication channels and virtual space of interaction (Henn and Meyhöfer 2003). Nevertheless, the direct links between individuals and organization are the only factors that matter. Personalized knowledge can also occur via direct interaction towards space by perceptive stimuli that specific environments offer. In order to bring people together, 'protected spaces' (ba) and 'enabling spaces' (Peschl and Fundneider 2012), like innovation labs or co-working spaces, are increasingly being established where individuals establish relationships towards a space first, independently of alternating collocated professionals and flexible superstructures (Suwala 2013; Lewis and Moultrie 2005, Magadley and Birdi 2009). The literature predominantly emphasizes knowledge management at the firm level (for example Toyota) (Dyer and Nobeoka 2000) as well as in the interorganizational context of strategic alliances, joint ventures and joint research teams. (for example Xerox and Hitachi) (Cavusgil et al. 2003, Quintas, Lefrere and Jones 1997, Revilla, Acosta and Sarkis 2005, Hautala 2011, Meier 2011).<sup>2</sup> Empirical studies show that firms are more effective in transferring and sharing knowledge, when they actively implement knowledge management practices. Knowledge management instruments studied in strategic alliances include advisory systems, alliance liaison offices, learning networks, training programmes, as well as mutual visits, plant tours, and on-site meetings (Meier 2011). Communities of practice, brainstorming camps, virtual teams, mentorship programmes, storytelling, talent mobility, job rotation, inter-divisional teams, information and electronic learning networks, delegation of responsibility and reducing organizational hierarchy are further mechanisms in 'learning organizations' (Lundvall 2006, Scholl et al. 2004, Seufert 2000). While other strands of the academic debate focus on the nature of knowledge and the different institutional levels of intervention, we examine the contextual implications of knowledge network management on the spatial scale of specific 'localities of learning' (Scholl et al. 2004, Meinke 2012).

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<sup>2</sup> Meier (2011) provides a overview and discussion of the key aspects of knowledge transfer (e.g. knowledge characteristics, partner characteristics, partner interaction and active knowledge management in strategic alliance.

Knowledge Network Management in Territorial Innovation Systems Typically, territorial innovation systems are multi-actor innovation networks, which are characterized by heterogeneous entities and groups (for example companies, HEI, non-university R&D institutions, public policy institutions) and predominantly weaker structures compared to intra-firm networks. Economic success and competitive advantages of regions in the knowledge economy as well as rapidly changing global trends and environments greatly depend on the regions' ability to create and process knowledge and quality of its innovation networks (Harmaakorpi and Melkas 2005). The debate on proximity as a precondition of collective learning shows that non-spatial natures of proximity, in particular social, cognitive and organizational proximity, are critical for promoting interactive learning across different regional 'learning organizations' (Boschma 2005, Brinkhoff, Suwala and Kulke 2012).<sup>3</sup>

However, studies on knowledge (network) management in territorial innovation systems still remain very limited. In the RIS debate, for example, Dahl and Pedersen (2003) and Saxenian (1994) highlight the supporting culture and infrastructure, including trade fairs, conferences, seminars, and social activities, which facilitates the building of personal relationships and informal links in Silicon Valley. These informal networks also encouraged the sharing of market and technical information. In contrast, cultures and settings in other regional innovation systems such as the Route 128 case rather neglected the formation of informal networks and sharing of knowledge. In further studies, Fukugawa (2006, 2010) observes a positive effect of such distinct institutions and services (for example incubation manager, human resource development services) on linkages of science park-based companies to research centres. In the example of the regional innovation system of Lahti, Harmaakorpi and Melkas (2005) describe the creation of tailor-made knowledge management instruments responding to the specific natures of knowledge prevalent in each stage of their SECI / rye bread model of knowledge creation (see Table 1). In their model, self-transcending knowledge, which is defined as tacit knowledge prior to its embodiment (for example sensing the presence of a certain potential), is added as another type of knowledge (in addition to codified (explicit) and personalized (tacit) knowledge) (Harmaakorpi and Melkas 2005). Interestingly, the model also refers to different types of the ba during knowledge transformation. The main objective of our analysis will be to show what KNM instruments are best to being applied to specific stages of ba. Hereby, in particular topical measures will play a key role in addition to more common relational instruments.

In this chapter, we define knowledge network management (KNM) as mechanisms to organize and steer the generation and transfer of knowledge across organizational boundaries of those knowledge organizations and innovation networks that define the dynamic innovation 'ecosystem' (triple helix) on the geographical scale of distinct 'localities of learning'. It aims at tapping information flows, structuring knowledge and connecting knowledge carriers in innovation hubs such as science and technology parks, but also in the region as a whole. Knowledge network management tools, for example, comprise virtual communication platforms, networking and matchmaking events, knowledge marketing, financial support schemes for transfer of talent and joint research projects as well as intermediary institutions (Know-Man 2011). The business management literature on knowledge management highlights different classifications of KM instruments (for example formal and informal learning behaviour, direct and indirect practices). In this chapter, we propose a distinction between relational (that is person-based) and topical (that is space-based, ba) knowledge network management instruments and contexts, respectively. Relational settings are characterized by direct steering mechanisms that promote the creation, transfer and application of knowledge between different individuals (individual-individual). In contrast, topical knowledge network management mechanisms (individual-space-(individual)) stress the importance of an active ba as a physical or virtual space (or framework). The ba serves

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<sup>3</sup> See Knobens and Oerlemans (2006) for a comprehensive literature review of the interplay of the different dimensions of proximity.

as a common environment among like-minded individuals ('peers') and organizations. Therefore, personal interaction stimulates the dissemination and sharing of information and knowledge. Interaction between individuals is indirect as the communication predominantly is directed towards the ba in general.

Phases of 'ba' (SECI / <i>rye bread model</i> )	Knowledge types	Knowledge creation / management instruments
<i>Visualization / imagination 'ba'</i> (identifying hidden trends and potentials)	<i>Self-transcending -&gt; tacit</i>	<i>Forecasts, scenarios, expert-based statements / interviews; external expertise and perspectives (un-prejudiced selection of experts)</i>
Socialization / originating 'ba' (creation of a trustful atmosphere between actors of the core process)	Tacit -> tacit	Meetings and events for socializing and networking in a relaxed atmosphere in order to increase social cohesion in the innovation network, e.g. sport events, experience and study trips, team-building events; A thematic alignment of events with different target groups (e.g. clients, users etc.) is feasible, too.
Externalization / interaction 'ba' (promotion of productive learning)	Tacit -> explicit	Thematic seminars with communication and sharing of the newest information and knowledge; Brainstorming and idea-development platforms and meetings that are moderated and documented to facilitate collective learning. Interactive forums facilitate interaction beyond certain meetings.
Combination / cyber 'ba'	Explicit -> explicit	Internet-based extranet / virtual platform for combination of explicit knowledge, which consists of project plans, minutes of meetings, research reports, action models and best practices; Channel for external information and knowledge to get to the network
Internalisation / exercising 'ba'	Explicit -> tacit	Thematic group education with strong emphasis on practical exercises (various stakeholder involved); Exchange of experts between organizations
<i>Potentialization / futurization 'ba'</i>	<i>Explicit -&gt; self-transcending</i>	<i>Delphi techniques, forecasts etc.</i>

**Table 1. Knowledge management instruments in Lahti regional innovation system based on SECI / rye bread model** (based on findings of Harmaakorpi and Melkas (2005))

The ba was primarily examined in intra-firm knowledge creation and organizational learning at the company level (Nonaka 1991, 1994). Senoo et al. (2007) show that workplace formation actively contributes to knowledge creation by activating the ba. KM practices that aim to enhance the exchange of information and knowledge as well as direct communication comprise workplace layout reformation (creation of free-seating systems, meeting areas and demo spaces boosting interaction and communication) and the development of an intranet database, in which internal documents were digitized systematically (Senoo et al. 2007).

In this section, we discuss how the model of an active ba can be applied to and created in science parks and other types of territorial innovation systems. Harmaakorpi and Melkas (2005) argue that modern firm organizations are mainly characterized as networked firm entities, and consequently, can be compared to territorial innovations systems. Differences in terms of hierarchy, leadership and general management, however, still exist (Harmaakorpi and Melkas 2005). Table 1.2 illustrates the distinction of relational and topical KNM measures both enhancing the ba by using mechanisms mentioned in the knowledge management and regional innovation systems debate (Harmaakorpi and Melkas 2005, Meier 2011, Lundvall 2006, Scholl et al. 2004, Uotila, Merkas and Harmaakorpi 2005). Whereas knowledge management practices at the firm level mainly put an emphasis on the promotion of direct personal interaction, we argue that KNM should also stress topical modes of operation. However, in many cases topical instruments cannot be allocated explicitly to only one of the two categories, but show central features of both modes of operation simultaneously. In the case of a 'liaison office', its role is either to offer a 'protected space' (topical/ba) for inter-organization interaction or to facilitate direct relationships (relational). These circumstances can only be satisfactorily answered by qualitative methods. Therefore, we conducted in-depth interviews with businesses to assess the 'liaison office's function – either as 'safe haven' to detect suitable cooperation partners or its matchmaking process.

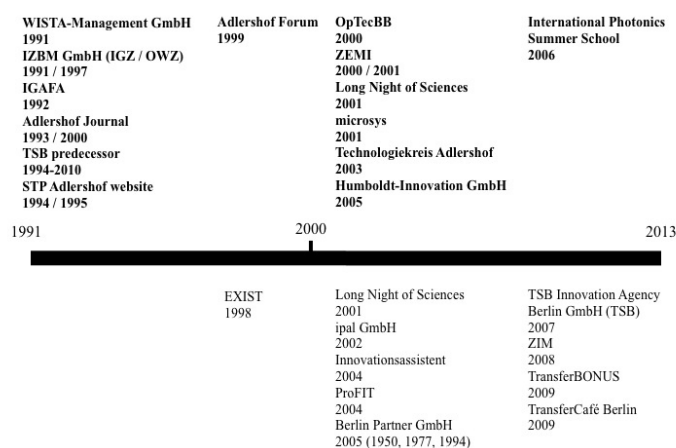
Relational instruments	Topical instruments
<p>Business management literature:</p> <ul style="list-style-type: none"> <li>• Alliance liaison offices</li> <li>• Learning networks</li> <li>• Information and electronic learning networks</li> <li>• Training programmes</li> <li>• Mentorship programmes</li> <li>• Advisory systems</li> <li>• Inter-divisional teams</li> <li>• Virtual teams</li> <li>• Talent mobility / job rotation</li> <li>• Storytelling</li> <li>• Mutual visits, plant tours, and onsite meetings</li> </ul> <p>RIS literature:</p> <ul style="list-style-type: none"> <li>• Thematic group education with strong emphasis on practical exercises</li> <li>• Incubation manager</li> <li>• Human resource services</li> <li>• Matchmaking events</li> <li>• Financial support schemes for joint research projects</li> </ul>	<p>Business management literature:</p> <ul style="list-style-type: none"> <li>• Communities of practice</li> <li>• Brainstorming camps</li> </ul> <p>RIS literature:</p> <ul style="list-style-type: none"> <li>• Socializing and networking meetings and events, e.g. sport events, experience and study trips, teambuilding events</li> <li>• Thematic seminars with communication and sharing of the newest information and knowledge</li> <li>• Knowledge marketing</li> <li>• Intermediary institutions (e.g. TTO)</li> <li>• Internet-based extranet / virtual communication platform for sharing and combination of explicit knowledge</li> </ul>

**Table 2. Relational and topical instruments of knowledge network management** (own compilation based on Scholl et al. (2004), Melkas (2005), Fukugawa (2006, 2010), Lundvall (2006), Know-Man (2011), Meier (2011))



## Managing Innovation in Two Science Parks in Berlin and Seville

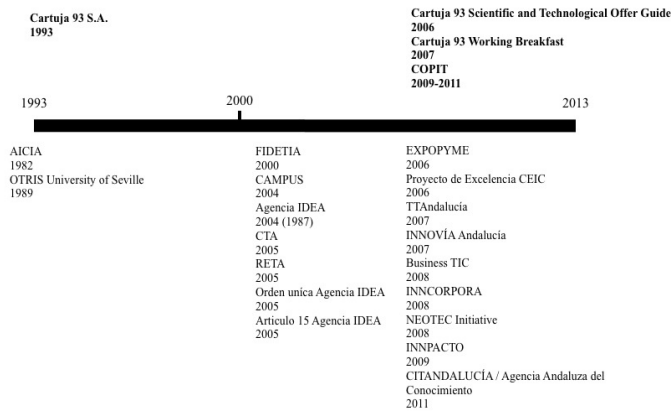
The empirical framework of this chapter is examined at the two science parks Berlin-Adlershof<sup>4</sup> and Seville-Cartuja.<sup>5</sup> The data was gathered within the EU Interreg IVC project ‘Knowledge network management in technology parks (Know-Man)’ in Autumn 2010 and Spring 2011. In total, 54 technology-based firms (TBF) participated in a survey, which was characterized by a methodological mix of standardized questionnaires and expert interviews. In the empirical research, we aim to analyse the character of interaction between high-technology businesses and scientific institutions as well as the impact of existing knowledge network management systems at the two innovation sites in Berlin and Seville. The large majority of the surveyed firms are characterized as R&D intensive high-technology companies, which maintain strong or even multi-faceted long-term relationships to scientific institutions in the science parks and beyond. Both science parks are large-scale regional redevelopment landmark projects, which aim to promote innovation and regional economic growth in distinct high-technology sectors. The triple helix, that is complementary HEI and non-university research institutions in conjunction with TBF, is a critical element at both science parks. The two case studies only differ slightly in terms of the businesses’ composition. While the Berlin-Adlershof science park is characterized by a large number of micro and small companies, Seville- Cartuja’s is also home to several individual large national companies and units of prominent international firms, for example, Alter Technology Group and Celgene (Brinkhoff, Suwala and Kulke 2012). At the beginning of both science parks’ development, geographical proximity was the primary initial precondition for the development of networks and a dynamic growth process. Management strategies did not include any innovation network building systems (Kulke 2008, González Romero 2002, Brinkhoff, Suwala and Kulke 2012). However, various boundary-spanning mechanisms and KNM practices have been installed in the recent past. Figures 2 and 3 provide a chronological overview of important knowledge network management instruments and institutions in both science parks (bold letters) and related regions.



**Figure 2. Timeline of major Berlin-Adlershof science park and Berlin third stream initiatives and KNM instruments (own elaboration)**

<sup>4</sup> The Berlin-Adlershof science park was established in 1991. Today ca. 955 companies (of which 445 high-technology companies primarily operate in the six key clusters optics and photonics, material and micro system technologies, ICT, environmental technologies, energy and biotechnology), 11 non-university research institutions and six natural science departments of the Humboldt-Universität zu Berlin are located at the site. In total, ca. 14,940 employees work in the science park – about 12,120 of them in the private sector and ca. 2,820 at the university and non-university research institutions. Furthermore, roughly 8,440 students study in the science park. In 2012, all organizations generated a total of ca. €1.7 billion in turnover (WISTA-MG 2013).

<sup>5</sup> The Seville-Cartuja science park was founded in 1993 at the former site of the Expo 1992. In 2010, about 340 companies with a total of ca. 15,100 employees have been located there. About 180 of them are high-technology companies with about 7,860 employees that work in the science park’s major clusters ICT, engineering, environmental technologies, biotechnology/agro-food, energy and health. Furthermore, five universities (e.g. the University of Seville and EOI Business School) with ca. 8,000 students and multiple R&D centres reside in the science park. In 2010, the organizations’ total turnover was ca. €1.9 billion (Brinkhoff, Suwala and Kulke 2012).



**Figure 3. Timeline of major Seville-Cartuja science park and Andalusia third stream initiatives and KNM instruments (own elaboration)**

In particular, the qualitative case study approach allows the identification of a diverse set of substantial elements (for examples locational factors)<sup>6</sup> and – most importantly for this chapter – relational (individual–individual) and topical (individual–space–(individual)) KNM instruments that contribute to collective learning processes in the two science parks. Table 3 names the most prominent relational and topical KNM practices that are implemented in the Berlin-Adlershof and Seville-Cartuja science parks (as well as on the regional and national scale).

Type of KNM practices	Berlin-Adlershof science park	Seville-Cartuja science park
Relational knowledge network management mechanisms	<ul style="list-style-type: none"> <li>• STP management WISTA</li> <li>• Incubator management IZBM</li> <li>• Technology transfer offices / intermediaries (Humboldt-Inno)</li> <li>• Industry and regional networks (e.g. Technologiekreis Adlershof, OpTecBB)</li> <li>• <i>Matchmaking events</i></li> <li>• <i>Virtual contact platform Berlin TransferCafé</i></li> <li>• <i>Talent-oriented support programmes (e.g. Innovations-assistent)</i></li> <li>• <i>Financial support programmes for spin-offs and technology start-ups (e.g. EXIST)</i></li> <li>• <i>Financial support programmes for R&amp;D projects (e.g. ProFIT, TransferBONUS)</i></li> </ul>	<ul style="list-style-type: none"> <li>STP &amp; incubator management Cartuja 93 S.A.</li> <li>• <i>Matchmaking events (e.g. COPIT, encuentros TT)</i></li> <li>• <i>Technology transfer offices / intermediaries (e.g. FIDETIA, CITANDALUCÍA, CTA, TTO of University of Seville)</i></li> <li>• <i>Regional development and innovation agency IDEA</i></li> <li>• <i>Talent-oriented support programmes (e.g. INNCORPORA, Torres Quevedo)</i></li> <li>• <i>Financial support programmes for spin-offs and technology start-ups (e.g. Programa CAMPUS, Artículo 15 Agencia IDEA, NEOTEC)</i></li> <li>• <i>Financial support programmes for R&amp;D projects (e.g. Orden unica Agencia IDEA, INNPACTO, Proyecto de Excelencia CEIC)</i></li> </ul>
Topical knowledge network management practices	<ul style="list-style-type: none"> <li>R&amp;D marketing (e.g. WISTA website, Adlershof Journal)</li> <li>• Networking events (e.g. Forum Adlershof Business Lunch)</li> <li>• Congresses / conferences (e.g. microsyst Berlin)</li> <li>• Inter Photonics Summer School</li> <li>• Long Night of Sciences</li> </ul>	<ul style="list-style-type: none"> <li>R&amp;D marketing (e.g. Cartuja 93 website, Cartuja Scientific Inventory)</li> <li>• Networking events (e.g. Cartuja 93 Working Breakfasts, COPIT)</li> <li>• <i>Congresses / conferences (e.g. Expo PYME, Innovia, Business TIC)</i></li> </ul>

**Table 3. Relational and topical KNM instruments at the two case studies** (own elaboration, Note: KNM instruments in italic letters are implemented beyond the science park-scale – on the regional or/and national scale)

<sup>6</sup> As an illustration, we provide an example of the static, substantial and non–personalised element of KNM. Locational factors such as a critical mass of knowledge carriers are illustrated in the following statement collected in the Berlin-Adlershof case study: ‘Although nothing has developed so far, here is a certain potential, which you won’t find to this extent at another location’. (Company 18, STP Adlershof)

Previous research in inter-organizational relationships and innovation-related collaborative activities highlight the central position of personal contacts (Oinas 1997, Boschma 2005, Brinkhoff, Suwala and Kulke 2012). Typically, these ties are based on personal relationships to former work colleagues or fellow students. Other contacts are based on referrals from the companies or the scientific institutions' personnel. Also, our two case studies reveal the very strong importance of relational KNM practices and institutions that initiate personal interaction directly and, hence, the building of social proximity and mutual trust. Intermediary institutions at both innovation sites such as the science park management organizations WISTA-Management GmbH and Cartuja 93 S.A. hold an active matchmaking role. Further boundary-spanning interfaces are the locally rooted networks Technologiekreis Adlershof and OpTecBB in the Berlin science park, as well as distinct Andalusian technology transfer organizations, for example CTA and FIDETIA. The following statements showcase the emphasis on direct relations between different knowledge organizations (key words are highlighted in italic letters).

The Technologiekreis [Adlershof] is a very important institution. ... Often, requests for *cooperation* are stated. You just have to know whether it suits your interests and whether you have the personnel to realize it within the time period. Then, you can *get in touch with the people*. (Company 13, STP Adlershof)

It's always easier, when you know each other beforehand, when you know who you are talking to compared to when you have to ask through the university in order to *find the right person*. ... This is the reason why we are in various committees and networks such as OpTecBB. Not because we're expecting big business, but to get to *know* beforehand *who* works in what field and who could contribute to solutions in certain problems at some point. (Company 9, STP Adlershof)

In these two examples, the Berlin-based businesses' CEOs know exactly whom they are going to meet through the networks Technologiekreis Adlershof and OpTecBB. The network members know each other and also are known to prospective members (through the networks' marketing activities). Know-who is the crucial circumstance for relational KNM instruments. Hence, the businesses already presume what kind of relationships with distinct businesses and other organizations may evolve through their active involvement in the business networks. Nevertheless, the interviewees also emphasize topical relationships that are manifested in different bas. Exemplary modes are virtual or physical spaces through which individuals and organizations connect indirectly (socializing ba), but subsequently may result in direct personal links. These anchoring spaces may be theme-marked or experience-marked places or distinct networking events, meetings points and virtual platforms that 'peers' utilize and frequent.

Most importantly, the framework is provided by the informal contact, for example the informal contact when you get to know each other (...) and when it becomes transparent what they others can do. (...) There's the 'Academic Lunch', *where* one and the other CEO are invited and sit next to a university professor at the table. And as soon as three people sit together, they talk 'what do you do?' and 'what do you do?' and such things. (Company 19, STP Adlershof)

Fundamentally, it's been through personal contacts, but always under the umbrella of Cartuja 93 S.A., the management entity of the STP Cartuja, with distinct activities, events, conferences, talks, and so on. Well, *there* you will meet research groups, and so on, you will exchange ideas and opinions. (Company 22, STP Cartuja)

Contacts are made at conferences, trade shows and presentations. These are good *occasions and places*, respectively, to meet people that work in the same field or something which may create synergies. (Company 14, STP Cartuja)

Furthermore, multiple interviewees express the demand for rather topical KNM practices such as physical places and events (physical ba). As an illustration, science park-based demo shows at prominent and highly frequented places such as the Cartuja science park's business centre Pabellón de Italia could create a ba, which spurs informal interaction and the building personal relationships.

But what I'm missing is *some space where* demos, prototypes, products, and so on, of the companies are presented. (...) We can pass it, we have a look at the demo, and can go from there to get in touch in a natural way. (...) More informal, more non-virtual. (Company 10, STP Cartuja)

I would like them to meet me. To *host a conference and a forum*, and the research centres tell us about what they focus on, what they can offer, what they dedicate to, where do they want to be, how do they think they could support the companies ... I think it could be done more quickly, to sit down together at a conference, a forum for one day, and to tell us. (Company 25, STP Cartuja)

One way to build contacts would be a *regular event*, for example once a week. ... Fun and a relaxed atmosphere should be underlined, probably at a morning pint or brunch. (Company 6, STP Adlershof)

'Know-where', the physical ba, plays the crucial role here. Moreover, a virtual ba in terms of R&D marketing and information instruments such as comprehensive and demand-oriented virtual information and communication platforms are underlined by some companies, in particular those working in the ICT sector.

There should be an *Internet platform, where* companies could post requests for student placements (for example internships, master theses, working groups) for all universities. (Company 3, STP Adlershof)

... also, some kind of online database, a *platform* through which the companies can get in touch ... And it's also about the daily business, the products, the news, the ideas they have ... But you can put something on it like 'I'm looking for a technology partner for project X'. (Company 28, STP Cartuja)

Virtual spaces (for example social media platforms) stress the 'knowing where' and the indirect interactive relationships between individuals and organizations through 'protected spaces' (ba). Finally, intermediary institutions and persons take the role as personalized or institutionalized ba. Here, we interpret the role of such intermediary institutions as 'space', which can be considered as an intermediary membrane. There, the ba receives, transports and disseminates messages and needs between different individuals and organizations. This leads us to institutions (for example boundary spanners and networks) that bridge space through a so-called institutional ba.

I think a necessary service is a *[organization] that facilitates communication* between the scientific and the business world. This service can be implemented by *active officers* that promote cooperation between both sides, for example, innovation promoters. (Company 2, STP Cartuja)

If there would be a *care-taker* that is associated to WISTA or something, that promotes the organization in the network, it would be great. You could place your requests, your ideas to him and he would try to realize them. (Company 24, STP Adlershof)

However – as stated before – the role of brokerage institutions such as the science park management and industry networks is not clearly assigned to either relational or topical modes (institutional ba). These agents rather embody a hybrid function. The following example illustrates this aspect

About 50 per cent of the connections came from the contacts I had from my *previous research work experiences*. The other 50 per cent of the relationships came *through contacts to CSIC or are referred by the CTA*, for example. Also, through a networking event initiated by the research group of CABIMER – they facilitated the meeting of companies and researchers. (Company 12, STP Cartuja)

In many cases, the allocation of KNM practices to either one of the categories remains ambiguous. Relational and topical modes mostly coexist parallel with their respective individual features often complementing each other. Ultimately, knowledge network management is people management. Topical modes, that is institutional ba, virtual and physical ba, are created spaces that attract cognitively proximate knowledge carriers ('peers') and enable and accelerate the building of interpersonal relationships. Almost all examples from the in-depth interviews that we illustrate in this chapter exclusively refer to the phase of 'socializing / originating ba' in Nonaka's SECI model (which also is included in the adapted rye bread model of Haarmokorpi and Melkas 2005).

## Discussion and Conclusion

This chapter offers insights on knowledge network management in TIS as localities of learning. We define KNM as distinct practices and institutions to coordinate the creation and transfer of knowledge among knowledge organizations and innovation networks of the 'triple helix' in TIS. Our case studies at the Berlin-Adlershof and Seville-Cartuja science parks illustrate that managing innovation and knowledge in science parks as 'localities of learning' requires a complementary set of both relational and topical instruments of KNM. Therefore, science parks have to move beyond being a simple geographical concentration of private companies, HEI and R&D institutions, and political institutions (as propagated in the industrial society). Businesses of the knowledge economy clearly expect intermediary institutions such as science parks to provide direct and indirect links to co-located potential partner organizations in the private sector and academia. However, geographical proximity solely is not a sufficient precondition. Also, additional natures of proximity, namely organizational proximity in terms of active KNM systems, have to be implemented to nurture the development of inter-organizational linkages (Brinkhoff, Suwala and Kulke 2012). Consequently, modern science parks have to evolve towards active knowledge-creating entities. Taking this boundary-spanning role, innovation hubs have to create different bas in inter-organizational relationships and networks among stakeholders in the regional 'triple helix' (Hansson 2007). The findings of our case studies show that in particular topical KNM instruments represent genuine space-dependent measures to manage knowledge in territorial innovation systems through direct manifold individual-space (for example physical, virtual and institutionalized) relationships. These results are further supported by empirical studies at the firm level by Alvarenga Neto and others (Alvarenga Neto 2005, 2008; Alvarenga Neto et al 2009). Their findings of the assessment of KM initiatives in over 20 international firms (for example 3M, Dow Chemical, Xerox, Ernest & Young, British Telecom and Microsoft) suggest that the creation of ba or similar enabling conditions and contexts are not only crucial when managing knowledge in networks; knowledge organizations rather manage the context and readiness where knowledge is socially created, shared and utilized (Choo and Alvarenga Neto 2010).

Nevertheless, we support today's understanding of knowledge network management as (a type of) people management in particular. However, on the spatial dimension of TIS and science parks, the ba, in terms of 'protected enabling spaces' becomes more important in order to bring the multi-faceted types of knowledge carriers, organizations and networks together. These mutual spaces are defined by distinct needs, expectations, experiences, themes and knowledge backgrounds. Their role, which is recently emphasized by the increasing academic interest in organizational innovation spaces, for example innovation labs and co-working spaces (Lewis and Moultrie 2005; Magadley and Birdi 2009), becomes more crucial as they serve as initializing conglomeration for interactive relationships that contribute to the innovativeness of TIS and 'localities of learning'.

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