

## Airports Reconsidered

An emerging knowledge-economy-based space

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### 1 Introduction

Air transportation is gradually creating a completely new spatial configuration, as other kinds of transportation modes did in the past. Although the deep impacts of airports on the spatial structure are known since the 1950s (Taaffe 1956: 219), research on airport-linked spatial development has not attracted much attention within space-related disciplines such as geography, urban planning or urban and real estate economics for a long time. In recent years airports have emerged as vital nuclei of spatial development, powerful engines of economic growth (Conventz 2010, Button 2004), “docking and transfer nodes in global networks” (Zook & Brunn, 2006) and centers of permanent or temporarily knowledge exchange.

Although airports and their settings have come under more scrutiny due to an array of different and sometimes interwoven processes and dynamics, like for example globalization, deregulation, liberalization or increased global mobility, they still represent a crucially understudied element in the postindustrial restructuring of urban systems and in knowledge economy context. Especially for knowledge-intensive advanced producer service firms and high-tech companies airports and their vicinities have become advantageous business locations that supply a rare competitive advantage: accessibility. Successively, competence-based companies have settled their regional, national and sometimes supranational branches near the airport as many European examples plainly show. In Switzerland, for instances, the Glatt Valley is one of the top five performing business locations countrywide, benefiting from the good location factors, among them the international airport of Zuerich (NZZ 2012). A myriad of corporate headquarters have favored the Glatt Valley as office site and a huge demand is attracted from the IT-sector (NZZ 2012). A similar picture emerges in Munich where the neighboring municipalities of Eching, Garching, Hallbergmoos, Ismaning, Neufahrn, Oberschleissheim, Unterfoehring und Unterschleissheim have benefited above-average from the continuously settlement and expansion of companies in the past few years since the airports inauguration in the year 1992 (Dross et al 2011). From an economical point of view the axis between the airport and the city is considered as the most powerful airport-city corridor across Europe with a variety of multinational corporations such as SAP, Microsoft, Baxter, Cassidian, EADS, BMW, GE Electric, Swiss RE et cetera (Mueller 2012). Similar tendencies of airport-centered spatial development can be observed around several other European airports like Hamburg, Nice, Copenhagen or Paris (ACI 2004: 6, ECAD 2007).

The recentralization of new functions formerly localized in the central city and the shifting perception of airports enable airports to appear as modern kind of marketplace (Gottdiener 2001, Edwards 2005) where people can convene, exhibit, trade and change information. Thus, airports are in no way inferior to historic marketplaces of the Medieval city such as Brussels' Grand Place. Hence, with the history of airports, the history of markets is repeated.

How to interpret these new spatial articulations on a micro-level spatial scale? From our point of view, one of the most important keys in understanding these processes and dynamics are the locational requirements and changing internal and external value chains of knowledge-intensive companies.

This article introduces a new approach in order to understand the spatial alteration around airports more thoroughly. Starting point for a new understanding is a conceptual-analytical approach – an impact model – that combines the complex and multisided interplay between location strategies of knowledge enterprises, geographical proximity, airport-linked developments and the way airports are used within the process of knowledge creation. The innovative approach combines a methodological mix of quantitative and qualitative network analysis with methods of real estate market research.

The paper is structured in five sections. The second section reveals some general remarks on property markets and urban development, location and accessibility and the emergence of the knowledge economy. In the third section we will present the research concept. In part four we discuss the case study of Amsterdam-Schiphol. And finally, in the fifth section, we conclude by synthesizing the main findings and proposing an agenda for further research.

## 2 Property Markets and Urban Development

Since the emergence of urban systems, Cities are shaped by the location decisions of private companies, households, and governmental bodies that want to use the space for either consumption or production purpose (McDonald & McMillen 2006: 41). Their locational demands and site requirements are articulated at the market for real estate. Generally speaking, “a market is a group of buyer and sellers of a particular good or service” (Mankiw 2011: 66). In other words, a market is a mechanism through which different goods and services are voluntarily exchanged among different market participants. Both, demand and supply, are the two driving forces that make markets work and that determine the quantity and price of a certain product or service. Generally, markets can take many forms, scale, locations, and types of participants.

Applying the market concept to land and buildings, a real estate market can be defined as “the market for the usage (or the right to use) real property (land and built space) (Geltner 2006: 3). It is the exchange platform where the demand side with its specific spatial needs and willingness to pay encounters the supply side represented by property owners who are willing to sell or rent to buyers or tenants.

The term “real estate market” is a multilayered expression with more than one meaning and a complex and interwoven way of functioning (Archer & Ling 1997). It “can refer to the market for the use of the physical space, to the market for ownerships interests in the property, or to still other phenomena that are closely related” (Archer & Ling 1997: 7). The following simple visualization in reference to Archer and Ling (1997) will help to understand the complexity of real estate markets and how the single elements of space, property and capital market are interlinked. In contrast to other real estate analyst who only make a distinction between space markets on the one hand and capital markets on the other hand, Archer and Ling differentiate between a three-market model (Archer & Ling 1997).

Due to the interdependencies between the different elements of the system any smaller changes in one component will have an impact on one of the other elements of the system. For example, a better business climate or a changed economical context will stimulate the demand for space for economic activity which in turn has an impact on the different property markets and finally on the spatial structure and functional organization of spatial entities. As spatial demand underlies a constantly re-examination process it is far from being static. Indeed this process is the result of changing locational requirements and frequently depends on location and accessibility.

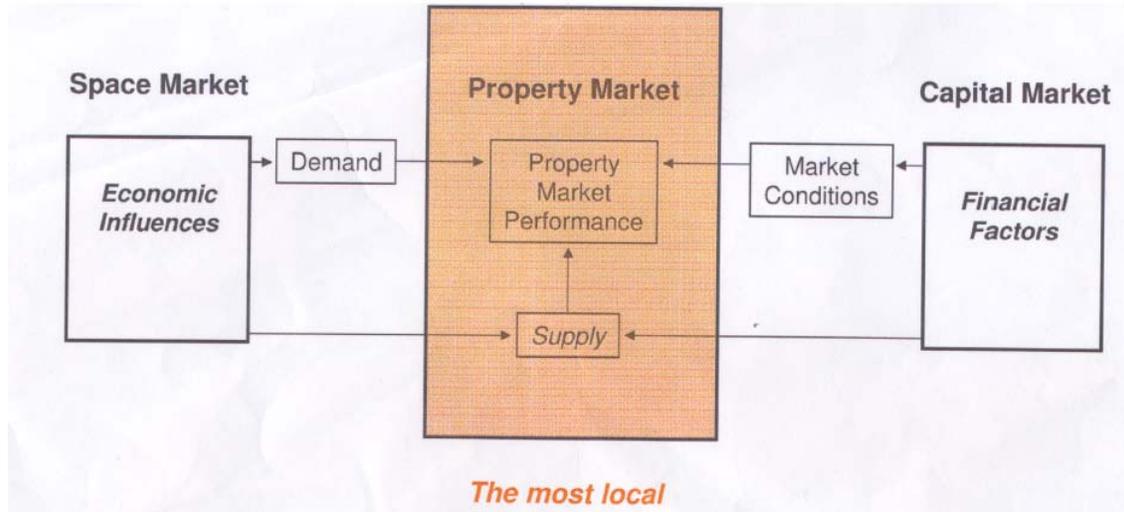


Figure 1: Functioning of Real Estate Markets  
(Higgins adapting Archer & Ling 1997)

### 2.1 Location and Accessibility

"Location is a complex and changing attribute. It is access to whatever may be important for a particular economic activity, and the demand for urban space derives from the demand for access." [...] Each possible use has important access needs – often called linkages – that determines the desirability of a site for that use" (Archer & Ling 1997: 8). In the most general sense, accessibility is the ease of reaching destinations. [...] Accessibility can also be used in reference to places, to describe how easily one place or location, say for business can be reached by people in other places. "Although in the early days of economic geography, access was conceptualized in terms of simple distance as one of the key concepts underlying the spatial organization of the settlement system (Christaller 1966) and industrial location (Weber 1929), accessibility also depends on the communication and transportation networks that facilitate interaction". From a spatial perspective, the effects of accessibility become clear with the example of airports. Dross et al (2011) as well as Thierstein et al (2007) have shown that airport access affects economic performance. Airports attract knowledge intensive firms which, in turn, drive spatial and real estate development (Goebel, Thierstein & Luethi 2007; Dross & Thierstein, 2011; Button & Taylor, 2000; Haas & Wallisch; Schaafsma 2008)".

Before introducing the specific research concept some general reflections on the growing importance of knowledge in contemporary economies need to be done in order to get a deeper understanding of the subject matter.

### 2.2 The Emergence of the Knowledge Economy

Recent decades have witnessed a period of fundamental changes in world-wide economic activities (Dicken, 2011). Increasingly, the western hemisphere is experiencing a shift from a natural to a knowledge-based production. Today, knowledge is considered as a key driver for innovation and economic growth. At the same time, knowledge has become an integral part to those companies engaged in producer services and in advanced manufacturing but also to "firms in traditional industries in order to stay ahead of international competitors, occupy markets niches, and maintain a competitive advantage" (Bathelt & Glueckler. al 2011: 1). According to Peter Hall and Kathy Pain growing knowledge-based economy is a mayor driver of spatial development (Hall & Pain 2006: 4). Thierstein et al also underline the growing importance of the knowledge economy: "The knowledge economy with the so-called

knowledge-intensive services is a central driver considered to be reliable for the development of the new gravitation fields of economic power” (Thierstein et al 2006: 13).

Although there has been research of knowledge-based economy since late 1990s research still lacks of a commonly accepted definition of what the knowledge economy exactly is. One definition that is provided by Luethi (2011) describes knowledge economy as the “part of the economy, in which highly specialized knowledge and skills are strategically combined from different parts of the value chain in order to create innovations and to sustain competitive advantage” (Luethi 2011: 21). Following Thierstein et al the knowledge economy is characterized by three important pillars: Advanced Producer Services (APS), High-Tech industries and knowledge creating institutions such as universities and research establishments.

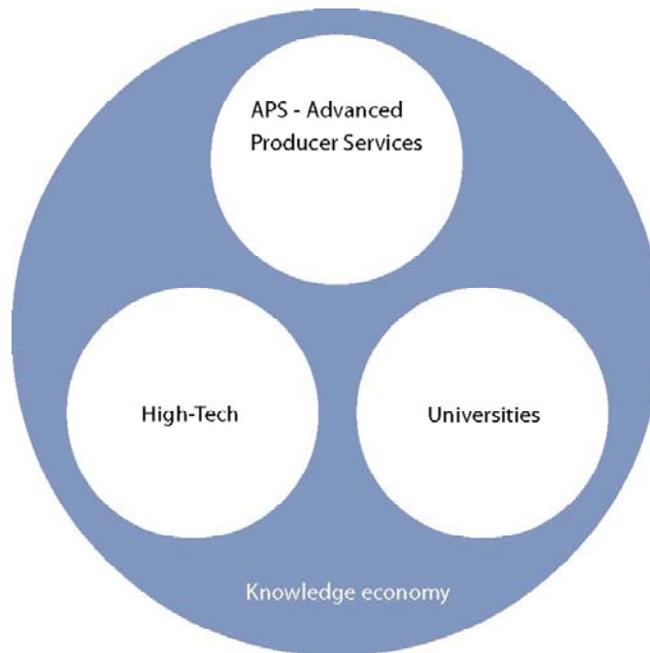


Figure 2: The Three Pillars of the Knowledge Economy  
(Thierstein et al. 2006)

One key characteristic for innovation on the one hand and the knowledge economy on the other hand is the combination of science based knowledge and operating experience.

Knowledge is not easily exchangeable. Instead, the exchange of knowledge to a large extent requires geographical and social proximity which is based on established face-to-face interactions. Following Polanyi’s seminal classification, knowledge can be distinguished into codified or explicit knowledge and tacit knowledge (Polanyi 1966). As opposed to tacit knowledge, explicit knowledge is codifiable, articulate, or storable – verbally, visually, or symbolically. Thus tacit knowledge is highly contextualized and not effectively transferable between individuals by certain media. With his well-known phrase “we know more than we can tell” Polanyi (1966: 4) illustrates the fundamental idea of the distinction between explicit and tacit knowledge (Gertler 2003). Tacit knowledge in combination with personal experience is considered as an essential prerequisite in creative processes and innovation, and therefore as foundation of the knowledge economy (Schamp 2003: 181).

The above described “local nature of knowledge” (Malecki 2000) forms one basis for the

research on location strategies of knowledge intensive firms which will be discussed in the next sections.

### 3 Research Methodology

Based on these previous attempts, we now present our current research concept aiming to reveal the specific role of international airports for knowledge intensive firms and the spatial consequences that results from the spatial practice. The contribution aims to get a new understanding of the complex and multilayered interplay between a network infrastructure such as an international airport and real estate markets in knowledge economy context. The micro-level spatial effects of this relationship still remain an understudied area in spatial disciplines.

Especially in a (hyper) dynamic urban and regional planning context new consolidated findings about the effect of different determining factors of airport-linked spatial development are eminently important for a long-term and balanced spatial planning perspective.

As the interaction between an traffic junction such as an airport and the spatial development of its surrounding is not reducible to only one causal chain a more complex approach is required. One reference point of identifying the different causal chains and their interweaving among themselves is a conceptual-analytical approach by use of an impact model. This approach allows the identification of the complex causal chains and its single elements.

#### 3.1 A Stylized Impact Model

The starting point of our stylized impact model is the location behavior and site selection process of knowledge-intensive firms. The model describes three inter-dependant cycles. The similarity of all three cycle is the starting point: the site selection of knowledge-intensive companies. The outer circular flow relates to the international accessibility. Knowledge-intensive companies have a demand for air traffic services. Airport operators again react by adjusting their capacity according to the demand. At the end knowledge-based companies benefit from a higher degree of accessibility. The intermediate cycle illustrates the evolving urban structures and developments. As a result of the increased demand airport operators and municipalities facilitate the centralization of urban functions in an around the airport. The inner cycle relates to the knowledge workers. Knowledge-intensive search for employees, which settle in close spatial proximity to their workplace. As a result of all three causal chains a spatial entity is created characterized by a new spatial quality and accessibility profile. The maturing process of this development heightens the attractiveness of the airport location to such an extent that the settlement process of further knowledge-based companies continues and existing company start to expand.

An increased demand for air traffic services drives a second business activity of airport operators: the non aviation sector where real estate services play a key factor in terms of future growth. Such non-aviation activities can be comprised of retail developments and the implementation of new retail concepts like shopping arcades and malls, Michelin Star Award-winning restaurants, and other real estate developments such as offices, hotels, conference, exhibition and convention centres, hospitals and beauty facilities, leisure, recreation, museums or fitness facilities. All this developments and service will be used by knowledge-intensive firms, by their employees for example during lunch break, meeters and greaters or local residents. With the changed locational requirements of the knowledge economy, the changed use of airports by different customer groups and the perception of airports a new urbanizing space is emerging. The longer the process takes, the more companies from the knowledge economy are attracted and the more new urban structures come through.

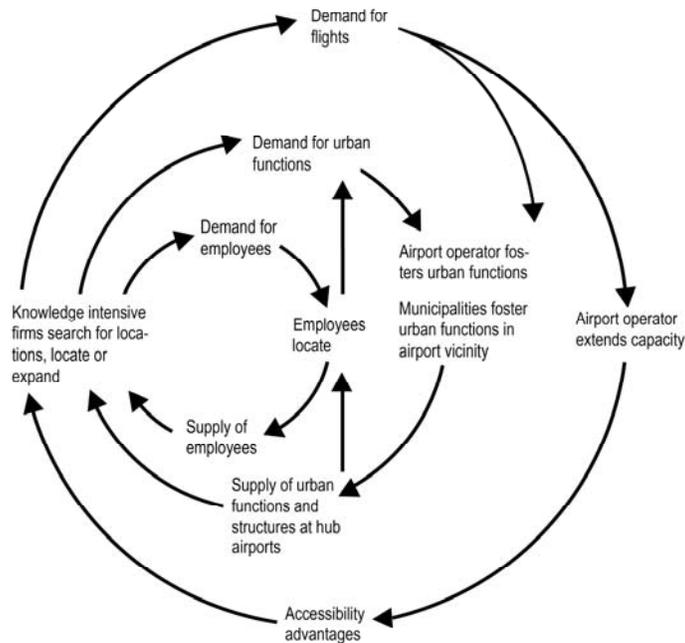


Figure 3: Stylized Impact Model  
(Thierstein et al 2011)

### 3.2 Research Questions and Hypothesis

From the theoretical and conceptual considerations discussed above, we deduct the following main research question, which reads as follows:

*Which role do knowledge-intensive companies with their locational requirements and spatial (business) practice play in terms of the development and transformation of property markets in and around international airports?*

Moreover we are interested in answering the following sub-questions among others:

- *Which general role exists between international airports and companies from the knowledge economy?*
- *Which role do international airports have within the knowledge creation process, the business practice and optimizing firms-internal and firms-external value-added chains?*
- *Which role do airports play within the site selection process of knowledge-intensive companies?*

Starting from the theoretical and conceptual considerations discussed above, we propose the following main hypothesis:

If knowledge-intensive companies and their highly mobile employees demand accessibility, than the emergence of a new real estate site and functional space at and round international airport is supported.

### **3.3 Methodological Approach**

Analyzing the knowledge-based spatial patterns at and around international airports requires a methodological mixed approach consisting of quantitative and qualitative network analysis and real estate market research methods. Relational thinking in terms of connections of activities – linked through both physical and non-physical flows – is one central key to understand spatial developments processes around airports. According to Dickens (2011) the critical point of applying a network approach is that it draws the attention to the interconnectedness of economic activities across different spatial scales: global, national, and regional. But quantitative approaches only would fall short. The challenge of understanding airport-related spatial processes can only be met through a mixed approach of quantitative and qualitative methods working in tandem. Based on the theoretical consideration an innovative approach was elaborated that combines four different research methods which will be discussed in greater detail now.

#### *3.3.1 Interlocking Network Model*

First, we use the interlocking network model as Peter Taylor introduced it. This approach allows estimating the city connectiveness from the office networks of multi-location, multi-branch enterprises from the Advanced Producer Service and High-Tech Sector. The basic premise of the interlocking network model approach is that the more important the office, the greater its flows of information will be to other office locations. It provides one specific way to address the question how inter-city relations can be empirically measured despite the chronic lack of data on inter-city information flows. The method was originally developed to measure the connectivity between global cities based on multi-branch APS firms as they organize business activities across their offices worldwide (Pain & Hall 2008).

#### *3.3.2 The value chain approach*

Information exchange and business activities do not only arise through intra-firm branch office networks, but also from the division of labor between companies. Thus, in a second step, the interlocking network model will be completed by an internet-based value chain analysis. The value chain survey will combine relational data on firm location with the degree and importance of working interrelationships along individual firm's chain of value. This approach avoids both a firm-centric and region-centric perspective. In summary, it provides a valuable analytical instrument for the researching of business organizations and networks that cut cross regional, national and international scales (Birch 2008). The value chain approach will help to answer the following questions: On which spatial scales are the different outsourced knowledge-intensive activities located? Are there any differences between Advanced Producer Service companies and High-Tech firms?

#### *3.3.3 Real estate market research*

Based on the analysis of media and market reports the module covers the systematic gathering and interpretation of real estate market key numbers. The module aims to get a deeper understanding and perspective on current and future property market conditions (vacancy rates, lease prices etc), the supply and demand situation or the spatial integration of the submarkets within the total market. This research steps provides the preparation for the in-depth interview series.

#### **3.3.4 Qualitative Network Analysis**

Additionally to the quantitative network analysis, a series of in-depth face-to-face interviews on executive level will be conducted in order to get a deeper insight into strategic networking of knowledge-intensive companies, the role an airport plays within the site selection process or the knowledge generation process. This research module will be the empirical backbone of the research project.

## 4 Preliminary Research Findings

Under the general framework of the global (time-based) competition, the potential and the locational advantages of airports as network- and service-infrastructure have become more integral than ever to cities, business models and the location decisions of a broad spectrum of industries. For cities, especially those exposed to global competition, urban competitiveness is highly determined by connectivity and networks (Taylor et. al. 2011).

Cities increasingly set out to treat their airports not only as a “foyer or entrée” to their urban area, but also as a way to provide a competitive advantage within the global competition for future-oriented enterprises and highly skilled employees, especially of the knowledge economy. In order to increase the attractiveness of airports and their hinterland as office sites to future service companies, many cities, airport authorities and other actors have started strategic develop of the locations in and around airports. One of the most prominent examples is Amsterdam’s Schiphol airport, which was one of the first to discover and tap into the wide economic potential of the airport.

Owing to the unique locational qualities and advantages of airports described above, many knowledge-intensive enterprises have started to favour airports and their vicinities as advantageous business sites. In the following chapter, the new office locational patterns around Amsterdam-Schiphol will be analyzed.

### 4.1 Case of Amsterdam-Schiphol

Under the conditions of globalization, the spatial outlines of Amsterdam as a city have been reconfigured. The urban system of Amsterdam and its growth pattern were once perceived as “prototypical expansion of the mono-centric city” (Salet & Majoor 2005: 19). Beginning in the early 1960s and continuing into the present day, the historical inner city, characterized by channels, listed buildings etc., has not been able to fulfil the increased demand of large-scale leasing on the part of the rising service and knowledge economy. As a consequence, and as a result of new accessibility requirements, companies started settling in the surroundings of the urban ring road or sometimes even further away. Through this trend, the spatial formation of Amsterdam has gradually been transformed into a polycentric urban landscape. New concentrations of urban activities appeared for example at the southern edge of Amsterdam reshaping the area into a dynamic growth zone (Bontje, 2005). In this context, Schiphol has become “the most prominent growth engine [...] and the largest employment concentration in the metropolitan area [...]” (Bontje, 2009: 193).

Amsterdam-Schiphol, located 17.5 km southwest of Amsterdam, is the Netherlands’ main airport, Europe’s 4th biggest airport and one of the world’s major hubs in international air traffic. Moreover, Schiphol is one of the two hubs of Air France-KLM. Although named and recognized as Amsterdam-Schiphol, the airport is actually located in the neighbouring municipality of Haarlemmermeer and not in the city proper of Amsterdam. Through the different airline networks, virtually every major city or economic market in the world is reachable from Amsterdam-Schiphol. This integration of the airport into international air traffic is supplemented by an ideal landside connection through all means of transportation. By road, Schiphol is linked via two major highways – A4 and A9 – to downtown Amsterdam and the broader metropolitan area. By rail, Schiphol is directly connected to Amsterdam and to important western European business centres such as Brussels, Paris, Frankfurt, Cologne or Dusseldorf. Through only an eight minute train ride, the airport is also in close spatial linkage to the Zuidas, Amsterdam’s rapidly developing business district where a new high-speed train station will be opened in the next years.

At the end of the 1980s, the master plan for Schiphol proposed for the first time the idea of realizing office projects in the central area within the loop of the access roads that bring people in and out of the airport area (Kloss & de Maar, 1996: 82). Today, this strip is known

as Schiphol-Centre and since the beginning of the 1990s, new office sites have gradually been built up (Schiphol Group, 2010; Kloss & de Maar, 1996). Currently, the total stock of lettable office space comprises nearly 200,000 m<sup>2</sup> of office space (Jones Lang Lasalle, 2010: 9). In the future, the office stock at Schiphol-Centre will grow by another 8 – 15 percent due to a number of projects in the pipeline, such as the extension of the Outlook Building (Jones Lang Lasalle, 2009a: 11).

The construction activities of the office complexes were simultaneously accompanied by the construction of an increasing number of high-quality facilities such as hotels of different categories, or meeting and conference centres. Similar to the office buildings, most of these premises are either directly linked to the terminal via walkways or promenades. All this helped to transform the location of Schiphol-Centre into a multifunctional and multimodal premium business site at the periphery of Amsterdam, which today is considered to be one of the top office locations in the whole of the Netherlands.

The high value of the airport sites is reflected in the office rents. In recent years, Schiphol-Centre has become the country's top office location, achieving the highest office rents countrywide. From 2004 – 2007, the recorded prime rents at Schiphol-Centre were at 350 €/m<sup>2</sup> per year (Jones Lang Lasalle, 2009b, 2010: 10). At the end of 2009, the annual top rent was around 365 €/m<sup>2</sup> (Jones Lang Lasalle, 2010: 10). That was a decrease by 3 per cent compared with 2008 where a maximum of around 375 €/m<sup>2</sup> was reached (Jones Lang Lasalle, 2010: 10). Since then, contractual agreements with maximum rents of 390 €/m<sup>2</sup> per year or even above have been registered (DTZ Zadelhoff, 2009). In comparison to this, the South-Axis (Zuidas), the actual central business district of Amsterdam – halfway between city centre and Schiphol Airport – reached rents of approximately 335 €/m<sup>2</sup> per year in 2009. In the city centre itself, a prime rental value of around 255 Euro /m<sup>2</sup> was realized at the end of the fourth quarter of 2009 compared to 280 €/m<sup>2</sup> in 2008 (Jones Lang Lasalle, 2009b, 2010: 10).

From the very beginning, the main strategy of the Schiphol Group was to attract companies that were either airport-related or had a strong affinity to the aviation business. However, scientific literature does not offer a standard definition for either of these terms. One approach defines airport-related companies as companies “that have their business at the airport (such as airlines) or use the airport intensively (such as the head offices of international companies)” (Schaafsma, 2008: 71). Indeed, Schiphol has been very successful in attracting internationally oriented companies offering superior business services, which have located their international or European headquarters at the airport. The demand for office space is generated from a broad spectrum of business sectors such as finance, consultancy, traffic and transportation, government or healthcare. Among the office space occupiers are prominent companies and institutions such as the American Chamber of Commerce, AXA Investment Managers, Citibank International, the Dutch Infrastructure Fund and Delta Hydrocarbons (WTC Schiphol, 2010). Hence, the demand comes from enterprises that are not directly related to the aviation business. Today, this submarket has reached a certain level of maturity that is characterized by a manageable amount of high quality office properties with different locational qualities and price ranges. Basically, the closer the office is to the passenger terminal, the higher the office rent is. Future prospects expect a further densification of the strip and new office constructions, such as for example the Gateway building (Conventz, 2008).

## 5 Concluding Remarks

Just as much as people were attracted to ports, railway stations and motorway intersections in centuries of the past, airports have rapidly become new urban growth generators, hubs of information and knowledge exchange, and centres of competence. The accessibility profile of international hub airports again induces a multitude of economic and regional catalytic effects

such as settlement of companies, employment development, or stimulation of innovation, etcetera (ECAD 2007: 4). In recent years airports have become vital growth poles for urban and regional economies and centres of a new post-industrial spatial structure. As fundamental nodes of the networked post-Fordist knowledge society, airports take centre stage within the knowledge creation and the organization of chains of economic value added. Once planned as spatially seldom-integrated solitaires at the cities edge, airports have morphed into network and service infrastructures and places of highest centrality and accessibility. Like no other infrastructure facility, many European airport locations integrate two core, contemporary spatial qualities: worldwide connectivity by air and multimodal landside accessibility on local, regional and national scales.

As the examples of Schiphol and Frankfurt illustrate, airports are no longer mainly perceived as transportation nodes, but more generally as advantageous business sites. Multimodality of transportation infrastructure combined with an extensive business infrastructure is understood as a crucial competitive and developmental advantage within the international time-based competition. With the expanding floor space for office-based services in and around international airports, a new urban locational pattern is evolving. This kind of locational quality is exactly tailored to the locational requirements of knowledge-intensive companies. The willingness of those customer groups to pay top rents, i.e. far above the average, reflects the demand for such locations.

The recentralization of new functions formerly localized in the central city and the shifting perception of airports enable airports to appear as a modern kind of marketplace (Gottdiener 2001; Edwards 2005) where people can convene, exhibit, trade and change information. Thus, airports are in no way inferior to historic marketplaces of the Medieval city such as Brussels' Grand Place. Hence, with the history of airports, the history of markets is repeated.

Although Airports have grown out of their niche as pure infrastructure facilities and morphed into attractive real estate sites, the complex dynamics that are taking place in and around international airports represent a crucially understudied element in the post-industrial restructuring of urban and regional systems. From our point of view, one of the most important keys in understanding these processes and dynamics are the locational requirements and changing internal and external value chains of knowledge-intensive companies. Thus, future research must place a special focus on intra-firm and extra-firm linkages of APS and High-Tech firms that are settled in the vicinity of airports. Secondly, an additional qualitative investigation needs to be carried out, for example by means of qualitative network analysis. The combination of these approaches makes it possible to identify the role an airport plays and the potential it has within the site selection and the organization of value chains of knowledge-based companies.

Lastly growing inter-relatedness between hub airports, urban development and the knowledge economy certainly can have drawbacks. They may consist of an overly high degree of mutual dependency. Therefore a serious challenge for analysis, as well as for urban planning, is how to integrate urban functions more wisely in order to render the emerging structures more robust against the volatility of either natural disasters or external economic shocks. And, finally, new methods of analyzing and visualizing airport-linked spatial developments need to be established in order to show and understand the changing role and potentiality of airports. Raising awareness of the spatial drivers is a prerequisite for sustainable and forward-looking planning at urban and regional level.

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