

## **MAKING SPACE AND PLACE FOR KNOWLEDGE COMMUNITIES: LESSONS FOR AUSTRALIAN PRACTICE**

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**ABSTRACT:** This paper aims to shed light on the planning and development processes of the knowledge-based urban development phenomenon, with respect to the construction of knowledge community precincts. We undertake policy and best practice analyses to learn from the planning and development processes of internationally renowned knowledge community precincts—from Copenhagen, Eindhoven and Singapore. In the light of this, we scrutinise major Australian knowledge community precinct initiatives—from Sydney, Melbourne and Brisbane—to better understand the dynamics of national practices, and benchmark them against the international best practice cases. The paper concludes with a discussion on the study findings and successfully establishing space and place for both knowledge economy and society in Australian cities.

**Key Words:** Knowledge economy; knowledge society; knowledge-based urban development; knowledge community precinct

### **1. INTRODUCTION**

The changing and challenging conditions of the 21st century—e.g., globalisation, knowledge economy transformation, climate change, and global financial crises—have been significantly impacting our economy, society and built and natural environments (Frane et al., 2005; Malecki, 2007; Claessens et al., 2010). Today the generation of knowledge, mostly in the form of science, technology and arts, is seen as a panacea for the adaptation to changes and management of challenges (Cooke, 2002; Asheim, 2007; Yigitcanlar, 2011, 2013). Making space and place that concentrate on knowledge generation to support knowledge economy and society formation has become a priority for many nations and cities.

Concepts such as ‘knowledge city’ and ‘knowledge precinct’ are coined as places where citizenship undertakes a deliberate and systematic initiative for founding its development on the identification and sustainable balance of its shared value system. These places base their ability to create wealth on their capacity to generate and leverage their knowledge capabilities (Carrillo, 2010). In recent years, the term knowledge precinct in its most contemporary interpretation evolved into ‘knowledge community precinct (KCP)’. A KCP is a mixed-use post-modern urban setting that is flexible, decontextualized, enclaved or fragmented. It includes a critical mass of knowledge enterprises and advanced networked infrastructures, developed with the aim of collecting the benefits of blurring the boundaries of living, shopping, recreation and working facilities of knowledge workers and their families—i.e., knowledge community (Yigitcanlar et al., 2008b). In the literature this type of development—a place containing economic prosperity, environmental sustainability, just socio-spatial order and good governance—is referred to as a knowledge-based urban development (KBUD) (Yigitcanlar, 2009).

In this paper, we aim to provide an understanding of the planning and development processes of the KBUD phenomenon with respect to the construction of KCPs, particularly in the Australian context. In order to do so, the paper, first undertakes policy and best practice analyses to shed light on the planning and development processes of KCPs and learn from the international success stories, such as Orestad Copenhagen, Brainport, Eindhoven, and One-north Singapore. We then, scrutinise performance and achievements of major Australian KCPs against the findings from the global best practice analysis. In terms of comparator KCPs, one case from each of the three largest Australian capital cities was selected—i.e., Sydney’s Australian Technology Park, Melbourne’s Parkville Knowledge Precinct, Brisbane’s Kelvin Grove Urban Village. In the analysis of both overseas and Australian cases, we adopt an asset-based approach focusing on the key strengths and weaknesses of each KCP case in terms of its seven asset-bases (Table 1).

**Table 1.** Asset-Based Approach.

<b>Assets</b>	<b>Descriptions</b>
Symbolic assets	City brands, geographic trademarks, landmark buildings, endemic plants, city reputation
Social assets	Civic initiatives, community centres, communities, social amenities and infrastructures
Human assets	People's capacity and skills to work, education and training centres, thickness of the labour market
Heritage and cultural assets	Historical and archaeological sites, handicrafts, cuisine, ethnography, cultural diversity, openness and tolerance
Natural, environmental and infrastructural assets	Natural and constructed amenities, flora and fauna, technical infrastructure
Financial assets	Financial support, institutions and resources available to people, firms and cluster formation
Knowledge assets	Intellectual property rights, research and development centres, universities, project partners
Relational assets	Management, governance, institutions, networks, interactions, collaboration, orchestration of the development

Source: (Velibeyoglu and Yigitcanlar, 2010)

## **2. GLOBAL BEST PRACTICE**

### ***Orestad, Copenhagen***

Crossroads KBUD initiative of Copenhagen is part of the growth-stimulating strategies that State and Local Governments of Denmark developed owing to the economic drawbacks and social unrest of the 1980s (Garlick et al., 2006). Having started with construction of Oresund Bridge between Denmark and Sweden after the collapse of Soviet Union, this initiative has become the symbol of the adaptation of Denmark to knowledge economy and urban rejuvenation. As part of Crossroads KBUD initiative in 1992, the Orestad KCP project was initiated following the lead of the new Law on Orestad. In 1995, the master plan was prepared. Lessons from international case studies were successfully adapted in the plan: provision of a wide-spectrum of urban activities together with science and research facilities, for example, housing options, cultural, entertainment, recreation facilities, visual amenity, and easy access to the other urban hubs (Arlund, 2007). In 1999 construction of the KCP commenced in the form of a new knowledge community of students,

workers, and residents. Once fully completed, it is estimated to host over 80,000 jobs and 20,000 inhabitants (Arlund, 2007). Orestad covers a 310ha area and consists of four districts: university; knowledge industries; urban centre; and low and high-density residential areas. Information and communication technology (ICT) and biotechnology industries are the main knowledge sectors of the KCP. Harnessing housing units and student accommodations with the university, and designing a public domain consisting of recreation, entertainment and cultural uses in and around the precinct are the main spatial objectives of the development (Fernández-Ges, 2009).

**Symbolic assets:** being located at the heart of the capital of Denmark has been the main drawcard of the KCP for attracting both national and international investment. At the regional scale, the Oresund Science Region is a cross-border partnership between Denmark and Sweden. In addition Orestad is one of the KCP best practices from the EU region (Garlick et al., 2006). Initiated by the State Government the KCP development aims to take advantage of drastic political and economic changes in Europe in general and Copenhagen in particular.

**Social assets:** as opposed to the bottom-up planning tradition, a welfare state-led development model was adopted in the planning and implementation phases of Orestad (Andersen, 2005). Lack of community involvement in the planning process, aggressive public funding policy, gentrification of the area, and deportation of inhabitants are widely criticised (Lund et al., 2001). However, cultural events and exhibits have been used as social vehicles to attract wider Copenhagen communities to the KCP.

**Human assets:** Copenhagen has large number of service sector employees, which have been channelled into the new knowledge sectors. Strongly linked with the city, Orestad KCP particularly attracts qualified knowledge workers from the city, region and neighbouring EU countries. This way the KCP builds a strong human asset-base not only for the precinct but also for the wider city-region to benefit (Book et al., 2010). Moreover, the Living Lab project, which is specifically designed for non-academic people to test their innovative ideas, is a pioneering initiative designed to integrate the general public into the precinct.

Although the KCP did not have a significant **heritage and cultural assets** component, easy accessibility to the historical city centre is a prominent advantage of the precinct, including the Opera House and Royal Library (Majoor, 2008). Approximately 20% of the inner-city population is from abroad, coming mostly from other EU countries. This

has added a multicultural flavour to the precinct. The KCP also reaps the benefits of Copenhagen's reputation of tolerance to cultural diversity, and immigration policies on the skilled workforce.

**Natural, environmental and infrastructural assets:** residential and business/industry areas of the KCP cover a formerly vacant waterfront site. It is linked to the Copenhagen CBD by a transit line subway and to Sweden by Oresund Bridge (AAS, 2012). Parks and canals are built in the precinct to integrate water and open space providing amenities to the wider district. The KCP is planned as a mixed-use development comprising: 60% businesses, mostly knowledge economy sectors; 20% residential; and 20% education and R&D institutions (Andersen, 2005). The KCP has world-class transport connections, high residential amenities and thus is an attractor for local and international talent.

**Financial assets:** financing and construction of the Oresund Bridge and subway system were the two most critical steps precluding the structural development of R&D, academic and business clusters in the KCP (Arlund, 2007). Orestad Development Corporation, which was founded by the Ministry of Finance and the Ministry of Transport, and Copenhagen Municipality, has developed the precinct through national and local funds. Nonetheless, the power for planning and management was given to the KCP founding groups (Andersen, 2005). As a result of the KCP's financial success the development is to be completed by 2015 instead of the original plan of 2030.

**Knowledge assets:** the KCP has quite a strong base. Crossroads, including the Orestad KCP, is a partnership project between the University of Copenhagen, the Danish Consumer Agency, the Royal Library, the Danish Broadcasting Corporation and the Information Technology University of Copenhagen, bringing together the key actors in this KBUD project. There are also a number of ICT and biotechnology firms located in the precinct, employing talented knowledge workers and showing a good example of a triple-helix partnership (AAS, 2012).

**Relational assets:** due to economic recession that the city had been experiencing, the Ministry of Finance and Copenhagen Municipality took a bold step in initiating Orestad KCP considering the areas of knowledge and labour resources, and the proximity to Sweden and other EU countries. Orestad is the most significant KCP project from Denmark and has created a desired contrast between the old and new faces of Copenhagen. Even if the lack of community involvement in the planning and implementation processes was heavily criticised, the overall economic success of the project has deflected most of these criticisms (Arlund, 2007).

***Brainport, Eindhoven***

Having sharply lost the manufacturing sector in 1993, Eindhoven has been looking for initiatives to effectively channel its technical knowledge and R&D infrastructure to knowledge economy sectors. The Brainport KBUD initiative has been put forward as the vision for the Eindhoven region to define cross boundary economic development movement. Furthermore, this project pursues a balanced KBUD approach and particularly involves the development of the Eindhoven region together with other cities from the Netherlands and neighbouring Belgium and Germany to create a cross-boundary synergy. Brainport KCP has evolved as a triple-helix initiative of local government, academic institutions and business models as part of the regional KBUD project (Maldonado and Romein, 2010). The KCP received the award of Intelligent Community of the Year in 2011 at the Intelligent Community Forum, indicating success of the knowledge community development efforts. As a product of the national government KBUD project, the KCP aims to accommodate growth of Eindhoven in the R&D activities. Implementation of the KCP started in 2010 and is to be completed by 2014. The precinct includes the High Tech Campus, Strijp-S and Technical University of Eindhoven. The KCP has a large repertoire of new economy sectors to be developed including medical technology, ICT, microelectronics, nanotechnology, and automotive and creative industries. The KCP covers a 3,250ha area and is planned to host more than 100 high tech companies, some of which are international industry leaders. Even though renovation of industrial heritage buildings for mixed-use development is advised as a branding strategy, the main weakness of this precinct is the lack of a metropolitan character. For this reason, the balanced use of urban and countryside patterns in Eindhoven has been advised as marketing strategy to attract a qualified workforce with families.

***Symbolic assets:*** the KCP benefits from its prime location in the heart of Eindhoven. This location is known for being the headquarters and main manufacturing area of Philips. The city has vibrant urban but no metropolitan character. However, the city has a good reputation due to high-quality education in the Technical University of Eindhoven fostering local knowledge, worker production and attracting foreign students (van Winden and van den Berg, 2004). The KCP uses these assets as a marketing strategy for reaching wider global markets.

***Social assets:*** considering the industrial and commercial history of Eindhoven, the community has a strong governance culture. The

displacement of the manufacturing industry affected the welfare of the area and the community actively supported the new economic direction towards knowledge sectors, including the development of the precinct (Maldonado and Romein, 2010).

**Human assets:** Eindhoven has a workforce with high-standard technical knowledge due to the industrial era labour needs and higher standards in tertiary institutions. However, this constrains the area, particularly in utilising the skills in profitable sectors and making an easy transition to knowledge-based activities (van Winden and van den Berg, 2004). Due to specialised tertiary institutions and the medium-size of the city, the training and skill development courses are mostly focused on the KCP's technical expertise areas.

**Heritage and cultural assets:** the KCP consists of an urban form of the industrial era development and contains a number of early 20th century industrial buildings. Nearly 20% of the population has foreign descendants, of which most of them are from Western Europe. While the cultural diversity is limited, social equity is fairly good and the unemployment level is relatively low (van Winden and van den Berg, 2004). There is a trend of retrofitting and converting old industrial buildings for residential, R&D and cultural uses. This provides a renewed image of the city, enhances the quality of amenity provision to the existing urban areas and contributes to the appeal of the KCP, while underlining its industrial heritage.

**Natural, environmental and infrastructural assets:** although hard infrastructures meet the general needs of the inhabitants, transport infrastructure limits the accessibility at the regional scale. However, airport and high-speed train infrastructure has been expanding together with the knowledge economy developments in the area. Accessibility, economic infrastructure, ecological infrastructure, education, urbanisation, historical patrimony and spatial pilots are seven key topics that spatial strategy takes into account for knowledge sector development (Maldonado and Romein, 2009).

**Financial assets:** the Brainport Avenue KCP is located right next to the city centre of Eindhoven, and the EU and State Governments provide financial incentives for investment in the precinct. The KCP encompassing 13 projects has been started (ERC, 2009). Nonetheless, the KCP's development is still nowhere near completion due to budget cuts effecting development as a result of the current global financial crises (Maldonado and Romein, 2010).

**Knowledge assets:** the Technical University of Eindhoven is an internationally distinguished university forming one of the main

knowledge generation bases for the city. Embedded Systems Institute and Polymer Institute are the two R&D institutions that reinforce the profile of the KCP. Approximately 50% of the total Dutch R&D expenditure is spent within the city—the precinct being a significant contributor—which proves the good connections of entrepreneurs, universities and governments (van Winden and van den Berg, 2004). The KCP particularly focuses on the technology valorisation of strong sectors, such life-tech (i.e., life sciences, medical technology), high-tech systems (i.e., ICT, micro-electronics, nanotechnology, automotive, mechatronics) and creative industries (Maldonado and Romein, 2010).

**Relational assets:** there is a strong local initiative group forming coalitions with regional and national interest groups to recover the profile of the KCP. The influential stakeholders of the precinct collaborate with each other and have a strong partnership with the local government. This provides an obvious advantage in supporting economic development strategies and becoming more competitive in the knowledge economy (Maldonado and Romein, 2009).

### ***One-north, Singapore***

Initially established as a science and business park in a technology corridor concept back in 1991, One-north acquired its name in 2001 (Wong and Bunnell, 2006). One-north is a KCP initiative of the Singapore Government, designed to attract global biotechnology, ICT and media investment, which has succeeded to a great extent. The flexibility of the government in planning and locating the new investment demands, and providing generous incentives is among the main drivers of One-north's KBUD success. The KCP is located adjacent to the CBD and well connected via transport infrastructure. In 2000, the government announced the development, which is an \$8.5 billion science-culture-business park project expected to be completed by 2015 (Han, 2005). The precinct is about 200ha and will accommodate 138,000 people. Zaha Hadid Architects prepared the master plan and aimed to integrate offices, residents and other accommodations, retail outlets and sports and recreational facilities with green spaces and heritage sites. The precinct has four functional sub-divisions, including Biopolis, Fusionpolis, Mediapolis and VistaXchange. These involve biomedical research, ICT research, including media, science and engineering, creative industries and business-residential uses, respectively (Han, 2005).

**Symbolic assets:** due to the political history and strategic geographic location, Singapore has always been a regional hub for trade with strong international economic connections, i.e., investments of foreign companies, technological exports in South East Asia (Wong and Singh, 2008). Singapore uses this image in branding the city-state as a prominent financial player in the global knowledge economy, and the KCP as a prominent knowledge generator.

**Social assets:** Singapore has a unique cosmopolitan characteristic in South East Asia and a long tradition of business contacts at the global scale. Due to a strong government domination tradition, the community seems receptive to the top-down planning regime. In contrast to the lack of fully embraced local democracy, a rapid KBUD, which brings wealth to the city-state, is maintained (Koh, 2006). Existing old residential stock close to the precinct houses local and international workers. The KCP development and management company (Jurong Town Corporation (JTC)) revitalised these areas with features tailored to the needs of knowledge workers and prioritise applicants of those working in the KCP. The residential area is mixed with local inhabitants and knowledge workers and generates a diverse social fabric in and around the precinct (Majoor, 2008).

**Human assets:** the long history of being an ICT export hub has created a spill over effect, which contributes to knowledge economy excellence (Koh and Wong, 2005). Singapore has a developed local and international labour market and competes with other global actors in attracting knowledge workers. This is largely owing to its financial capacity, which has matured throughout the former industrial era (Koh, 2006). The education system is well integrated with the supportive services of knowledge economy, and the KCP houses a knowledge community with diverse ethnic backgrounds.

**Heritage and cultural assets:** in addition to its own cultural assets, particularly the mosaic of Chinese, Indian and British, Singapore experienced a relatively long colonial era and it is still possible to follow its tracks in the urban fabric. Singapore has a mixture of different cultures when compared to its neighbours. The State embraces policies to maintain a national identity against the other cultural influences (Wong and Bunnell, 2006). The KCP benefits from the heritage and cultural assets of the city-state by being in close proximity to the historical/cultural sites.

**Natural, environmental and infrastructural assets:** due to scarcity of land and resulting high population density, it is hard to evaluate the quality of its natural amenities. However, the city-state is rich in high-

quality built environments, which are flexible to meet the housing demand of local and international labour (Han, 2005). Singapore has resilient and smart transport and ICT infrastructure systems to upkeep with the growing demand. The KCP reaps the benefits of having a rich built environment with good urban design and architecture. In addition, investments toward enriching the natural environment within the precinct are ongoing. Sustainable practices in energy, logistics and transport, feedstock, environment and water have been promoted by innovative infrastructure implementations and small footprint facilities (JTC, 2011).

**Financial assets:** owing to its vibrant economic structure, Singapore has the capacity to support large projects and the government is still the largest player initiating signature projects. The KCP attracts the attention of prominent multinational companies and finance institutions to invest in the growing knowledge sectors (Koh and Wong, 2005). Government provides generous financial incentives for small and medium size enterprises (SMEs), i.e., tax exemptions, R&D grants and training subsidies from which companies at the KCP also benefit (Wong and Singh, 2008).

**Knowledge assets:** the KCP has an increasing trajectory in innovation and knowledge transfer and strong R&D institutions supporting growth. Government is the main player in research. Government research institutions occupy a number of buildings built in the KCP. This number is expected to grow in parallel to the urban development in and around the precinct. A new business district is located next to the existing research facilities such as the National University of Singapore, the National University Hospital and the Singapore Science Park (Wong and Bunnell, 2006).

**Relational assets:** there is a duality of state and private initiative in the civic area. Although still strong and prescriptive, the governmental structure has an ability to adapt to the changing economic climate—i.e., restructuring public institutions as private firms to initiate specific projects, e.g., JTC for One-north (Koh and Wong, 2005). Semi-government firm JTC manages the investors to the KCP in a coordinated way to make the best match between firms and research institutions in accordance with the 2008 master plan (SURA, 2012). However, democratic governance and over regulation of the economy are the issues over which there is an ongoing criticism (Wong and Bunnell, 2006).

### **3. LESSONS LEARNED**

The three globally reputable KCPs investigated have a successful industrial past—in Copenhagen and Eindhoven dating back to post-WWII era and in Singapore to the 1980s. Existing financial capital strength in these cities has made the provision of resources for the KCP investment possible. Relatively underutilised areas close to the CBD/historical city centre were chosen as the physical locations of all precincts. Rather than implementing a greenfield, infill or brownfield development, these locations were preferred due to the benefits of established social and physical infrastructures. These KCPs were strategically planned and developed with the purpose of either regaining the weakened regional/global economic advantage or taking a strong stand for possible prospective economic downturns. Place branding was used as an imperative strategy in the KBUD and planning processes of these precincts to re-image the urban development.

Triple-helix partnership is utilised for the development of all KCPs. Although the level of involvement of parties in this model varies for each case, in general the public sector has played the major role in initiating the development. Involvement of stakeholders has been in differing degrees depending on cultural, governance and planning traditions and backgrounds. However, the main motive has been that in the increasing global competition for attracting and retaining global investment and talent, governments wanted to take a strong position immediately so as not to bear the heavier opportunity costs of late entry in the competition.

Precincts from Copenhagen Eindhoven and Singapore mostly invested on their endogenous assets, even though it was aimed at attracting exogenous talent and investment. The KCP development process highly benefited from the existing industry experiences, market connections, scale and spill over potential of the economy and workforce as the development initiator or facilitator. This was intentionally planned for further building on the advanced technology manufacturing background of these cities. All three cities have strong academic institutions, R&D facilities and business-university partnerships at the regional scale, which provided a relatively easy access to skilled-employment. Due to the large populations and manufacturing era social structures, all cities have already developed a good service sector, which has allowed transitioning from neo-classical to knowledge economy easier and helped in the rapid emergence of complementary knowledge sectors.

In all three cities there exists a substantial cultural mixture of workforce, which is inherited from either the geopolitical context (applies to the

former British colony Singapore) or previous industrial era (prior immigration policies to strengthen the service sector). Integration of immigrants with the rest of the society, and reciprocal tolerance of the local inhabitants and immigrants is another highlight that in all cases has more or less succeeded, supporting their multicultural agendas.

Financial incentives from governments have been seen as a requirement to attract and/or incubate start-up companies and SMEs considering the local characteristics and risk aversion strategies, for example, attracting footloose investment and talent. Instead of having a limited number of large multinational companies, these governments prefer to house a large number of start-up companies and SMEs, as most of the innovation happens there, and try to enhance interaction between them through spatial strategies, i.e., proximity, encounters, interaction. Therefore in all three cities similar strategies are adopted as they are seen to be more effective and if successful more profitable.

In all cases as a common feature, city authorities have invested in not only physical infrastructures of the area in its confinement, but also provided residential and recreational options, and good accessibility to the urban services, entertainment and cultural facilities. All urban development plans of these cities have emphasised the importance of a vibrant cultural life and supporting socio-cultural land-uses via activity planning and infrastructure provision in line with the preferences of knowledge workers and their families. Place branding and locating development close to existing visual amenities and conversion of old infrastructures to new R&D and residential uses are also common trends in all cases.

Connecting university-airport-CBD with a fast and convenient means of public transport such as high-speed trains or people movers is one of the key strategies adopted. Gentrification and displacement of the original occupants are two main criticisms, which are particularly highlighted for the Singapore and Copenhagen cases.

Even though these KCPs were developed in confined urban areas such as in relatively small-scale districts, there are other supplementary connected projects in all these cities linking KCPs with broader urban and regional KBUD projects. The reason for this linkage is that since the developable land satisfying the aforementioned conditions (e.g., CBD proximity, airport connection, residential area requirements) is limited, there is a need for complementary projects to complete the knowledge economy and society formation package.

In some cases creative, cultural and entertainment sectors are considered as among the main knowledge sectors. These sectors, therefore, are included in the KCP repertoire due to increasing value and appreciation for their products, and the growing demand of the knowledge labour for these services.

Geographic proximity, which is exploited successfully in all cases, is still the main factor at regional and local scales. The regional scale is important for immigration, even though all cities aimed to attract global talent. Migration from the first-order neighbouring countries (that is spatially and culturally closest) constitutes the main multicultural groups in all three cases. The local scale is important for placing similar uses together in precincts to generate a synergy with cooperation, competition, and investing supplementary sectors in and around the city.

Economical investment areas mainly concentrate on ICTs, biotechnologies and creative industries. Additionally, designing the urban spaces to live, work and play—the cliché referring to the temporary demand of the new labour—is another common spatial strategy widely employed for creating attractive spaces with successful urban design.

#### **4. AUSTRALIAN PRACTICE**

##### ***Australian Technology Park, Sydney***

Sydney is internationally recognised as a global city and is an important actor of the global economy. Although, the city is dominated by finance and insurance, business and property services, there are a number of sub-centres specialising in creative industries and health and biotechnology fields. Particularly the higher quality of academic and research facilities around these sub-centres have facilitated the emergence of business hubs as a consequence of the KBUD movement. Australian Technology Park (ATP) is one of these successful examples of a KCP creation in terms of planning, funding, implementation and operation as a triple-helix approach. The ATP master plan was prepared in 1994, and the site was officially opened in 1996. The precinct has developed gradually according to the corporate plan of ATP, and in 2005 a new master plan was prepared. In the regional strategy plan, the KCP is listed as a knowledge asset, and shown as one of the magnet infrastructures considering its proximity to major transport routes and knowledge clusters, knowledge-intensive activities, and dedication to sustainable development. The main planning theme for this inner-city area where the KCP is located is to connect the ATP precinct to the Green Square

development site and create linkage between knowledge-based land-uses and supporting service services (DOP, 2008). The construction works continued until 2010 and now the KCP is completed and fully functional. The precinct covers a 14ha area. There are over 100 ICT and biomedicine organisations on the site employing over 2,000 people (ATP, 2011). Due to the close proximity to the central spine of Sydney and Redfern neighbourhood, the KCP also has a wide range of business, entertainment, culture and recreation services. Surrounding and nearby dwellings provide various residential options for ATP's knowledge workers and their families.

**Symbolic assets:** being the largest and most globalised Australian city, Sydney has achieved a world-class status and global knowledge economy player position. The KCP is located at the inner city Sydney, and benefiting from Sydney's international reputation is marked as a catalyst for excellence in research and technology development. ATP is very well known in South East Asia, and has excellent connections particularly with the Asia-Pacific markets (Yigitcanlar, 2010).

**Social assets:** the KCP already has a civic characteristic due to renovated heritage buildings and being close to the busy Redfern train station. There are plans to develop cultural and exhibition facilities and skill development training in and around the precinct to attract local and research communities and further develop the precinct as a more vibrant hub (ATP, 2011).

**Human assets:** due to the world-class education and research institution of Sydney, there is no significant shortage of qualified workforce in the R&D sector and the city itself also has a concentrated service sector (COS, 2008). Sydney attracts knowledge workers from all over the world particularly from the Asia-Pacific region.

**Heritage and cultural assets:** the KCP was developed on a former manufacturing site of locomotive workshops and goods stores and has been shown to be one of the most significant areas for renewal in the Sydney City Strategic Plan (DOP, 2008). There are many important heritage sites around the KCP, which are being planned for conservation and incorporation within the precinct. The KCP is a cosmopolitan urban environment due to the significant cultural mixture of the inhabitants, particularly areas around the CBD where community tolerance is quite high. This is one of the reasons for a high-level of skilled migration to the area.

**Natural, environmental and infrastructural assets:** the KCP is located close to a number of environmentally significant areas, which have been

protected by the State and Local Governments, and have a good infrastructure to support urban services and the growing demands of the population. The precinct benefits from high quality urban infrastructure and amenities including efficient public transport and a well organised pedestrian network. Making the precinct particularly sustainable is the virtue governed by the collaboration of the government, precinct management and the tenants. In 2005, ATP management published targets for sustainable practices in energy conservation, reducing waste production and water consumption for the KCP (ATP, 2011).

**Financial assets:** Federal and State Governments fund the R&D endeavours in the KCP. The incubator facilities are designed for spin off SME technology firms as direct support. Sydney has adopted an economy strategy to develop ICT and biomedical sectors by involvement of the stakeholders. This enables firms to access governmental and private funds from various institutions, which the KCP firms highly benefit from.

**Knowledge assets:** the University of Sydney and the University of Technology Sydney support a number of SMEs on ICTs and biomedicine in the precinct (DOP, 2008). However, the marketing strategy for the KCP as a prime business real estate limits attracting and growth potential of innovative firms due to higher relocation costs.

**Relational assets:** the KCP has been developed as a mutual initiative of the private sector, government and universities; the current management—i.e., The Redfern–Waterloo Authority, semi-governmental firm—of the precinct has been implementing a proactive approach to further development of the area emphasising the sustainability concept (ATP, 2011). Relocation of one of the national broadcasting companies is expected to foster the media industry presence in/around the precinct.

### ***Parkville Knowledge Precinct, Melbourne***

Contemplating the metropolitan characteristics of Melbourne, a number of specialised activity centres have proliferated particularly around world-class education and research institutions. Parkville KCP is an outcome of this trend and of the organic synergy between health research facilities around the University of Melbourne. Even though investment and development of the precinct has been on an ad hoc basis, it has been purported that coordination and integration between other research institutions and industry could bring more effective results for the KCP. Among other initiatives from Melbourne, the medical and bioscience research specialised KCP comes forward with its organic development as an expert knowledge sector with a global reputation in cancer research.

Parkville Precinct Strategy Plan indicates that the development will be completed by 2016. The KCP covers around 550ha area. In 2006, there were approximately 1,800 people living in the precinct and over 23,000 people were involved in health (14,362ppl.) and education (5,113ppl.) activities (COM, 2008). The KCP is a good example of how local level KBUD activities are linked with the State and City level KBUD planning. The Strategy Document of Melbourne outlines the needs of becoming a world-class knowledge city, role of universities and KCPs in creating synergies in an urban context, and effective ways of collaboration to cultivate city-based learning (COM, 2008). Furthermore, the Victorian Government's Strategic Plan for Parkville KCP provides details of policy options and implementation strategies. This plan explains the role of the precinct as the major cluster of medical and biotechnology research, education and healthcare. It states, "collaboration to drive innovation within the precinct is vital to its ongoing status as a world-class biomedical precinct, and its contribution to high levels of health, social and economic benefits for the State" (DOH, 2005, p.6).

**Symbolic assets:** Melbourne is the second largest Australian city, however, much more famous for arts, culture, sports and entertainment scenes than Sydney. Parkville is located on the Northern section of the Melbourne CBD, and has a strong biomedical sector recognised globally. Similar to Sydney, it has good ties and strong connections with the Asia-Pacific markets.

**Social assets:** because the KCP has followed a relatively more organic development path to becoming a learning, healthcare and biomedical hub in the region by using university linkages, it is also strongly linked with the socio-cultural hubs located in the university and around the city (COM, 2008). The precinct benefits from the social and multicultural activities of the adjoining University of Melbourne and the CBD.

**Human assets:** the KCP is surrounded with globally recognised education and research institutions that attract a large number of international tertiary education students (COM, 2008). The opportunity of international university graduates migrating as skilled-workers makes accessing a qualified labour force easier for the KCP. The city itself has a mature service sector. Like Sydney, Melbourne is internationally recognised as a knowledge city and attracts knowledge workers from all over the world particularly from Asia-Pacific (Yigitcanlar et al., 2008a).

**Heritage and cultural assets:** the University of Melbourne campus is a heritage site and also other heritage sites are within the close proximity to the KCP (COM, 2008). Many people with various cultural backgrounds

inhabit the precinct and its surrounding area and community tolerance is quite high. Melbourne is one of the most culturally vibrant cities in Australia—in big competition with Sydney—where integration of immigrants to the community is highly successful.

**Natural, environmental and infrastructural assets:** University of Melbourne campus and surrounding urban fabric provides a unique urban characteristic to the precinct, which also enhances the residential amenity. Its proximity to the city centre and higher densities around the precinct have also organically supported a mixed-use development (COM, 2008). The KCP has well-connected public transport, pedestrian and cycling networks allowing good accessibility to the precinct (DOH, 2005). The KCP's connection to the CBD, key infrastructure and research facilities has been shown as the prominent competitive advantage in cancer research (COM, 2008).

**Financial assets:** State Government promotes the area by providing incentives to the new firms and also maintaining the existing healthcare facilities. The University of Melbourne provides research facilities and researchers the businesses, and bridges graduates and firms benefiting the companies located in the precinct (DOH, 2005). In terms of project implementation, the growth requirements of the existing research facilities and start-up firms are planned to be met either through rezoning irrelevant uses in the precinct, even though it is hardly possible when highly developed status of the precinct is considered, or encouraging urban development of mixed-use areas in close vicinity (DOH, 2005).

**Knowledge assets:** along with the State and Local Governments, the University of Melbourne, Bio21 Institute, the Royal Melbourne Hospital, the Royal Children's Hospital, and the Royal Women's Hospital are prominent institutions that have elevated the growth potential of the precinct (DOH, 2005). There are a number of SMEs located in the KCP, which have a significant number of biomedical patents and are producing medicines, and thus, are extensively contributing to Melbourne's knowledge edge.

**Relational assets:** with support from the State Government, the City of Melbourne, and the University of Melbourne, the KCP has become a successful example of triple-helix collaboration. Particularly, the KCP, University of Melbourne and regional hospitals in the area have facilitated a synergy between the university, healthcare facilities and the firms that invest in biosciences R&D (DOH, 2005). Additionally, the City of Melbourne employs several benchmarking tools—including RMIT's Global University Cities Index, and World Capital Institute's the Most

Admired Knowledge City Awards (MAKCi)—to evaluate the performance of the city and its KCPs (COM, 2008).

***Kelvin Grove Urban Village, Brisbane***

In the South East Queensland Regional Plan, adaptation to knowledge economies is covered in support for business centres and employment policy sections. This clearly advocates the creation of key KCPs for their urban sustainability principles and their creation of highly skilled jobs and employment diversification opportunities (DSD, 2009). The Kelvin Grove Urban Village (KGUV) project is a good example of the Smart State Strategy of the Queensland Government. This Project is regarded as a social experiment in Australian urban design due to ambitious implementation of the new urbanism principles (Carroll et al., 2007). KGUV is proof of the commitment of the Queensland Government and Brisbane City Council to the Smart State Strategy. The project is also considered as an alternative solution to sprawling urban form. The KCP is a joint initiative of Queensland Government and Queensland University of Technology (QUT). This has also been the foundation of the QUT's Kelvin Grove Campus. This multi-award winning project was planned in 2001 before construction commenced in 2002. The KCP covers about a 16ha area and is only 5 km from the Brisbane CBD. Until now more than \$1 billion was spent on this mixed-tenure, medium density, inner city planned KCP. As of 2008, it inhabits around 4,000 people from all age groups—being mostly young knowledge workers—in approximately 2,000 individual dwelling units.

***Symbolic assets:*** the KCP is located in the inner city of Brisbane within close proximity to the CBD. Even though Brisbane is not as globally famous as Sydney or Melbourne, it is the third largest capital city in Australia and has been recognised as one of the newly emerging world cities considering the growth in population and economy. The two brands of the State—the Smart State and Sunshine State—reflect the symbolic strengths of the city and the KCP, which are investment on knowledge and the perfect climate (QG, 2008).

***Social assets:*** cultural and performing arts activities attract local inhabitants and tourists to the precinct. The flow of international students and researchers combined with the original local inhabitants has created a community consisting of a mixture of people from different age groups and cultural backgrounds in the KCP. Additionally, indigenous cultures

are also recognised, and thus, contribute to the cultural mosaic of the city (QG, 2010).

**Human assets:** the city has a growing skilled workforce as a result of the contemporary immigration trend. QUT is the only education and research institution facilitating R&D activities and business development in the precinct. However, the other two large universities in the city are within 10km and the bio-medical research centre of the KCP is very well linked with the major hospitals of the city. The health research is local and provides clinic level services (QG, 2008).

**Heritage and cultural assets:** albeit limited in numbers, the heritage of indigenous people and former military barracks has been preserved in the precinct and surrounding area. Brisbane has been one of the focal points of international students and immigrants in Australia; therefore, there is an increasing openness and tolerance between the existing inhabitants and newcomers. Furthermore, the city is also well known for the safety it provides for residents (QG, 2010).

**Natural, environmental and infrastructural assets:** compact urban development concepts are adopted in the design principles, which has been recognised with a national design excellence award. The KCP is a master planned community and reflects characteristics of both traditional Queensland style urban fabric and modern research facilities with surrounding amenities. The KCP has a convenient public transport and non-motorised transport network, however, its connection to the CBD has been considered as rather weak (Yigitcanlar et al., 2008b). Quality of the urban space—i.e., medium density, mixed-use development, accessibility to the services by non-automobile means and attractive civic environments—is detailed in the KCP master plan. Housing diversity and provision is another topic highlighted as “a wide range of demographics has been included in the accommodation options including student accommodation, disability support options, aged accommodation, and people living in government assisted housing via the Brisbane Housing Company” (Carroll, et al., 2007, p.10).

**Financial assets:** the State Government played an important role in the initial investment into the precinct; subsequently the management has been handed to a QUT-based firm. There are no direct incentives to the firms at the moment, but the state government has been investing in hard and soft infrastructures, and also in branding of the precinct. Perhaps the financial asset limitation is the major barrier for the growth of the KCP.

**Knowledge assets:** creative industries and health are the main sectors that are intended to be located in the KCP (QG, 2008). While the former is developing consistently, the latter requires more time, support and

effort to grow. No success stories have been recorded from the precinct yet. However, on paper quality accommodation, recreation, urban design, research facilities and infrastructures make it an ideal KCP model. On the other hand, the precinct management may need to do more than just providing world-class infrastructure and design for it to become more appealing to the knowledge industry. This may include various incentive schemes.

**Relational assets:** the KCP is a joint initiative of Queensland Government and QUT, with support and involvement of the Brisbane City Council. QUT has been providing education and research infrastructure for the creative industries and health, and is responsible for the development and marketing of the precinct (QG, 2008). The KCP has not yet managed to attract a high-level knowledge industry. This is perhaps a result of Brisbane being a second-tier city for relocating such industry from Sydney and Melbourne or overseas.

## 5. DISCUSSION

The KCP cases we explored in this paper to better understand the planning and development characteristics and processes provide interesting findings (Table 2). First of all, although each case, to a certain degree, has unique characteristics, there are a lot of similarities observed. For example, all cases include a government-led initiation process. Developing a ‘good business climate’ is seen as the primary driver of such development. In most of them a triple-helix model partnership has occurred. Central urban areas are chosen as physical locations for the precincts, proving the claims from the literature that knowledge generation is generally an urban phenomenon. Even if all precincts are aiming to facilitate endogenous assets for knowledge generation and community development, in almost all cases, policies for attracting exogenous talent and investment exist. In most of these developments a great value is given to the knowledge generators, i.e., knowledge workers. In some of them forming knowledge communities even comes before generating knowledge. In the global and Australian cases special attention is given to the social and natural and built environments to attract and retain talent from the city/region or abroad—investing on a ‘good social and spatial climates’. Management of KBUD and also knowledge-based activities of the precincts are practiced fairly well all across the case studies, establishing a ‘good governance climate’.

Secondly, in addition to commonalities among the case studies, each precinct has its own unique qualities. In the case of Orestad a top-down model, despite the bottom-up planning tradition, is followed due to the project having a crossroads effect between Sweden and Denmark. This project was one of the very first global cases with its cross-country focus. Orestad achieved success by taking full advantage of opportunities following the aftermath of economic recession. This success was attained with the strong support—and also strong influence—of government. In the Brainport case, being a local/regional initiative the development progressed a bit slow when compared to others. The KCP was the inner ring of a circle of KBUD initiatives, i.e., second ring is being Eindhoven city and third is Eindhoven region. Even though the city that the precinct is located in does not have a strong metropolitan character, the existing rich urban amenities and facilities, along with the technical knowledge and skilled labour force of the city created a positive springboard for development. In the One-north case, the city-state, Singapore, provides the major uniqueness to the KCP. Singapore has a powerful but at the same time effective and efficient top-down planning and development process with an extreme flexible-firm-like government, and the advantage of having only one city knowledge corridor has helped One-north to surface as an ambitious KCP.

Thirdly, in the Australian cases, when compared with European and Asian examples, the first thing we notice is the effects of the tyranny of distance, which made international connections, for example in the case of Orestad, not so easily possible. The beauty of the knowledge economy is that it comes with the advanced ICTs that gap most of the problems caused by the distance. However, limited proximity and face-to-face knowledge exchange mostly restricts the impact area of the Australian knowledge industry and businesses to the Asia-Pacific Region.

**Table 2.** Compared Salient Characteristics of KCPs.

Precincts	Strengths	Weaknesses
<b>Orestad, Copenhagen</b>	<ul style="list-style-type: none"> <li>· Major economic hub in its region and availability of cross-boundary interactions</li> <li>· Attractive location, subway accessibility and urban amenities provided</li> <li>· Strong research and business</li> <li>· Prevailing interest of residents and businesses to take place in the precinct</li> <li>· Support of state and local government</li> <li>· High turnover of the investment</li> <li>· Initiatives to attract local inhabitants and tourists to the area</li> <li>· Successful image making activities</li> </ul>	<ul style="list-style-type: none"> <li>· Gentrification and displacement of the inhabitants</li> <li>· The EU based workforce</li> <li>· Linear precinct development limiting pedestrian movement</li> <li>· High global competition and openness to financial recession</li> <li>· High cost of living</li> </ul>
<b>Brainport, Eindhoven</b>	<ul style="list-style-type: none"> <li>· Alliance among local government, academic institutions and businesses</li> <li>· Remarkable manufacturing background and existing global brands</li> <li>· Strong knowledge base and high quality academic institutions</li> <li>· Large investment to R&amp;D and market success of the firms located</li> <li>· Mixture of urban and rural characteristics</li> <li>· Renovation of heritage structure for place-branding</li> <li>· The state's interest to develop cross-boundary endeavours</li> <li>· Ongoing interest of the businesses to new precincts</li> <li>· Initiatives to improve accessibility of the city and regional connections</li> <li>· Effective use of heritage resource to build an image</li> </ul>	<ul style="list-style-type: none"> <li>· Lack of vibrant urban character to attract knowledge workers</li> <li>· Weak airway connectivity</li> <li>· Over specialised workforce</li> <li>· Limited mixed-used development</li> <li>· Limited developable land</li> <li>· Relatively isolated location</li> <li>· Footloose industries and inhabitants</li> <li>· Attracting qualified workforce with urban amenities and character</li> <li>· High cost of living</li> </ul>
<b>One-north, Singapore</b>	<ul style="list-style-type: none"> <li>· Strategic location and strong logistic network;</li> <li>· Lightweight governmental structure to initiate and implement R&amp;D and business investments;</li> <li>· Access to qualified workforce</li> <li>· High quality residents, residential amenities and urban services;</li> <li>· Easy access to the precinct facilities and the CBD</li> <li>· Flexible government structuring</li> <li>· Global interest of businesses and attractive Incentives for SMEs</li> <li>· Good management of current and prospective customers</li> <li>· Urban scale-city-nation</li> <li>· Effective city management to enhance urban amenities and Singapore brand</li> </ul>	<ul style="list-style-type: none"> <li>· Scarcity of developable land</li> <li>· Gentrification and displacement of the inhabitants</li> <li>· High population density and lack of environmental amenities</li> <li>· Strong top-down governance</li> <li>· Footloose industries and inhabitants</li> <li>· High cost of living</li> </ul>

- Strong logistics web/network

Source: the Authors

**Table 2.** Continued. Compared Salient Characteristics of KCPs

<b>Australian Technology Park, Sydney</b>	<ul style="list-style-type: none"> <li>· Proximity and accessibility to the CBD and other R&amp;D facilities</li> <li>· Heritage characteristics and governmental support for conservation</li> <li>· Successful sustainability practices</li> <li>· Tick service and knowledge workforce</li> <li>· Support of the state government</li> <li>· The Redfern-Waterloo Authority to increase decision making and implementation flexibility</li> <li>· Good international and local connections</li> </ul>	<ul style="list-style-type: none"> <li>· Small scale development</li> <li>· Lucrative real estate image</li> <li>· Limited developable land in and around the area</li> <li>· Locating irrelevant sectors to the area</li> <li>· High cost of living</li> </ul>
<b>Parkville Knowledge Precinct, Melbourne</b>	<ul style="list-style-type: none"> <li>· Global recognition in biomedical and cancer research</li> <li>· Strategic location in city and proximity of supportive R&amp;D, academic institutions and businesses</li> <li>· Easy access to knowledge and service workforce</li> <li>· Good public and non-motorised transport infrastructure</li> <li>· Growing service and innovation demand in medical and health sectors</li> <li>· Synergy between government, academy and business to bring the best benefits</li> <li>· Ongoing interest of researchers to Melbourne universities</li> </ul>	<ul style="list-style-type: none"> <li>· Lack of coordination and integration among research facilities</li> <li>· Very limited land to meet growth demand</li> <li>· Limited land, which may hamper growth of the sector</li> <li>· Over specification</li> <li>· High cost of living</li> </ul>
<b>Kelvin Grove Urban Village, Brisbane</b>	<ul style="list-style-type: none"> <li>· Strong urban economy and state government support</li> <li>· Thriving research and businesses for creative industries</li> <li>· High quality urban amenities and accessibility to the key business hubs</li> <li>· Preservation of high quality urban amenities and characteristics</li> <li>· Attractive research environment and social structure</li> <li>· Good accessibility</li> <li>· Successful academic institutions and attractive for international researchers and students</li> </ul>	<ul style="list-style-type: none"> <li>· Lack of regional and national sectoral connections</li> <li>· Less known globally</li> <li>· Immature metropolitan character</li> <li>· Risk of being unknown and lose qualified workforce</li> <li>· No clear framework to pursue coalitions in other regions</li> <li>· Lack of governmental support</li> <li>· High cost of living</li> </ul>

Source: the Authors

Another challenge Australian cities and hence KCPs are facing is the standing of the country in the knowledge economy rankings—being behind the investigated competitors of Denmark, The Netherlands and Singapore—and even worse having a development paradigm shift away from knowledge economy prioritisation, i.e., considerations on the abolishment of Smart State Strategy of Queensland and further investing on the traditional sectors of Australia such as mining, agriculture, tourism and construction. In the case of ATP, the planning and development process was top-down; nonetheless, a semi-government firm managed this process. Similar to One-north the development was originally planned as a knowledge precinct and did not include any residential or recreational/cultural facilities. ATP is now moving towards conversion into a KCP and these facilities are to be allocated either on site or nearby. Focusing on the physical precinct boundary, the precinct is a relatively small scale one, however, when the blurring boundaries—much like Brainport—with surrounding Sydney’s rich urban amenities is considered, the precinct can be considered quite well integrated with the city centre. Parkville contrary to other examples is a bottom-up and organic development, and a natural growth of the University of Melbourne’s industry collaboration around the campus. Having plans to further expand and become a globally acknowledged KCP, the development is now seeking a more comprehensive approach to coordinate/integrate KBUD endeavours. KGUV is a unique case aimed at developing a true knowledge community with a top-down approach and being a Smart State initiative. KGUV started as a very ambitious project, however, later on due to potential political complications/rivalry strong support for the development was pulled, leaving the university to manage and promote the development pretty much by itself. Even though there was no creative industry in the region, QUT initiated research education in the sector within the precinct, which is surprisingly becoming one of the strongest in Australia. Urban form related strategies of the precinct are prominent and the design quality of the precinct is widely recognised. However, the analysis has shown that as attractive as good infrastructure and design can be, some financial initiatives are also required to create a magnet in the KCP for both industry and talent. Hence, KGUV should seek innovative approaches creating a stronger financial capital by developing further linkages with governments and industries.

Finally, we are well aware of the limitations of this study and the literature review, content and qualitative analyses we have undertaken, and are hence, planning to undertake a more in-depth prospective study.

Thus, although the findings of this research revealed useful insights for Australian KCP development, the study results should be taken into account by considering the limitations—i.e., case selection, data collection/availability, and potential bias of qualitative analysis.

## **6. CONCLUSION**

In this paper, we explored the literature and current successful practices to shed light on the planning and development processes of the KBUD phenomenon with respect to the construction of KCPs. In general, the findings of global best practices, Australian practices and the comparison have revealed that despite their branding and characteristic differences, KCPs do provide space for knowledge generation and place for knowledge communities. More specifically, such precincts are initiated with the lead of public sector, but received support from either industry or academy or both down the track—i.e., triple-helix model. The investigated KCP cases from Australia and overseas are exemplar initiatives with their salient characteristics showing varying degrees of uniqueness—e.g., Orestad being an international crossroads, Brainport being the inner circle of a number of local and regional KBUD rings, One-north being the transformation of a knowledge precinct into a KCP, ATP being an inner-city historical site redeveloped as KCP, Parkville being an organically developed KCP, and KGUV being fully engineered and a particularly urban design focused KCP. All cases highlight the importance of central urban locations as home for such precincts in order to benefit from the rich socio-cultural amenities of the city they are placed in. All cases not only demonstrate the importance of economic, social and spatial measures for a KBUD success, but also underscore the role of governance. The major differences between Australian and overseas cases were, 1) the size, 2) the degree of maturity of the precinct, and 3) whether they were an organic growth or engineered KBUD. Although, the investigated European and Asian best practices are more comprehensive and planned in comparison with Australian cases, with room for development Australian KCPs may also have the potential to set standards for other cities seeking such development.

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