Chapter VII
Queensland's Smart State Initiative:
A Successful Knowledge Based Urban Development Strategy?

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ABSTRACT

During the last two decades, knowledge-based development has become an important mechanism for knowledge economies. In a knowledge economy, information and communication technology is extensively seen as a potentially beneficial set of instruments, which may improve the welfare and competitiveness of nations and cities. At present, both public and private actors aim to exploit the expected benefits of information and communication technology developments. These technologies offer unprecedented promise for social and economic development on all global, national, regional, urban, and local levels. Therefore, this chapter seeks to investigate the potential of information and communication technology policy at both regional and urban levels, and, in particular, to shed light on various factors that influence urban information technology policies in the public domain. The chapter sets out to explain the knowledge-based urban development processes and challenges and opportunities in information acceptance and use in urban policy-making in Queensland, Australia. This chapter draws on providing a clear understanding on policy frameworks and relevant technology applications of the Queensland Smart State experience.

INTRODUCTION

Many cities worldwide face the prospect of major transformation in the 21st century as the world moves toward a global information order (Castells, 2000). In this new era, already upon us, urban economies are being radically altered by dynamic processes of economic and spatial restructuring

(Graham & Marvin, 1996). The result is the creation of *informational cities* or with the new and more popular name *knowledge cities*.

For the last two centuries, social production had been primarily understood and shaped by neo-classical economic thought that recognized only three factors of production: land, labor, and capital. Neo-classical economics considered knowledge, education, and intellectual capacity as secondary, if not incidental, parameters of production (Knight, 1995). Human capital was assumed to be either embedded in labor or just one of numerous categories of capital. In the last decades, however, it has become apparent that knowledge in and of itself is sufficiently important to deserve recognition as a fourth factor of production. In the globalizing world, knowledge and information, and the social and technological settings for their production and communication are now seen as keys to development and economic prosperity (Lever, 2002).

The rise of knowledge-based opportunity has, in many cases, been accompanied by a concomitant decline in neoclassic industrial activity (Burton-Jones, 1999; Drucker, 1998). The replacement of physical commodity production by more abstract forms of production (e.g., information, ideas, and knowledge) has, however, paradoxically, reinforced the importance of central places and led to the formation of knowledge cities.

It is mainly in cities that knowledge is produced, marketed, and exchanged. Therefore, knowledge cities aim for a knowledge-based urban development (KBUD) that assists decision-makers in making their cities compatible with the knowledge economy and thus able to successfully compete with other cities. Knowledge cities provide their citizens with enabling conditions that foster knowledge creation, knowledge exchange and innovation (Ergazakis et al., 2004). They also encourage the continuous creation, sharing, evaluation, renewal, and update of knowledge.

To compete nationally and internationally cities need knowledge infrastructures (e.g., uni-versities, research and development institutes); a concentration of well-educated people; technological, mainly electronic, infrastructure; and connections to the global knowledge economy (e.g., international companies and finance institutions for trade and investment). Moreover, knowledge cities must not only possess the people and things necessary for the production of knowledge but, as importantly, they must function as breeding grounds for talent and innovation (Winden & Berg, 2004).

The economy of a knowledge city creates high value-added products using research, technology, and brainpower. In the knowledge city, the private and the public sectors value knowledge, spend money on supporting its discovery and dissemination and, ultimately, harness it to create goods and services (Carrillo, 2006). Although many city initiatives call themselves knowledge cities, currently, there are only a few cities around the world (e.g., Barcelona, Delft, Dublin, Montreal, Munich, and Stockholm) that have earned that label. Many other cities aspire to the status of knowledge city through urban development programs that target KBUD (Ergazakis et al., 2004). Examples include: Copenhagen, Dubai, Manchester, Melbourne, Monterrey, Singapore, and Shanghai.

During the last two decades, KBUD has become an important mechanism for knowledge economies of cities. In a knowledge economy, information and communication technology (ICT) is extensively seen as a potentially beneficial set of instruments, which may improve the welfare and competitiveness of nations and cities. At present, both public and private actors aim to exploit the expected benefits of ICT developments. ICTs offer unprecedented promise for social and economic development on all global, national, regional, urban, and local levels. This chapter seeks to investigate the potential of ICT policy for KBUD at both regional and urban levels, and, in particular, to shed light on various factors that influence urban ICT policies in the public domain that targets transforming cities into knowledge cities.

The chapter will set out to explain the KBUD and urban policy making processes in Queensland, Australia. This chapter will draw on providing a clear understanding on policy frameworks and relevant ICT applications of the *Queensland Smart State* experience.

The chapter consists of six sections. The first section following the introduction provides background information. The second section focuses on the KBUD processes in Queensland. The third section offers a comprehensive analysis of the *Queensland Smart State* initiative, and it also identifies actors and goals of the agenda of Smart State experience. The fourth section reviews knowledge-based development and ICT applications, and policies of the Queensland Smart State and Brisbane Smart City experiences, and their impacts on Brisbane's successful KBUD. The fifth section discusses knowledge hubs and ICT developments within the Brisbane metropolitan area. Then the chapter concludes with future trends and conclusion sections.

BACKGROUND

In the information era, sustainable economic growth and development is highly associated with knowledge economies (Metcalfe & Ramlogan, 2005). The term, *knowledge economy*, was first introduced by the OECD in 1996. A knowledge economy creates, distributes, and uses knowledge to generate value and gives rise to "a network society, where the opportunity and capability to access and join knowledge and learning intensive relations determines the socio-economic position of individuals and firms" (Clarke, 2001, p. 189). Rapid advances in ICTs during the last two decades established the infrastructure that enables the knowledge economy to scale up. The main novelty of the knowledge economy consisted of the need to manage an intangible asset that, in contrast to material resources, does not depreciate

through use but rather becomes more valuable the more it is used (Laszlo & Laszlo, 2006).

According to Buckley and Mini (2000), a city's knowledge economy is the economic wealth and well-being that results from the effective investment in people and ideas that create an environment where information, creativity, goods, and services are produced and exchanged, drawing on best practices. It requires a skilled labor force, up-to-date knowledge, effective use of technology (primarily ICTs), and broad city resources that foster a productive urban economy. In this process, communication, good governance, and partnerships are developed with all major stakeholders.

Emerging from analysis of the knowledge economy has been recognition by some of the role of creativity as the force behind knowledge (Corey & Wilson, 2006). Landry (2000), Florida (2005) and Henderson (2005) directed planners and urban administrators to think about the environmental and cultural assets of the cities and communities as economic resources. Corey and Wilson (2006) underlined the important role of ICTs in developing a knowledge economy and KBUD.

KBUD is a powerful strategy for economic growth and the post-industrial development of cities and nations to participate in the knowledge economy. It is a strategic management approach, applicable to purposeful human organizations in general (Carillo, 2002; Yigitcanlar, 2007). KBUD has two purposes: The first one is, it is an urban development strategy that codifies technical knowledge for the innovation of products and services, market knowledge for understanding changes in consumer choices and tastes, financial knowledge to measure the inputs and outputs of production, and development processes, and human knowledge in the form of skills and creativity, within an economic model (Lever, 2002). The later one is that, it indicates the intention to increase the skills and knowledge of people/residents as a means for individual and social development

(Gonzalez et al., 2005). KBUD policies includes: developing and adopting the state of art ICTs, distributing instrumental capital, developing human capital, and developing capital systems (Carrillo, 2002).

To date, the structuring of most of the knowledge cities (or creative urban regions) has proceeded organically; in essence, as a dependent and derivative effect of global market forces. Urban and regional planning has responded slowly, and sometimes not at all, to the challenges and the opportunities of the knowledge city. Therefore, in recent years urban planning has consolidated its interest in the paradigm of post-modern social production under the rubric of KBUD (Carrillo, 2004). Planning sees KBUD as a new form of urban development for the 21st century that could, potentially, bring both economic prosperity and sustainable socio-spatial order to the contemporary city (Yigitcanlar, 2007). The goal of KBUD is a knowledge city purposefully designed to encourage the production and circulation of abstract work (Cheng et al., 2004). KBUD also can be regarded as a tool or an approach to nourish the transformation and renewal of cities into the knowledge cities and their economies into knowledge economy (Yigitcanlar, 2005).

The globalization of the world in the last decades of the 20th century was a dialectical process. On one hand, as the tyranny of distance was eroded, economic networks of production and consumption were constituted at a global scale. At the same time, spatial proximity remained as important as ever, if not more so, for KBUD. Organizational proximity and institutional proximity, although mediated by ICT, and, in so far as they depend on personal contact and the medium of tacit knowledge, remain closely associated with spatial proximity. The clustering of knowledge production in cities is essential for fostering innovation and wealth creation.

The social benefits of KBUD extend beyond aggregate economic growth. On the one hand, is the possibility of a particularly resilient form of urban development secured in a network of connections anchored at local, national, and global coordinates. On the other hand, quality of place and life, defined not only by the level of public service (e.g., health and education), but also by the conservation and development of the cultural, aesthetic and ecological values that give cities their character, and attract or repel the creative class of knowledge workers, is a prerequisite for successful KBUD. The promise of KBUD is a secure economy in a human setting: in short, smart growth, or sustainable urban (and economic) development.

KNOWLEDGE-BASED URBAN DEVELOPMENT IN AUSTRALIA

Once Australia entered the information era and the new millennium, Australia needed to make a choice between two options for the continuum of her successful economy. The first option was competing as a low-wage economy based on the excellent, but now degrading, natural resource base by reducing wages, living standards, and environmental controls. And the second one was continuing with industries that are price takers in the global economy. Fortunately, Australia has chosen the later one, which is to be part of the emerging knowledge economy, an economy that has an emphasis on the use and dissemination of information as the basis for innovation, competitiveness, and growth (Marceau et al., 1997). Ruthven (1999, p. 20) has found that:

Australia is moving from a period of sweeping change in the structure of its industries. The enterprises, their activities and their importance to the economy differ significantly from the position 50 years ago and show radical changes from the position that existed at the beginning of the [last] century.

Mainly because of the high level of knowledge base, business research and development (R&D), government support for business R&D, total investment in knowledge, communication and electronic commerce and venture capital, in many respects, Australia is well-placed to compete in the global knowledge economy. Australia's prime strengths revolve around the following three key factors (McKeon & Lee, 2001, p. 65):

- A reasonable strong knowledge and technology base.
- A number of competitive industries linked to that knowledge base.
- A rapid process of adjustment over the past two decades to new global realities.

The KBUD process in Australia comprises six interrelated components. These are (Munro, 2000):

- Information technology (usually considered to encompass computing and communication technologies—ICTs).
- Information networks.
- New industry processes (including innovation, research and development, and technological diffusion).
- The human (and also social) capital.
- Capital accumulation through the privatization and commercialization of knowledge.
- Strategic urban management (metropolitan planning, knowledge precinct development—including work, residential and recreation areas).

Gleeson and Low (2000) argue that production in, and development of, the Australian city should be structured by the dynamics of the global economy. Recent statistics indicate that Australia and its state capitals are well-placed to take advantage of the knowledge economy. Australia rates above the OECD average for most of the indicators of readiness to move toward a knowledge-based economy. Knowledge-based industries account for 48% of Australian GDP (B-Hert, 2004).

Marceau (2005) contends, however, Australian policy makers are, in the main, content to repeat received KBUD wisdom. The *cluster* approach, based on the perception of the U.S. experience (e.g., Silicon Valley and DNA Valley), is particularly in vogue. Marceau's research, however, shows the geography of high-tech industry in America to be neither an accident nor a simple process, and hence not easily replicated. Effective knowledge policy needs to be flexible enough to capture the advantages of Australian industrial, intellectual, and socio-economic and urbanization history.

To date, no Australian city has been recognized as a knowledge city. Melbourne, Sydney, and Brisbane are three leading Australian cities in competition to become the first Australian knowledge city, although Melbourne is much closer to such recognition than the other two (Ovalle et al., 2004).

Melbourne has a considerable advantage in this competition, as since the 1990s, Melbourne City administration was well-aware of the KBUD processes, and municipal strategies already are developed and applied for the knowledge-based development of the city (Yigitcanlar, 2005). One of the strategy tools for the knowledge-based development in Melbourne is the city plan. The 2010 Melbourne City Plan aims to shape the future of the city as a prosperous, innovative, culturally vital, attractive, people-focused, and sustainable city (Shaw, 2003). Another strategy tool, the metropolitan strategy plan for Melbourne, *Melbourne 2030,* builds on the similar visions for the city by focusing on nine key directions, which are: a more compact city; better management of metropolitan growth; networks with the regional cities; a more prosperous city; a great place to be; a fairer city; a greener city; better transport links; and better planning decisions and careful management (Victorian Government, 2002). Following Melbourne's lead, the state and city administra-

tions of Brisbane and Sydney also adopted similar vision and goals in their metropolitan and city plans (Yigitcanlar, 2007).

Although a relatively small city by international population standards, Sydney is actively involved in the global economy. Its capacity to create and sustain global connections supports the premise that connectivity, rather than city size, determines economic success in the global context. However, until recently, Sydney did not have a comprehensive metropolitan development strategy because of its fragmented municipal nature. The new metropolitan strategy (Sydney in 2031) emphasizes innovation and acknowledges that increasingly, global competitiveness depends on investment in knowledge and innovation, and aims to strengthen and support the economic competitiveness of the city by knowledge-based development (NSW Government, 2005).

The rapid population growth and urban development in Brisbane and its metropolitan region, South East Queensland (SEQ), during the last decade have led state government and Brisbane City Council to develop a new KBUD strategy, *Smart State Strategy*, for the city and the state. The following section discusses this policy and some of its implementation in detail.

THE QUEENSLAND SMART STATE STRATEGY

In terms of overall economic measures, Queensland is an outstanding performer and has been Australia's fastest growing regional economy over most of the last decade. Economic growth in Queensland has exceeded that for Australia for the last nine consecutive years, and Australia itself has been acclaimed as one of the fastest growing economies in the OECD (Greenfield et al., 2006).

In 1998, Queensland was developing an extensive knowledge infrastructure centered on nine universities and research agencies. Queensland also had emerging capabilities in niche areas, such as ICT, nanotechnology, neuroscience, forensics, sports science, and eco-tourism, as well as continuing her competitiveness in food and agribusiness, aviation and aerospace, mining, marine and environmental technology industries. However, many of the developments were not coordinated, and there was insufficient recognition of these sectors' potential to generate wealth. The Queensland government recognized that greater levels of investment were needed to boost Queensland's knowledge infrastructure and take advantage of the state's potential. In August 2003, the government released the Smart State Strategy prospectus, Queensland the Smart State—Investing in Science: Research, Education and Innovation, charting the government's investments in science, technology, research, and innovation over the next five years. The prospectus outlined the government's commitment to achieving the Smart State vision, stated the vision as using knowledge to drive economic growth, and charted future directions and new initiatives in nine key strategic areas (Queensland Government, 2004, p. 4):

- Using knowledge to drive economic growth
- Skilling the Smart State
- Providing Science education
- Building Queensland's scientific and research facilities
- Commercializing discoveries and innovations
- Harnessing smart science for the environment
- Managing the knowledge and information economy
- Using government agencies to drive research and innovation
- Establishing strategic partnerships

The Smart State strategy comprises a number of initiatives for providing a stimulus to boost

industry innovation and commercial capacity for greater global export and trade gains. The aim of these initiatives is targeting the mobilization of the innovation process by providing support in converting ideas into tangible results. These initiatives include the funding of: innovation building, Smart State research facilities, innovation skills, and innovation projects. The total amount of public funding provided over a four-year period for these projects is approximately $220M (Queensland Government, 2005a).

Key initiatives for building the Queensland brand through expanding on strengths, successes, and recognition to take Queensland to the world include (Queensland Government, 2005a):

- Smart Sector Strategies to grow priority industry sectors.
- Smart ICT—Taking it to the World—to grow the ICT industry and exports.
- Queensland Aquaculture Development Initiative—$4M over four years.

Key initiatives for making the right connections by investing in strategic alliances and networks include (Queensland Government, 2005a):

- Smart State council to provide advice on emerging trends in innovation and skills.
- International Collaborations Program to support strategic alliances.
- A virtual forum for Queenslanders to shape the future Smart State agenda.

As well as providing an immediate stimulus for innovation, Smart Queensland takes the long-term view by building Queensland's capacity as an innovative society. Investing in knowledge and skills requires a new approach in learning and education that equips people with the knowledge, technology, skills, and abilities necessary to succeed in an innovative society. Key initiatives in the field of learning and education include: the *Smarter Learning* project, which is a consistent

approach to assessing and reporting across all Queensland schools; the *Smart Classrooms* project that provides access to learning beyond the traditional school grounds; and the *Smart Academies*, which is the centre of excellence in science, mathematics, technology, and in creative arts (Queensland Government, 2005a).

Creation of new knowledge-intensive jobs and skills are among the major requirements of the knowledge economy, therefore, training and higher education system enthusiasm about innovative enterprise and partnership with industry is a must. Key initiatives in this area include (Queensland Government, 2005a):

- Modernize the vocational and education training system to deliver flexible and responsive training.
- Smart State University internships to assist students to become work-ready.
- Skilling Solutions Queensland—a one-stop shop providing free training and career advice.

To achieve KBUD and to be competitive in the global markets, the Smart State strategy also aims to attract international investment and knowledge workers as well as improving its residents skills through training, and providing incentives to Australian investors. Investing in diversity, creativity, connectivity, and sustainability is another important aspect of creative urban regions. Therefore, Smart Queensland aims to increase Queensland's appeal as a place to live, study, work, and play, by creating a dynamic Queensland, building a community that cares for its people and fosters and celebrates knowledge and creativity. The key initiatives are categorized under three main groups. The first one is the "Business and Skilled Migration Program," which aims to promote Queensland's appeal to skilled knowledge workers. The second one is "building the multicultural image of the state" by organizing festivals to celebrate Queensland's

cultural diversity. And the last one is to promote exchange of ideas by encouraging participation to the "Queensland Ideas Festival" (Queensland Government, 2005a).

Infrastructure is needed to be provided in order to strengthen connectivity of Queensland's firms, institutions, and residents. Key initiatives in the provision of new infrastructure include the streamlined development of the approval process for telecommunications infrastructure and the online telecommunications information portal for business and communities (Queensland Government, 2005a).

Sustainability and smart use of our natural resources is an integral part of the Smart State Strategy and includes the following initiatives (Queensland Government, 2005a):

- Premier's taskforce to develop a Sustainable Natural Resource Development Strategy.
- International Water Centre—$2.4M over four years.
- Innovative research to control the cane toad—$1M.

The Smart State Strategy is mainly about positioning Queensland economy as a modern knowledge economy, recognizing knowledge, science, technology, research, education, and innovation as key drivers of economic growth. It also aims to achieve knowledge-based development and KBUD through a wide collaboration between public-private-academia partnership and including all stakeholders and interest groups into the decision-making process as active actors.

Most of the initiatives have targeted enabling technologies as applications of enabling technologies are critical to the sustainability and globally competitiveness of Queensland's important traditional industries—such as agriculture and mining—based in the regions, and for the growth of emerging industries, such as ICT, biotechnology, nanotechnology, smart materials, aviation and aeronautics (State Development and Innovation, 2004). These initiatives and the Smart State Strategy (Figure 1) have a strong pushing power in positioning Queensland economy as a knowledge economy.

The Smart State Strategy plays an important role in facilitating the development of ICT and learning communities in Queensland. The strategy initiated an "e@able project" to establish an industry internet portal and share relevant information between all levels of government,

Figure 1. The Smart State Strategy (Queensland Government, 2005a, p. 13)
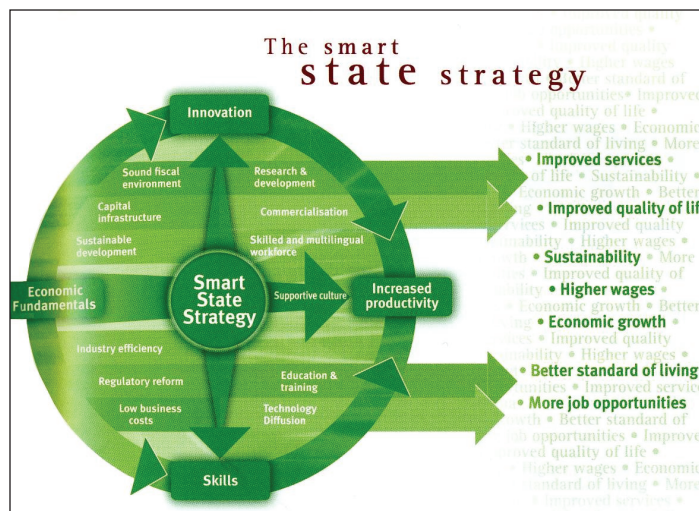
ICT providers, developers, and communities (Queensland Government, 2006).

The SEQ Regional Plan 2026 also supports the Smart State Strategy. This plan represents a Smart State way of planning in this region. The economic development initiatives reflected in the Regional Plan are underpinned by the Queensland Government's Smart Queensland: Smart State Strategy 2005-2015. This strategy "identifies investment in research, development, technology diffusion and commercialization of ideas. It also includes investments in knowledge, skills, diversity, creativity and connectivity as the key mechanisms to achieve increased productivity and a better quality of life" (SEQRP, 2005, p. 82).

The Regional Plan aims to foster innovation and develop skills and technological capabilities in the region to support existing and future industries by: (1) Developing an accessible range of regional education and training infrastructure and programs that encourage workforce participation, respond to specific regional industry needs, and support skills development in the workforce and broader community; and (2) Supporting existing and emerging clusters of science, innovation, and research and development (SEQRP, 2005, p. 86).

THE ROLE OF ICT IN KNOWLEDGE-BASED URBAN DEVELOPMENT

Brisbane is the capital city of Queensland and the fastest growing state in terms of economy, urban development, and population within Australia. Although there are few knowledge-intensive industries located, and some limited KBUD initiatives are planned for Cairns and Townsville (Northern Queensland), most of the KBUD in Queensland occurs within the Brisbane metropolitan area (South East Queensland).

The use of ICTs in inter-organizational communication, in information-sharing and data management is key to achieve cities' agendas, in terms of KBUD, delivery of services, and outcomes through social integration. Similar to Queensland's Smart State Strategy, the City of Brisbane also has adopted a 10-year Smart City vision aimed at addressing and promoting the following: information access; lifelong learning; the digital divide; social inclusion and economic development. The operationalization of Queensland's Smart State and Brisbane's Smart City initiatives from one centre for each promotes overall integration of various local and statewide e-governance initiatives. The city and the metropolitan region are well-integrated in terms of service delivery, the infrastructure for which is underpinned by the telecommunications plans, with social integration addressed through the various initiatives. Integration is facilitated largely through a strong state government and city council—with a clear policy framework and well-resourced staff (Odendaal, 2003).

If ICTs are to function as tools for development, then skills development and improved access are key to achieving this. Underlying this technical development is the importance of social development—literacy training, public computer access and creating opportunities for participating in the ICT industry. Brisbane's efforts in this regard are based around partnerships with state government in providing training in schools, with small scale businesses in providing cheap hardware, and with small information technology businesses in implementing www.ourbrisbane.com portal for participation (Odendaal, 2003). The www.ourbrisbane.com project is promoted as an icon in itself; it is marketed aggressively as a key component of the Smart State and Smart City initiatives. It is seen as an underpinning to all of Brisbane's long-term objectives and emerged as a project, in response to the need to make Brisbane a competitive city, nationally and regionally. Given the city and region's reliance on the service sector for growth, enhancing its function as a key

service center through ICT development is seen as strategic and important for KBUD.

Brisbane shows the synergy that can come from public-private partnerships (private partners in www.outbrisbane.com, in providing access for communities to inexpensive hardware), from networks with other state agencies, such as State Education in providing various initiatives and internet training; and working with federal and state government in establishing opportunities for one-stop service payment and registration online around life-events (Odendaal, 2003). This synergy is combined with the strong local economy and lifestyle options to attract more knowledge-intensive industry and workers, which supports KBUD within the region.

Queensland's Knowledge Hubs

A feature of globally competitive knowledge economies is that governments, universities, and industry work together in these economies to create regional *knowledge hubs*. Knowledge hubs have three major functions: to generate knowledge; to transfer and apply knowledge; and to transmit knowledge to others in the community through education and training (Dvir & Pasher, 2004). The Queensland Smart State and Brisbane Smart City strategies have augmented KBUD in and around Brisbane (Table 1). Brisbane and its metropolitan area (South East Queensland) have emerging strengths in a number of dynamic new sectors and knowledge hubs that will help drive the regional capacity to develop into the future. Biotechnology and biosciences, in general, aviation and aerospace and ICT, in particular, are examples of strong development opportunities that have the potential to make Brisbane a global player in the world's fastest growing knowledge-intensive industries (Andrews, 2006).

The Brisbane central business district and surrounding suburbs are home to globally recognized knowledge hubs and clusters, such as Herston (medical research) and Kelvin Grove (creative industries, health). The ICT sector is developing in Milton and Fortitude Valley, with government representation in the iLab incubator (Toowong) and Information Industries Board (Milton).

Table 1. Major knowledge hubs in Queensland (Rayner, 2006)

Location	Type of knowledge industry
Cairns to Townsville James Cook University	Tropical sciences Tropical ecotourism Tropical health Aquaculture Disaster prevention Environmental sustainability
Boggo road University of Queensland Prince Alexander Hospital	Biotechnologies and Biosciences Health and food sciences Nano technologies Brain Institute Pharmacy sciences
Creative industries Queensland University of Technology Griffith University Millennium Arts	Collaborative arts Film and television Visual and performing arts Asia Pacific Triennale
Royal Brisbane Hospital	Queensland Medical Institute Children's and Women's Health
New knowledge precinct proposals @ Sunshine Coast—Brisbane—Gold Coast	Subtropical urban renewal Urban waterfront development Sustainable housing and living

Substantial activity also is centered around the University of Queensland at Santa Lucia with a range of research facilities, including the Institute for Molecular Bioscience and a natural resources/ environmental cluster nearby at Indooroopilly Longpocket. A similar concentration is located south of the city, with Griffith University at Nathan, the nearby Mt. Gravatt Research Park and Brisbane Technology Park at Eight Mile Plains. Emerging clusters are apparent at the Sunshine Coast, based on the University of the Sunshine Coast (at Sippy Downs). and at the Gold Coast with the Griffith University campus and the proposed Knowledge Precinct. The Gold Coast also is home to a thriving ICT industry and enterprises associated with leisure and entertainment (Queensland Government, 2005b, p. 49-50).

Elsewhere in the region, there are specialist centers of research and development at sites such as Pullenvale (minerals and energy), Coopers Plains (pathology, bio-security) and Cooroy (timber). The ongoing development of University of Queensland campuses at Ipswich and Gatton will be a key factor in diversifying that area's economic activity, as well as increasing access to education and training in the Western Corridor. Urban redevelopment areas, particularly knowledge precincts such as Boggo Road/Dutton Park, provide the opportunity for mixed-use development, incorporating high value-added research, development, and service industries, and linkages to university research facilities. Such developments have the potential to encourage industry clusters, which can be located either in close proximity or more distant proximities, but connected by high-speed broadband and equipped with other ICTs (Queensland Government, 2005b, p. 50).

CONCLUSION

Knowledge cities feature growth based on the generation of value using common assets with the purpose of achieving sustainability. The ad-

vantages of a knowledge city at global, national, regional, and local scales cannot be ignored by the city authorities, policy-makers, private sector investors, and social organizations. Knowledge city strategies and KBUD policies have been adopted by a number of cities and regions since the late 1990s.

Knowledge cities are complex entities, and attempts to transform cities into knowledge cities will likely result in failure if they are not guided by sound strategic visions. These strategic visions should incorporate policies for attracting and retaining knowledge workers and industries, and also for empowering citizens as knowledge creators and innovators. The top-tier knowledge cities specialize in a few sectors only, but set ambitious goals for each, and they also develop their knowledge-based policies carefully (Yigitcanlar, 2007).

The common strategies for building successful knowledge cities include: political and societal will; strategic vision and development plan; financial support and strong investments; setting-up of agencies to promote KBUD; international, multicultural character of the city; metropolitan web-portal; value creation to citizens; creation of urban innovativeness engines; assurance of knowledge society rights; low-cost access to advanced communication networks; research excellence; and existence of public libraries' network (including online availability of resources).

Implementation of the above-mentioned strategies and policies for knowledge cities and KBUD requires a broad intellectual team with expertise in urban development; urban studies and planning; socio-economic development; models of intellectual capital; and knowledge management. It also requires understanding the diverse spatial forms of the knowledge city where a large number of knowledge clusters are particularly important in the promotion of the spill-over effects found to be vital for long-term economic prosperity (Yigitcanlar, 2007).

Strengthening the knowledge-base of cities also requires a nuanced geographical frame that allows understanding in diverse spatial forms of the knowledge city, where a large number of knowledge-based clusters (e.g., universities, R&D institutions, and knowledge precincts) are particularly important in the promotion of the spill-over effects found to be vital for long-term economic prosperity.

It is evident from the Queensland's Smart State and Brisbane's Smart City strategies and vision that Queensland and, particularly, Brisbane have the required potential that is mentioned above. In Queensland and Brisbane the state and local governments have and are developing strong urban ICT policies and KBUD strategies to strengthen the knowledge-base of the state and the city. Successful implementation and continuum of these strategies would likely transform Brisbane into a globally competitive knowledge city, and its economy into a knowledge economy. So far, there are some positive outcomes of KBUD (i.e., economic prosperity, human development, and moving toward social and environmental sustainability) in Queensland. However it is still rather early to comment on how successful Queensland's Smart State strategy would be.

FUTURE RESEARCH DIRECTIONS

In recent years, a new global urban order is being shaped by the growth of technology and knowledge economy (Slabbert, 2006). The importance of KBUD will increase in the near future as technology and economy continue to shape a new urban order, and competition between cities gets much tougher in order to attract and retain knowledge-intensive industries and workers.

To date, there has been limited research on the specifics of KBUD in Australia. Most of the research has been of a general economic character or narrowly focused on Australian knowledge precincts (e.g., ABS, 2002; DITR, 2002; Joseph,

1997; Sheehan et al., 1995). The socio-spatial dimensions of KBUD, and relevant social research that investigates such parameters as the quality and quantity of the knowledge workers, have been largely neglected. Other KBUD areas of relative neglect include ICT research (e.g., GIS, e-government, internet, online public participation) and policy-making and ICT adoption by state and local governments' planners (e.g., NIEIR, 2005; Yigitcanlar, 2006; Yigitcanlar et al., 2003). Therefore, further research that focuses on these neglected and underdeveloped research areas to determine key factors in transforming Australian cities into knowledge cities needs to be undertaken.

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