

# **KNOWLEDGE-BASED URBAN DEVELOPMENT IN CHINA**

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## Abstract

This thesis starts with a conceptual exploration of broad disciplines related to the emerging field of Knowledge-Based Urban Development (KBUD), upon which it developed understanding of the holistic meaning of KBUD. It argues that the need for knowledge for KBUD should include all types of knowledge – the wisdom – and that KBUD, in particular knowledge city, is to enhance urban social, economic, cultural, and environmental sustainability in a balanced manner. The fundamental of knowledge city lies on its justice and inclusion, which is developed equally for all.

Building upon the theoretical arguments it made, this research developed an analytical framework for analysing knowledge city. By applying the framework to both international KBUD initiatives and the Chinese case studies, it found that although there seems to be a general trend that suggests that the cities in developed countries have comparative advantages in transforming into knowledge city, the state of development is by no means the determining condition for a city to develop towards KBUD. Rather, the making of knowledge city relies on the ability to engage people of the whole community to establish an efficient institutional mechanism and develop an appropriate policy framework, which encourages and facilitates the creation of a cohesive knowledge environment, especially upgrading the city's knowledge base and fostering a cohering knowledge culture, to mobilise and apply all types of knowledge to serve and rule urban development behaviour so that it corresponds fully to the needs of enhancing the city's social, economic, cultural, and environmental sustainability.

The empirical evidence from the Chinese case studies also suggests that the very recent change of China's development ideology, which calls for the development of a "harmonious society" following the "scientific development concept" approach, is meaningful, from the KBUD perspective, only if they are conducive to making connection with and adopted for coordinating localised knowledge creation, transmission and utilisation, which are regulated for the great collective interests, in other words, for people of the whole community, for social equity and inclusion.

This thesis ends with offering some recommendations both for China's urban development policy and directions of future research.

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# Abbreviations

ICT	Information and Communication Technology
SEZ	Special Economic Zone
ETDZ	Economic and Technology Development Zone
HNTIDZ	High and New Technology Industrial Development Zone
KBD	Knowledge-based Development
KBUD	Knowledge-base Urban Development
KM	Knowledge Management
R&D	Research &Development
IASP	International Association of Science Parks
KCCS	Knowledge City Capital System
CICBS	Cities Intellectual Capital Benchmarking System
IC	Intellectual Capital
MKC	Manchester Knowledge Capital.
MOKC	Melbourne’s Office of Knowledge Capital
CPC	The Communist Party of China
FDI	Foreign Direct Investment
OVC	Optical Valley of China
WUA	Wuhan Urban Agglomeration
WEDZ	Wuhan Economic Development Zone
DHTI	Department of High-Tech Industry
PPC	Productivity Promotion Centre
RSEF	Resources Saving and Environmental Friendly
BISR	Big Impression Study Room
OECD	Organisation for Economic Co-operation and development
UNDESA	United Nations Department of Economic and Social Affairs
UNDP	United Nations Development Programme
UNESCO	United Nations Educational, Scientific and Cultural Organisation
CNISPRES	Chinese National Institute of Spatial Planning and Regional Economy

NGO	Non-Governmental Organisation
GDP	Gross Domestic Product
CAS	Chinese Academy of Science
CAE	Chinese Academy of Engineering
CASS	Chinese Academy of Social Science

# **1 Introduction**

## **1.1 Introduction**

The purpose of this opening chapter is to provide an overview of how this research has been initiated and conducted in order to answer the research question “how do Chinese cities interpret and act toward knowledge-based urban development?” It begins by introducing readers to the research background and the motivation to conduct the research. A brief survey of the existing studies is presented, which will lead to the research questions and the aims and objectives. Research methodology and methods adopted in this study are then briefly described. An expectation of contributions to knowledge is followed by a section outlining the logical structure of this thesis that aims to provide readers with a full picture of this study and guide them through the research journey.

## **1.2 Background to the research**

### **1.2.1 Global trend of urban development**

The last two decades have seen revolutionary changes in development under the circumstance of global transformations (Yigitcanlar *et al.*, 2008). First, the explosive advancement of information and communication technology (ICT) has engendered the “information society”, which was seen as the dominating phenomenon of the late 1980s and 1990s (Duff, 2000). Since the dawn of the 21<sup>st</sup> century, as the vital importance of knowledge for development has been recognised, the word “knowledge” has become a widely used prefix both by academics and practitioners, such as “knowledge economy”, “knowledge society”, “knowledge-based development”, and so on (Carrillo, 2003, Castells, 2000, Florida, 1995, Knight, 1995, OECD, 1996, UNDESA, 2005).

In the meantime, rapid urbanisation has changed the nature of development. Between 1980 and 2005, the world’s urbanisation level has increased by nearly ten points to approach 50 percent (UNDP, 2007) and was projected to increase to 75 percent by 2025

(Carrillo, 2006, p. xi). Some authors refer to the 21<sup>st</sup> century as the century of cities (Landry, 2000, p. xii). As stated by Knight (2008), “cities are primary civilising forces, anvils of civilisations, places where knowledge is advanced and new values are forged, where knowledge is passed on to succeeding generations, and where developmental synergies are realised” (p. xv). Cities are also the focal points of the knowledge economy since they are where knowledge is mainly produced, processed, exchanged and marketed (van den Berg *et al.*, 2005, p. 7). Cities are therefore playing the leading role in world development. Accordingly, urban development has always been the central both to policy making and academic studies over time.

To a great extent, the transformation of development as mentioned above is found in the change of ideas, theories, and approaches of urban development. The knowledge based turn was triggered by the success of Silicon Valley and Cambridge Science Park in the 1970s, which has led to the goal of urban development focusing on developing technopoles or industrial parks to make optimal utilization of technological resources in the 1980s (Castells and Hall, 1994). With the explosion of ICT and the emergence of an “information society”, the 1990s brought forth an explosion of science and technology parks to stimulate entrepreneurship and the emergence of “digital cities” as a way to optimise the application of information technology (Amidon *et al.*, 2005). This was soon expanded into the notion of “knowledge-based development” (Knight, 1995), which eventually gave birth to the concept of the “knowledge city” at the beginning of the 21<sup>st</sup> century (Ergazakis *et al.*, 2004, Yigitcanlar *et al.*, 2008).

This is the case not only in cities in developed countries, but also in cities in developing countries and regions, which are still in the process of industrialisation, such as Singapore, South Korea, Malaysia, Brazil, India, Mexico, Hong Kong, and Taiwan, where cities are even prioritised in the national development strategies. In China, as a result of implementing the “Opening Up Policy” began in the early 1980s, the country has quickly become the “World Processing Plant” (Aubert, 2005, p.62, People's Daily Online, 2006, Ziegler, 2006), which has led to unprecedented economic growth and the ever growing scale of urbanisation. More than 400 new cities and towns have been created and over 300 million rural residents moved from the countryside to cities since the economic reform began in the early 1980s (CCICED, 2005, Girardet, 2004).

Meanwhile, China's urban development has followed the global trend in the last two decades. The goal of urban development has evolved from developing the "Special Economic Zones (SEZ)" in the 1980s to "Economic and Technology Development Zones (ETDZ)", and "High and New Technology Industrial Development Zones (HNTIDZ)" in the 1990s (Dahlman and Aubert, 2001, OECD, 2003) and to "innovative cities", "learning cities", and "harmonious cities" starting from the beginning of the 21<sup>st</sup> century (Wang, X. K., 2006, Wu, 2005, Yang *et al.*, 2006).

Nevertheless, a survey of the literature in English language noted that while much has been written about western developed industrial cities in this respect, remarkably little can be found concerning the Chinese case. However, given China has increasingly integrated into the world economy and become a significant player in all spheres of global development (Yeung and Lin, 2003), its ever larger scale of urbanisation and urban development behaviour will inevitably affect the world's development agenda. This provided the initial motivation for conducting the current study.

### **1.2.2 Research on knowledge-based urban development: the state of art**

One may find that the above discussion has mentioned more than ten terms, each of which represents a large field for study. Nevertheless, taking "urban development" as the main subject and adding the currently widely used term "knowledge" as the prefix, the subject area for this study becomes "Knowledge-Based Urban Development (KBUD)". However, prior to the commencement of the research project in 2006, a preliminary search of the literature on KBUD returned no result. Indeed, it was not until 2008 when the term was first found in the title of an editorial book – "Knowledge-Based Urban Development: Planning and Applications in the Information Era" (Yigitcanlar *et al.*, 2008). The 16 papers selected in the book cover development strategy, urban planning, knowledge economy, and knowledge infrastructure. Most of them address economic issues. Nevertheless, as suggested by few studies on knowledge-based development (KBD), it is purposefully for balancing social, economic and environmental sustainability in the era of knowledge society (e.g. Laszlo and Laszlo, 2002, 2007). Bearing this in mind, the survey of the literature was extended to include a wider range of related subject areas, such as "information society", "knowledge management", "knowledge economy",

“knowledge based development”, “knowledge society”, “technopoles”, and “knowledge city”, and so forth.

#### ***1.2.2.1 Literature on information society***

The notion of information society came under the explosion of information technology in the 1980s (Fukuyama, 1999). Studies in this domain became a common area of interest attracting both advocates (e.g. Borja *et al.*, 1997, Castells and Himanen, 2002, Masuda, 1981, Masuda, 1990) and critics (e.g. Lyon, 1988, Webster, 2002). While the former characterise information society from an economic perspective, emphasising ICT based industries which are replacing manufacturing as a source of wealth, the latter (from a social perspective) criticises it for only partially explaining the features of the world we inhabit. For them, “digital divide” or social polarisation is seen as a byproduct of information society (Britz, 2004, Lasch, 2004, Nordenstreng, 2004, Roszak, 2004, Webster and Robins, 2004).

#### ***1.2.2.2 Literature on knowledge management***

Knowledge Management (KM) emerged primarily in business as a response to the changing global environment in which value creation is argued to be increasingly reliant upon knowledge (Davenport and Prusak, 1997). KM provides the means to generate, distribute and use knowledge in ways that add value to business activity and provide new opportunities for enterprises (Clarke, 2004, p. 192). KM has become another management approach which continues to pursue the unquestioned ‘business as usual’ motive: profits and growth in the late 1990s (Gonzalez *et al.*, 2004). Studies on KM have evolved from “dispersion” to “contraction” and then to an “institutionalisation” phase (Carrillo, 1999). Laszio and Laszlo (2002) suggest that KM is relevant beyond business applications that connect knowledge and innovation ecologies.

#### ***1.2.2.3 Literature on knowledge economy***

This concept of knowledge economy has emerged in the mid 1990s and is associated with numerous similar concepts (Carlaw *et al.*, 2006), but there is no commonly accepted definition of what a knowledge economy is. Almost all studies begin with defining what is meant by the knowledge economy. Generally, there are two schools of thought (Brinkley, 2006, van Winden *et al.*, 2007). One from a narrow sense refers to it as a

separate section that sits at the “top” of the economy, in which new technological knowledge is generated and marketed (e.g. Powell and Snellman, 2004, Rooney, 2003). This is the dominant perspective within the literature. Meanwhile, the other sees knowledge economy as one in which knowledge is becoming a more dominant factor throughout the economy. From this perspective, knowledge economy is not only about producing new scientific or technological knowledge regarded as a driver of growth, but also the use and valorisation of knowledge in economic processes and the acquisition of skills (e.g. Dahlman and Andersson, 2001, Munro, 2000). Both concepts have not been free from criticism. While the former is criticised for overlooking the social process of knowledge (Hepworth and Local Futures, 2001, Hepworth *et al.*, 2003), Smith (2002, p. 6) sees the latter covering everything and nothing, since “all economies are in some way based on knowledge, but it is hard to think that any are directly based on knowledge, if that means the production and distribution of knowledge and information products”.

#### ***1.2.2.4 Literature on knowledge society***

Knowledge society is the latest invention of the concept in the 21<sup>st</sup> century, which has been argued by many authors as being a “qualitatively rich” conceptual terms compared to the information society (e.g. Drucker, 2002, Lor and Britz, 2007, Servaes, 2003, World Summit on the Information Society, 2003). However, there is no widely accepted definition. Some studies focus on economics and technology perspectives to emphasise the presence of the knowledge economy and (technological) knowledge infrastructure (Britz *et al.*, 2006, Servaes, 2003), while others are making efforts to develop indicators for measuring knowledge society (e.g. Mansell *et al.*, 1998, World Bank, 1998). Not surprisingly, such indicators are far from comprehensive.

#### ***1.2.2.5 Literature on knowledge-based development***

For some authors, knowledge-based development (KBD) is the application of knowledge management to the social level (e.g. Aubert, 2005, Bounfour and Edvinsson, 2005a, Carrillo, 2002, Smedlund and Poyhonen, 2005), while Carrillo (2003) refers to it as the combination of endogenous growth theory and knowledge management. Other authors from a social perspective refer to KBD as a new development theory, which balances economic prosperity, human development, and socio-environmental sustainability (Laszlo and Laszlo, 2007). Moreover, KBD was defined by Knight (1995) for the first

time as a new development strategy for post-industrial cities both in America and Europe as a means of rejuvenation. Additionally, in order to encourage research in this field, the Journal of Knowledge Management has decided to publish a special issue on KBD every year from 2007 (Carrillo, 2007).

#### ***1.2.2.6 Technopoles***

The term has been used by Castells and Hall (1994) to mean science park, industrial cluster, technopolis, and science city. Although technopoles were originally established in ex-urban location (e.g. Silicon Valley and Japanese Technopolis), it has evolved to be part of urban development (e.g. Science Park and Science City). Studies in this field are concentrated on the economic aspect and efforts have been made to identify successful factors (Chen and Choi, 2004, Lee, C.-M., 2000, Lin, 1997, Siegel *et al.*, 2003), growth mechanisms (Koh *et al.*, 2005, LaValle, 1982, Luger and Goldstein, 1991), and policy-making issues (Bass, 1998, Fujita, 1988, Tatsuno, 1986, Wang *et al.*, 1998). While much has been written about its economic significance, little has been found addressing its impact upon social development, though it has been increasingly evident that the duplication of technopoles by developing countries is rather a problem (Hospers, 2006 ). Moreover, research on the contributions of technopoles to economic growth found mixed results (Siegel *et al.*, 2003).

#### ***1.2.2.7 Knowledge city***

Like knowledge society, knowledge city has also emerged to be an inclusive concept and received increasing attentions in various disciplines. Yet literature has not been developed systematically due to its very short history. Research efforts have been made to try to define what a knowledge city is, and how it will benefit urban development (Yigitcanlar *et al.*, 2008). However, the existing literature tends to confuse the concept with knowledge economy (e.g. Bounfour and Edvinsson, 2005a, van den Berg *et al.*, 2005), which gives rise to the question as whether knowledge city for knowledge economy or in the other way round. Meanwhile, the literature search has noticed that some terms have been used by authors interchangeably with knowledge city, such as “ideopolis” (Work Foundation, 2005), “intelligent city” (Komninos, 2002), “creative city” (Landry, 2000, Landry and Bianchini, 1995), “learning region” (Florida, 1995),



“digital city” (Aurigi, 2005), and so on, though each of these terms alone may represent a specific aspect of knowledge city.

Overall, the preliminary survey of literature provides useful insights for initially understanding the context of KBUD. Meanwhile, it also noticed that the vast majority of literature in the abovementioned fields seems overwhelmingly concentrated on the economic aspect. This gives rise to the question of what should be addressed by KBUD if it is emerging as an advanced form for enhancing urban social, economic, cultural, and environmental sustainability. With this question in mind, it is argued that there is a need for a holistic understanding of the nature of KBUD. The way in which this can be achieved is to look at a much wider range of literature in greater detail.

### **1.2.3 Chinese research in this field**

A search of Chinese literature in this domain found that there is a great deal of studies related to ETDZ, HNTIDZ, innovative city, learning city, harmonious city, and so on. Research into ETDZ and HNTIDZ in recent years has been concentrated on policy perspective addressing the choice of growth mechanisms and the relationship between them and the host city (Ma and Wang, 2008). Meanwhile, studies into the innovative city, learning city, and harmonious city are found and addressed from both theoretical and empirical perspectives. Theoretically, most studies are taking the western theories for grant (Li, 2003, Pan, 2003, Wang and Cui, 2006, Wu, 2005, Wu, 2002, Zhang *et al.*, 2007, Zhang and Fan, 2002, Zhuang, 2002). Few efforts have been made to relate western theories to Chinese empirical evidence. Meanwhile, most empirical studies are political and policy oriented (Liu, 2000, Sang, 2007, Wei *et al.*, 2007). Nevertheless, research into the field with “knowledge” as the prefix has rarely been found in the Chinese literature except “knowledge economy” in its narrow sense.

Drawing on this, in relation to the global movement of KBUD, a number of questions are raised, namely, how do Chinese cities interpret the notion of KBUD? What is the nature of Chinese innovative city, learning city, and harmonious city in the context of KBUD? What are the similarities and common features within the KBUD initiatives between Chinese and western cities? Are there any specific tensions and hurdles for Chinese cities to follow KBUD from the western theoretical point of view? How can these be solved? Initially, these questions formed the basic questions for the current research.

### **1.3 Aim and objectives**

#### **1.3.1 Research questions**

The initial motivation for undertaking the current study comes with the researcher's personal working experience and interest in exploring how Chinese cities respond to the global trend of urban development and the way forward. This took the researcher to conduct a preliminary survey of the literature. Drawing on the above preliminary survey of literature and the questions arising from it, the general question for this research has been defined to investigate "how do Chinese cities interpret and act toward KBUD?" Nevertheless, given the fact that KBUD itself is an emerging area of study and there are some fundamental questions have yet been clearly addressed in the current literature, the research effort will therefore be made firstly to answer the following questions:

- What is the nature or holistic meaning of KBUD?
- Which factors are central to KBUD?
- What is the general trend of KBUD movement in the global context?
- How do Chinese cities respond to the global KBUD movement?

#### **1.3.2 Aim and objectives**

The primary aim of this study is to investigate how Chinese cities interpret KBUD and take action to respond to the global movement of KBUD. On the basis of the research questions identified above, the objectives of this research are:

1. to refine the concept of KBUD
2. to develop an analytical framework for analysing KBUD
3. to examine international KBUD initiatives in order to identify the general trend of KBUD movement
4. to examine the practice of Chinese cities against KBUD, and
5. to recommend some policy options for Chinese cities in the making of knowledge city.

## **1.4 Research methodology**

Considering the current research aim and objectives, based upon the review of the methodological literature, a case study approach is argued to be the most appropriate strategy of conducting the research. The research is therefore designed to follow a case study process suggested by Yin (1994). Qualitative approach has been chosen to adhere to the case study strategy (Jacobs, 1993). As the object being studied is the city or city region and the knowledge based activities may take place everywhere within the city, there is no single source that can provide the desired data in full. For this reason, it is argued that there is a need to look at multiple sources. In consisting with this, multiple techniques for collecting relevant sources of data are accordingly employed (Yin, 2003). As will be discussed in detail in chapter three, documentary analysis, direct observation, and focused interview are used to fulfil this purpose. Furthermore, data is analysed under the themes identified in the review of literature and international KBUD initiatives.

In addition, in order to achieve the research objectives, two rounds of case studies are deemed necessary. The first round case studies, using cross-case synthesis analysis methods based on secondary data, review KBUD initiatives of 11 selected cities or city regions worldwide to answer the third research question listed above. Meanwhile, the second round case studies are conducted in four Chinese cities (including one pilot case study city) to achieve the fourth research objective. Detailed discussion of the methods of case selection and data collection and analysis are presented in chapter three.

## **1.5 Original contributions to knowledge**

This research is expected to make contributions to knowledge in the following ways. First, through refining the concept, it will clarify the ambiguity in understanding KBUD in the current literature. This will extend the concept in a broad sense to embrace not only economic but also social, cultural and environmental aspects. Second, the identification of an analytical framework will allow conducting a comparative analysis not only for the current research but provide a theoretical base both for future studies and policymaking and evaluations.

Most importantly, as noted by the literature, although learning from elsewhere (both domestic and international) is often seen as an effective way of gaining knowledge for

policymaking (Mulgan, 2005 ), studies into cross-cultural policy transfer found that few have been successful due to “inadequate attention given to the differences of preconditions” between the transferor and transferee (Hospers, 2006 , p. 6). In this sense, Hassink and Lagendijk (2001) and Hospers (2006) suggest that policy makers should develop strategies based on area specific characteristics rather than copying successful policy programmes from elsewhere. The recent institutional and economic processes in China provide a typical example for this. Given the fundamental importance of both the Chinese culture and its restructured socialist institutional setting to the transformation of the Chinese space-economy, Yeung and Lin (2003) maintain that there is a need to theorise the Chinese case to challenge against the Euro-American development geography. The current study is expected to contribute to knowledge in this respect. Bearing this in mind, a detailed discussion of the actual contributions of this research will be presented in the concluding chapter.

## **1.6 Structure of the thesis**

This thesis consists of eight chapters. In this opening chapter, an introductory overview of the thesis has been presented as above. The research questions and objectives are identified drawing on the background and a brief review of the issues of the existing literature. The overall research methodology employed for this research is outlined and the expected contributions to knowledge are presented.

In order to lay a theoretical foundation upon which this research can be based, chapter two provides a detailed review of literature range from the debate of knowledge for development, the meaning of development, knowledge economy, knowledge society, the earlier form of KBUD – technopoles, and knowledge city. By critically examining such literature, the first two research objectives are achieved.

Chapter three presents a detailed discussion of the choice and rationale of the research methodology upon which research strategy, approach, data collection techniques and analysis are justified. The process of the research is designed, which is followed by a presentation of the criteria and process of selecting case studies. Moreover, limitations of the research methods are provided at the end of this chapter.

Following the research design, chapter four presents findings from the review of international KBUD initiatives. Drawing on the secondary data collected through desk-based research, 11 cities or city regions worldwide are analysed under the selected themes. Cross-case synthesis is employed for conducting the analysis. By doing so, this chapter will answer the third research question.

Chapter five provides a general picture of Chinese urban development from historical, cultural, and policy perspectives. It begins with a discussion of the historical and cultural impact on the national concept of knowledge and urban development. The evolution of national policy on urban and regional development is discussed and Chinese literature in this domain is then reviewed.

Chapter six presents a discussion of the findings from a pilot study, which aims to identify reliable data resources, key informants, and testify the reliability of data collection and analysis techniques. The discussion is organised in accordance with the analytical framework.

Findings from three Chinese case study cities are presented in chapter seven. It starts with presenting findings from each case study, Hangzhou, Wuhan, and Chengdu. Then synthesis and discussion are provided by integrating the findings into the analytical framework.

The final chapter summarises the whole research project by providing the full picture of the findings within the main body of knowledge in relation to KBUD. In this chapter concluding remarks are drawn on the basis of findings and discussions provided in the previous chapters. Moreover, after presenting theoretical contributions and practical implementations and limitations, research objectives set in chapter one are evaluated. Finally, the research journey is concluded by providing recommendations to Chinese urban development policy and the future directions of research.

## **2 Knowledge and urban development: A review of literature**

### **2.1 Introduction**

In Chapter one, the initial survey of the existing literature shows that KBUD is attracting increasing research interest from various disciplines. However, being an emerging area of study, it is noticed that literature is yet to be well developed. Therefore, the survey of literature was extended to a wide range of related disciplines. As suggested in chapter one, in order to gain a holistic understanding of the nature of KBUD, there is a need for a detailed review of literature on these disciplines. This chapter is designed to fulfil this purpose. As also noticed in the preliminary search of literature, the concepts of knowledge and development were often confused and limited. It is argued therefore necessary to clarify such concepts for KBUD. Accordingly, the review of literature will start with a discussion of the conceptual evolution of knowledge and the role it has been playing in development. This is followed by a discussion of the nature of development and also its conceptual evolution. The discussion will then be moved on to the emerging fields such as information society, knowledge economy, knowledge management, knowledge society, knowledge-based development, technopoles and the newly engendered knowledge city.

### **2.2 Dynamic between knowledge and development**

From a historical point of view, it may be said that knowledge has always been the source of development. However, what has made a difference is that the role of knowledge has evolved significantly over time. The last two decades saw the increasing recognition of the importance of knowledge for developmental challenges and transformations. The word “knowledge” has therefore become a widely used prefix in relation to development, such as “knowledge economy”, “knowledge society”, “knowledge community”, “knowledge citizens”, “knowledge-based development”, “knowledge city”, and so on (UNDESA, 2005). Meanwhile, the understanding of

“development” (which was often economic centred), has broadened in recent years in an attempt to address social, ecological, political, and cultural concerns (Pike *et al.*, 2007).

Not surprisingly, this has attracted considerable attention from researchers, which has resulted in a vast amount of publications. However, in many cases these two concepts and their relations are not clearly defined. In order to lay a concrete foundation for the current research, it is argued necessary to clarify their meaning and the way in which they interact.

### **2.2.1 Debate on knowledge**

The way in which knowledge is defined has been the focus of debate throughout history. Table 2.1 (next page) shows some of the representing debate on knowledge definition. In western philosophy, the archaic definition of knowledge has been the “justified true belief”. Plato distinguishes episteme from doxa, claiming that knowledge is from ‘meaning’ as he believes episteme is infallible and true, whereas doxa is fallible. This has been criticised by Kant (1999) as that ‘meaning’ as knowledge is by pure chance because it can neither satisfy an objective examination, nor can it be subjectively appropriate. According to Kant, ‘believing’ may be a mode of representation of reality. However, it is also objectively inadequate, but is adequate subjectively as it stands for an authentic decision, whereas ‘knowing’ is both objectively and subjectively adequate. But the difficult issue is whether the knowing is a representation of the world with objective certainty (Nassehi, 2004).

Compared with the western philosophy, ancient Chinese philosophy defines knowledge from a pragmatist perspective. There were three main schools of thought: Confucianism, Taoism, and Buddhism (Zhou and Liu, 1999). The most influential Chinese philosopher Confucius referred to knowledge as to “know what we know and what we do not know” (the Analects of Confucius). From the Taoist point of view, knowledge is “knowing the nature” (Laozi, Dao De Jing). Cao (2007, p. 37) believes that the Taoist defines knowledge as the “recognition of object and its nature as is or is not”. Meanwhile, Chinese Buddhism defines knowledge as “knowing human themselves” (Zhao, 1986). In this sense, Chinese philosophy paid more attention to “what it is” rather than “how it is” (Yu, 2006, p. 67). This will be discussed in more detail in chapter five.

**Table 2-1 Knowledge definitions**

Plato
...justified true belief...
Aristotle
...result of experience...
Descartes
...product of the thinking self... [Cogito, ergo sum]
Locke
...result of sensation and reflection... [Mind as tabula rasa]
Kant
...result of logical thinking of rationalism and sensory experience of empiricism that work together...
Hegel
...result of sensory perception that becomes more subjective and rational through dialectic purification...[Absolute Spirit]
Nishida
...product of pure experience by mind and body...cannot be expressed in words...
Heidegger
...theoretical cognition useful for practical behaviour... [Dasein]
Polanyi
...tacit knowledge and explicit knowledge... [We know more than we can say.]
Nonaka, Takeuchi, Konno
...iceberg...[Explicit knowledge as the tip of the iceberg; tacit knowledge as the part hidden under the water]

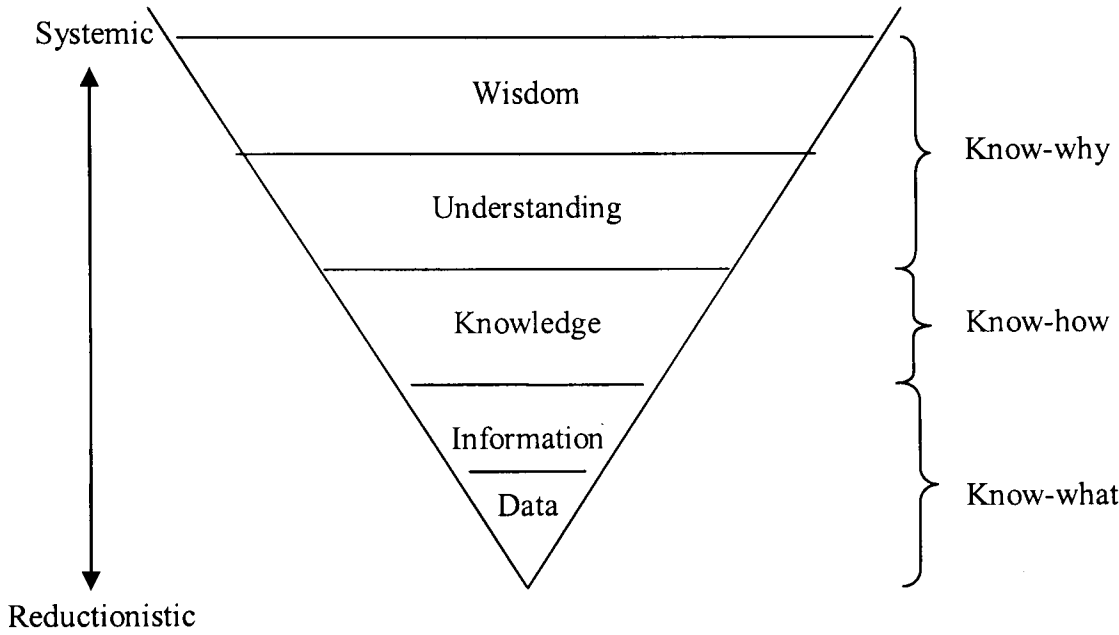
**Source: Adapted from UNDESA (2005, P. 21)**

In the Western tradition, there are two major streams of thought about knowledge: rationalism and empiricism. Rationalists, who are seeking to establish a definite foundation of knowledge, claim that certain knowledge cannot be found in experience but only in the realm of mind (Popkin and Stroll, 1993). In contrast, empiricists claim that “all knowledge derived from sense-experience (Russell, 1948, p.516)”, meaning that knowledge is a result of human experience and a means of reflection, and is, therefore, “context dependent” (De Long and Fahey, 2000). From this perspective, Wong and Radcliffe (2000) claim that knowledge is always located in an individual or a collective, or embedded in a routine or a process, being incorporated in language, stories, rules, and tools. The debate of these two streams represents the distinction between subjectivism and objectivism.

Qvortrup (2004) suggests that instead of accepting the subject-object distinction, knowledge is a system of recognitions. In this context, Laszlo and Laszlo (2002, p. 403) present that knowledge is an evolutionary “process rather than an end in itself”. They place knowledge in context with other forms of meaning in a pyramid (Figure 2.1). According to Laszlo and Laszlo (2002), from data to information, to understanding and to wisdom, there is a continuous movement through which “meaning” becomes more and



more sophisticated. Meanwhile, knowing moves from being more “reductionistic” to being more “systematic” and “holistic” since knowing at the lower portion of the pyramid is more specific but more limited, whereas at the higher portion it becomes more complex. Also, only with this movement are the “what”, “how” and “why” questions answered relatively.



**Figure 2-1 The pyramid of meaning**

**Source:** Adapted from Laszlo and Laszlo (2002, p. 403)

Up to this point, Carrillo (2002) argues that knowledge is not a thing, a mere record in a medium but the articulations of experience, cultural-psychological events by which relevant pieces of the world get connected with relevant perceptions and actions. From this perspective, Luhmann makes the point that knowledge “contributes to the establishment of a socially validated relationship between the mental system and the outside world and thereby to an increase of both stability and innovation (Luhmann, 2002, quoting in Qvortrup, 2004, p.97)”.

There are also many other debates on what can be regarded as knowledge in the existing literature. For example, the UNDESA (2005) refers to it as “people” and “information”; Stehr (1994, p. 5) sees knowledge as an “action resource” and “the possibility to get something going” and so on. Each of these comes up with a specific view of context.

Thus far, it seems that one cannot determine what knowledge is but how it comes about (Qvortrup, 2004). With regard to the relationship between knowledge and development, Laszlo and Laszlo (2002) argue that the essential question is not knowledge itself but “knowledge for what”. According to them, while knowledge is accounting for the progress of human society, it is also responsible for the increasing efficiency in exploiting natural resources and for increasing the gap between rich and poor. From this perspective, what kind of knowledge is relevant for sustainable development becomes vitally important.

## **2.2.2 Knowledge for development**

### ***2.2.2.1 The categories of knowledge***

There are many different ways of categorising knowledge. In the philosophical tradition, knowledge is divided into ontology and epistemology. In the ontological sense, knowledge is the subjective product of the individual mind (Searle, 1996). Nonaka and Takeuchi (1995) identify four ontological levels of knowledge: individual, group, organisation, and inter-organisation, while Spender (1996a, b, 1998) categorises knowledge in the ontological dimensions as social and individual knowledge. Fuller (2004, p.73-74) brings together individual and social knowledge into a continuum. The epistemological view of knowledge sees the nature of knowledge as being an institutional fact because it requires human institutions for its existence (Jakubik, 2007). Burrell and Morgan (2000, p.2) argue that in the epistemological sense, knowledge can be objective or subjective.

More often, in development practice, knowledge is divided into “explicit” or “codified” knowledge and “tacit” or “implicit” knowledge (Polanyi, 1966), scientific and practice knowledge, model 1 and model 2 knowledge, social and ethic knowledge.

### **Tacit knowledge vs. explicit knowledge**

Tacit knowledge refers to knowledge that has a personal quality that makes it hard to articulate or communicate analogously, the knowing or the deeply rooted know-how that emerges from action in a particular context. In contrast, explicit knowledge refers to the codifiable component that can be disembodied and transmitted, a notion analogous to knowledge, the know-what that can be extracted from the knowledge holder and shared with other individuals (Sambamurthy and Subramani, 2005).

Tacit knowledge is embodied in personal experiences, involving understanding and wisdom, demonstrated through actions, and is difficult to transfer (Laszlo and Laszlo, 2002). Explicit knowledge is codified and communicated in formal and systematic languages or codes, and set down in written documents (Nonaka, 1994). The epistemological debate about 'explicit' and 'tacit' knowledge has paid great attention to whether there is a clear separation between them (Brown and Duguid, 1998, Nonaka, 1994, Nonaka and Takeuchi, 1995, Ryle, 1984, Spender, 1996b, 1998).

The distinction between tacit and explicit knowledge has largely satisfied the need of knowledge management at an organisational level, but is far from enough for managing development at a societal level (Laszlo and Laszlo, 2002).

### **Scientific knowledge vs. practical knowledge**

Scientific knowledge is the most "formal knowledge" (Knight, 1995), which is seen as "a systematic body of knowledge about how natural and artificial things function and interaction" (Itami and Numagami, 1992, p.119). It covers "all methods and means devised by humans in pursuit of their practical ends, thereby including relevant development in science, mathematics, public health and medicine" (Chant and Goodman, 1999, p.vii).

In contrast to scientific knowledge, practical knowledge is "informal knowledge" (Knight, 1995). It is developed by various communities of workers in their worlds of everyday work (Carlaw *et al.*, 2006, p.683-684). Practical knowledge can be further subdivided into six types: professional knowledge, business knowledge, workman's knowledge, political knowledge, household knowledge, and other practical knowledge (Machlup, 1962, p 21-22, 1980, p 108).

Over the years however, there has been a strong tendency that scientific knowledge was regarded as unique knowledge accounting for development. Indeed, the advancement of scientific knowledge has led to the dramatic increase in productivity, thereby driving economic growth at an accelerated pace throughout history. However, at the same time, it has been found to be the major destroyer of the natural world, therefore resulting in the current situation where social and environmental sustainability is decreasing (Diamond, 2005, Meadows *et al.*, 2005, Murray and Cook, 2002, United Nations, 2005, World Bank, 1997, Yi, 2001). Moreover, Knorr (1999) notes that scientific knowledge also produces cultured routines, methods, and conventions which are able to cover up the latent functions of limitations of observation for the every-day life of research. Nassehi (2004, p. 446) even argues that “science is not the solution but part of the problem”.

### **Mode 1 vs. mode 2 knowledge production**

Gibbons (1994) distinguishes two modes of the production of scientific knowledge: mode 1 and mode 2. Mode 1 knowledge production is executed within universities and is dominated by an academic agenda with little interest in application, while mode 2 is done in intensive interaction with application and is driven by a broad range of interests. It is trans-disciplinary, problem-oriented, application-based, team-driven, multi-sited, partnership-based, socially distributed, heterogeneous, quality controlled, reflective and responsive, and less hierarchical than mode 1 (Jansen, 2002, Nowotny *et al.*, 2003). Etzkowitz and Leydesdorff (2000) suggest that mode 2 can be considered as an emerging system, resting like a hyper-network on the networks on which it builds such as the disciplines, the industries, and the governments. Perry (2008) points out that Gibbons' mode 1/mode 2 thesis underpins the process of knowledge-based development.

### **Social knowledge and ethical knowledge**

Knowledge can be also distinguished by human knowledge, structural knowledge, and social knowledge (De Long and Fahey, 2000). Human knowledge combines both explicit and tacit knowledge, manifested in skill or expertise. It is what individuals know or know how to do. Social knowledge exists in relationships between individuals or within groups. It comprises synergetic knowledge shared by group members, and is largely tacit. Social knowledge develops only as a result of working and learning together, enhancing the ability to collaborate effectively. Structured knowledge, different from the other two

types, can exist independently of human knowers, and is explicit and rule-based. It is embedded in the processes and infrastructure of a social system and represents an organizational and social resource.

These differentiations are important in recognising the relations and interdependencies among different forms of human knowing, but are still inadequate in directing a wisdom development. As stated, knowledge is “a sword with two edges”. Without intentional directionality, it could go in other directions which are not in our greater collective best interests. Laszlo and Laszlo (2002, p. 408) argue that scientific knowledge needs to marry with “ethical knowledge”.

This concern is also emphasised by a statement from the Forum on Science and Innovation for Sustainable Development (2000, p.7). More than 50 international academies of science state that:

A successful transition to sustainability requires more effective use of existing scientific knowledge and technology, greater integration of science into society as a whole, and the wisdom to avoid the destructive use of technological advances ...

From the discussion above, it is acknowledged that no matter how knowledge can be categorised, it can be good only if it is put to good use for human betterment on the basis of greater collective best interest.

#### ***2.2.2.2 Knowledge for development***

The social and environmental problems that are caused by development have been attributed to the “constitutional lack of perfect knowledge for development” by Hayek, the best known Austrian economist of the second half of the twentieth century. As early as the 1930s, Hayek realised that;

... we fall in effect back on the assumption that everybody knows everything and so evade any real solution of the problem... It has become customary among economists to stress only the need of knowledge of prices, apparently because – as a consequence of the confusion between objective and subjective data – the complete knowledge of the objective facts was taken for granted (van Hayek, 1937, quoting in Lin, 2007, p. 556).

And that

The economic problem of society is thus not merely a problem of how to allocate ‘given’ resources – if ‘given’ is taken to mean given to a single mind, which deliberately solves the problem set by these ‘data’. It is rather a problem of how to secure the best use of resources known to any of the members of society, for ends whose relative importance only these individuals know. Or, to put it briefly, it is a problem of the utilisation of knowledge not given to anyone in its totality (van Hayek, 1945, quoting in Lin, 2007, p. 556-557).

In this context, the problems that result from economic growth are concerned with the limited knowledge that heterogeneous individuals hold to carry out their actions and execute their plans over time. Even from the economic perspective, Hayek warned that the risk was likely the economists who pretended to know what was in practice not fully known or measurable therefore inevitably giving false advice. He said:

to act on the belief that we possess the knowledge and the power which enable us to shape the processes of society entirely to our liking, knowledge which in fact we do not possess, is likely to make us do much harm (van Hayek, 1974, p. 441).

In this sense, Carrillo (1999) notes that there is a need for “metaknowledge” – knowledge about knowledge, meaning that it is important to have knowledge about humans knowing about what they know and what they do not know in terms of managing a balanced socio-economic development, which Laszlo (2002) would call “wisdom”.

### **2.2.3 Development knowledge**

Having discussed what kinds of knowledge account for development without clarifying what is meant by development, it is now time to look at the concept.

#### ***2.2.3.1 Understanding development***

Referring to the concept of “development”, De Muro *et al* (2005) present that the term has a wide range of meanings which could refer to industrialisation, economic growth, structural change, modernisation, technological advance, progress, increase in personal incomes, and so on. Kuhn (1970) considers it as a paradigm, which is a set of received beliefs (basic assumptions, values, goals, expectations, knowledge, techniques...) that researchers and policy-makers share. Indeed, development has been conceptualised in

different theories of stages of human activity in history. Each reflects the level of human understanding of the nature of development in the given circumstance.

Most traditional definitions given to development were related to the concept of welfare and have direct linkages to economic growth. Even classical scholars made no distinction between growth and development. In Marx's view (1848), "development is the process of continuous overcoming of insufficient accumulation of capital compared to an abundance of available jobs" (De Muro *et al.*, 2005, p. 11). Schumpeter defines development as the "transition from one norm of the economic system to another norm in such a way that this transition cannot be decomposed into infinitesimal steps" (Schumpeter, 1932, quoting in De Muro, *et al.*, 2005, p.16).

Until the later 1960s, the meaning of development was often biased to "economic development" (Meier, 1970), and can be wholly equated with this relatively narrow focus and even with industrialisation (Beer *et al.*, 2003, p. 5). These limited definitions reflect the limited understanding of the meaning of development, which resulted in a situation where

most of the well intentioned development efforts that account for much of the "progress" achieved in the past, both in developed and developing countries, are responsible for major environmental damage and the widening of the gap between rich and poor on a global scale (Laszlo and Laszlo, 2002, p. 403).

Starting from the late 1960s and continuing throughout ensuing decades, it has seen the diversification of understanding of development. For example, in his work "The Meaning of Development", Seers (1969, p. 3) defines development as "the reduction and elimination of poverty, inequality and unemployment within a growing economy". However, he points out that development and economic growth "were not one and the same thing". This challenged the hegemony of economics in development thought.

During the 1970s and 1980s, rooted in dissatisfaction with the traditional approaches and critiques of orthodox neo-classical economics of the 1960s and 1970s, "alternative" approaches began to question the dominant approaches that focused on economic growth (Geddes and Newman, 1999). Since then, it has become increasingly imperative to gain a better understanding of development. The consequence of this is that social issues and the measurement of social well-being, gender issues, political and institutional factors

including issues of representation, participation, justice, and human rights, and the nature of the relationship between local communities and the environment were taken into account in the development thought (Novy *et al.*, 2006). However, with the emergence of a new economy, it saw a growing division between unskilled and skilled workers (De Muro, *et al.*, 2005), thereby becoming an increasing concern of development.

From the 1990s onwards, attempts had been widely made to redefine the concept of development. A great deal of studies has been carried out taking into consideration the whole of human experience in its socio-cultural and bio-physical environment. Findings from these researches indicate that it is important to expand the traditional concept of development to address social, ecological, political, and cultural concerns (Geddes and Newman, 1999, McMichael, 1996, Morgan, 2004, Pike *et al.*, 2007) through the sophisticated use of knowledge (OECD, 2001).

The new understanding of development involves making explicit and embracing knowledge leading to the movement of human society towards an ethical social innovation phase, which takes account not only of economic growth but also of all those dimensions that reflect the quality of life, full enjoyment of creative capacity and observance of human rights (Laszlo and Laszlo, 2002). The new concept also makes it clear that development is not owned and dispensed by a few but is a common undertaking on a global scale.

Nevertheless, as complicated as the socioeconomic dynamics, Novy *et al* (2006, p. 21) point out that there are four “crucial points” for understanding the term, described below:

- The word “development” has two aspects – development as an idea of good life and development as a process – which “refer to different dimensions of reality”. Development as an idea of good life is an underlying concept of many contemporary theories of social and political intervention, while development as a process is “a socio-economic dynamic which has been conceptualised from the 18<sup>th</sup> century onwards in different theories of stages of human activity” (p. 21).
- Development has to be differentiated from growth since they are two forms of socioeconomic dynamics. Growth is a “gradual process of productive expansion” (p. 21), whereas development refers to a “complex process of socioeconomic



transformation”, which leads to the “transition from one norm of the economic system to another norm in such a way that this transition cannot be decomposed into infinitesimal steps” (Schumpeter, 1932, quoting in De Muro *et al.*, 2005, p. 16).

- There exists a fundamental hiatus between development agents (exercised either by the state, political parties, intellectuals, international organisations, or by NGOs) and development beneficiaries or victims (the mass, the beneficiaries and target groups which are often those who suffer from modernisation and progress) – a subject-object-divide. This is a concrete political challenge, which calls for a new politics of knowledge and a new relationship between scientific experts and the people as experts of their everyday life.
- Development is linked closely to knowledge. This has become a “key concern in economics and policy making in the 21<sup>st</sup> century” (Novy *et al.*, 2006, p. 22) to contest against any reductionist use of development for economising. This calls for research to capture the concrete economic and political situation (conjuncture) and to elaborate development strategies effectively both for the present and the future. Education in a wide sense as an effort to enhance the capacity of self-development and of social improvement as a whole is needed.

The last point that Novy *et al.* (2006) made reflects the new understanding of development in the context of knowledge society.

In summary, literature on development has now come to a consensus that development is a multidimensional concept involving a dynamically interconnected process in which social, cultural, economic, and environmental elements are mutually interacted and constrained on a global scale.

#### ***2.2.3.2 Geographical dimension of development***

The recent literature on development concepts makes explicit references to scale on a global basis. However, given the fact that differences exist between the South and the North on a global scale and disparities between different regions within a country, most studies are focused on a regional or local scale (Pike *et al.*, 2006). Development definitions are thus geographically differentiated, varying within and between places over

time. Development focus has evolved multi-scale understandings to incorporate differing meanings of the local and the regional (Pike *et al.*, 2007). The examination of development within local and regional scales can normally be referred to as urban development.

### ***2.2.3.3 Understanding urban development***

Urban development evolves over time and space as the outcome of the microscopic interactions of individual choices and actions taken by multiple agents – households, businesses, developers, and governments (Alberti and Waddell, 2000). Traditionally, urban development was often assumed, consciously or unconsciously, that actual processes of urban change were either natural evolutionary outcomes or inevitable process of theoretical imagination. This has led to an unreal portrayal of processes of urban development.

Nevertheless, the neo-liberal urban development discourse distracts away from the actual development trajectories of each specific urban case and tends to overlook the fact that development is deeply historical, place-specific and embedded within specific and concrete institutional settings. This view confuses “discourse” with theory and theory with reality, taking its “explanatory” factors of economic growth and progress as actual descriptors of the way urban economies and societies develop (Moulaert *et al.*, 2007).

Starting from the 1980s and throughout the last two decades, the dominant view of urban development portrayed a ‘new’ urban economy which is significantly engaged in large-scale physical renovation, competes in the favourite sectors of the global markets (new technologies, advanced business and communication services, elite culture, virtual use values, and so on) (Brenner *et al.*, 2005) and adheres to a neo-liberal new urban policy agenda, supporting and justifying market-led urban development (Moulaert *et al.*, 2003). Accordingly, urban development policies have been implemented in a variety of cities world wide. However, in many cases these policies contributed to further fragmentation of the spatial urban structure, the social fabric of the city and the economic interdependencies within the urban territory (Moulaert *et al.*, 2007).

This dominant view of urban development has been increasingly criticised as being inconsistent, the economic distortions, the capital logic, the class-character and the

disrupting social, political, cultural and bio-physical consequences of this form of urban development (Christiaens *et al.*, 2007). This has led to the emergence of alternative approaches of urban development – knowledge-based urban development (Yigitcanlar *et al.*, 2008).

## **2.3 Understanding knowledge-based urban development**

As discussed in the previous section, the advancement of understanding of knowledge and development has brought forth the alternative approaches of urban development. Nevertheless, it was not until very recent the term KBUD could be found in academic writings. In fact, the emergence of KBUD as an approach for cities has gone hand in hand with the evolution of society. This can be traced back to few decades ago when major industrial cities suffered deindustrialisation, efforts were made to attracting and retaining large companies' headquarters aiming to sustain the cities' economic growth (e.g. Knight, 1974). This was replaced by the “information revolution” (Wriston, 1992), which has led to the emergence of “information society” (Castells, 1996) in the 1980s and 1990s. At the dawn of the 21<sup>st</sup> century, the so called “knowledge revolution” (Chichilnisky, 1998) has resulted in the rise of the “knowledge economy” (Munro, 2000, OECD, 1996), followed by the “knowledge society” (UNESCO, 2002, 2005). All of these formed a combining force which engendered the KBUD. This section discusses the movement toward KBUD.

### **2.3.1 From industrial society to knowledge society**

#### ***2.3.1.1 Debate on information society***

As early as the 1960s, a few social scientists began to feel a deeply rooted change in society, and experienced some indication of the end of the aging paradigm of industrial society. In the following decades, deindustrialisation in major industrial countries gave chances to the shift away from the primary and secondary sectors towards the service sector; increased importance of scientific work, research and development; a transformation of work from manual workers towards brain workers (Fleissner and Hofkirchner, 1998). This trend was accelerated by the explosion of Information and Communication Technology (ICT) (Duff, 2000).

The notion of the “information society” comes with the formulation of the “free-context information” (Fleissner and Hofkirchner, 1998), in which information was no longer connected to human beings only. Rather, it was defined in a formal, mathematical, statistical way, and could be found everywhere: in physics, chemistry, biology, psychology, history and economics (Evans and Wurster, 1997). Starting from this moment, information became an important source of prosperity and competitiveness. This paved the way for the increased acceptance of the notion of the “information society”.

For those who advocate the view that humans now inhabit an information society (e.g. Borja *et al.*, 1997, Castells, 1996, Masuda, 1990), the information society concept is self-evidently accurate. However, it has been criticised as being partially characterised as the world that we now inhabit (Roszak, 2004, Webster and Robins, 2004). Indeed, informational development occurs in an unequal society and accordingly reflects and influences social divisions (Nordenstreng, 2004). There has been much concern in recent years of the emergence of a “digital divide”, a fear that the more privileged groups will race ahead with access to new technologies and high-grade information sources, while the poor will be left further behind (Lasch, 2004, Norris, 2004), which Britz (2004) would call “information poverty”. Webster (2006) presents that although no one can deny that any effort to understand the character of contemporary societies must come to grips with information, it is considered “inappropriate and misleading”. The UNESCO (2005) states that the rise of global information society, which was spawned by the new technology revolution, must not overshadow the fact that it is valuable only as a means of achieving genuine knowledge societies.

#### ***2.3.1.2 The emerging knowledge economy***

The mid 1990s onward saw the increasing publications on the so called “new economy” (Quah, 2002, Stehr, 1994), “information economy” (Carlaw *et al.*, 2006, Harris, 2001, Talero and Gaudette, 1996), “weightless economy” (Quah, 1999), “knowledge-based economy” (APEC, 2000, OECD, 1996), and “knowledge economy” (Munro, 2000, Powell and Snellman, 2004), and so on and so forth. The numerous terms that were employed to mean similar concept indicate there is no common agreement on how to

define it. Indeed, even under the same term, it may acquire many different connotations (Carlaw *et al.*, 2006).

However, studies into this domain can be generally clustered into two main types (Brinkley, 2006, van Winden *et al.*, 2007). The first equates the concept with ICT and its sectoral consequences; either on certain core industry sectors (mainly professional services), or wider economic effects on all economic structures, mainly through cost reduction and networking enabling processes (Quah, 2002). This is a view from a narrow sense refers to it as a separate section that sits at the “top” of the economy, in which new technological knowledge is generated and marketed (e.g. Powell and Snellman, 2004, Rooney, 2003). For example, the OECD defined the knowledge-based economy as: “economies which are directly based on the production, distribution and use of knowledge and information” (OECD, 1996, p. 7). Similarly, Powell and Snellman (2004) present that:

We define the knowledge economy as production and services based on knowledge intensive activities that contribute to an accelerated pace of technical and scientific advance, as well as rapid obsolescence. The key component of a knowledge economy is a greater reliance on intellectual capabilities than on physical inputs or natural resources (Powell and Snellman, 2004, p. 199)

There are also some authors who simply limit it to organizations competing in the computer, software, internet, telecommunications, or networking fields (e.g. Harris, 2001, Ittner *et al.*, 2003).

The second sees the concept as the post-industrial economy as a whole, which emphasises equally the production and commercialisation of new scientific or technological knowledge and valorisation of knowledge in economic processes and the acquisition of skills (e.g. Dahlman and Andersson, 2001, Munro, 2000). In this regard, the Asia-Pacific Economic Cooperation (2000) defines the knowledge-based economy as:

... an economy in which the production, distribution, and use of knowledge is the main driver of growth, wealth creation and employment across all industries. In this context, being a KBE means more than simply having a thriving ‘New Economy’ or ‘information economy’ that is somehow separate from a stagnant ‘old economy’. In a truly knowledge-based economy, all sectors have become knowledge-intensive, not just those usually called ‘high technology’ (APEC, 2000, p. vii).

In fact, there is a debate between the two schools of thought. The first point of view has been criticised as overlooking the social process of knowledge by Hepworth and Local Futures,(2001) and Hepworth *et al.* (2003). Meanwhile, Smith (2002) notes that the second view point seems to cover “everything”, but “nothing”, since “all economies are in some way based on knowledge, but it is hard to think that any are directly based on knowledge, if that means the production and distribution of knowledge and information products” (p, 6-7). Moreover, some authors from a social perspective believe that knowledge economy is only part of the emerging knowledge society, which embraces a much broader social context that both motivates and mediates the development and exchange of knowledge (McLennan, 2003, quoting in Carlaw, *et al*, 2006).

### ***2.3.1.3 The knowledge society***

In the very recent literature, there has been a trend towards the use of the term “knowledge society” to replace the “information society” (e.g. Drucker, 2002, Servaes, 2003, World Summit on the Information Society, 2003). This reflects an often intuitive recognition that the concept of “information” is perhaps too meagre to carry the weight of the far-reaching societal changes that are anticipated. Lor and Britz (2007) argue that the migration to the term “knowledge society” reflects an understanding that the “knowledge society” is a qualitatively richer concept. The UNESCO (2005) emphasises that the concept of knowledge societies encompasses much broader social, ethical and political dimensions. It rules out the idea of any single, ready-made model, which does not take sufficient account of cultural and linguistic diversity.

The UNDESA (2005) defines the “knowledge society” as:

one in which institutions and organizations enable people and information to develop without limits and open opportunities for all kinds of knowledge to be mass-produced and mass-utilized throughout the whole society. At its best, the knowledge society involves all members of the community in knowledge creation and utilization; it supports the goal of high quality and safety of life (p. 141).

From this definition it is clear that in the knowledge society, knowledge is not limited to a narrow sense but includes “all kinds of knowledge”. It is not simply a society of more knowledge and technology and of the economic and social consequences of these factors. A knowledge society is also a society permeated with knowledge settings, the whole sets of arrangements, processes and principles that serve knowledge and unfold with its

articulation. The knowledge society also produces a general knowledge environment and structures and policies that sustain the great access to knowledge for all and freedom of expression (Cetina, 2007).

In this sense, Laszlo and Laszlo (2002, 2007) would prefer to call it “learning society” to emphasise the process of acquisition and creation of knowledge rather than knowledge as the product or objective of such a process. According to them, the key to the ‘learning society’ are knowledge citizens, which are defined by Carrillo (2004) as a better educated (formally or informally), critical and informed population that is ready to participate in civic life, is politically active, is interested in a better quality of life for itself and the next generation, including concern for healthy lifestyles and less dependence on consumption, is appreciative of artistic expression and cultural activities and is more competent in human relations. Without the inclusion of knowledge citizens, the knowledge society would create a polarization of those with access to the ivory towers of the complex and expensive info-tech industries, universities and research institutions and those who continue to live at the low-tech margins of society (Laszlo and Laszlo, 2007).

Despite the sound definition, many studies into the “knowledge society” are focusing on economics and technology, by emphasising that the changing role of knowledge in productive force, in which knowledge is increasingly replacing capital, labour and natural resources as central value- and wealth-creating factors. In addition to the emphasis of the presence, the role of information infrastructures, and the changes in economic and social organisation (Britz *et al.*, 2006, Servaes, 2003), a number of knowledge society indicators have been developed from this perspective (Mansell *et al.*, 1998, World Bank, 1998). The most popular indicators used are:

- qualitative measurement of the use of, and access to, modern ICTs;
- the number of scientists in a country;
- the amount spent on Research and Development (R&D) as a percentage of the gross domestic product (GDP);
- the ability to produce and export high technology;
- number of patents filed in a country; and
- the number of articles published in highly ranked scholarly journals.

These indicators are useful in understanding the development status towards the knowledge society, but are far from perfect to measure it. In this regard, Britz *et al* (2006, 2007) put forward four pillars of knowledge society:

- ICT infrastructure – a well developed, maintained and affordable information and communication infrastructure;
- Usable content – the information that is accessible should also be affordable, available, timely, relevant, readily assimilated, and in languages and contexts users can relate to and understand;
- Human capacity – there is a need for all members of the society who can create and utilize knowledge as well as add value to the accessed information;
- Physical delivery infrastructure – a knowledge society is underpinned by a ‘materialized’ and top-heavy infrastructure that includes harbours, airports, railways, roads, warehouses and physical addresses of people.

According to Britz *et al* (2007), these are four indispensable criteria of a knowledge society. They argue that usable content and human capacity are the two crucial components of a knowledge society. A society can still pass for or approach the status of an information society if it satisfies the two criteria for infrastructure and achieves a low score on usable content and human capacity, but to be counted as knowledge society, it must also be rated highly on usable content and human capacity.

For the UNESCO (2005, p. 17-20), the concept of the knowledge society is thought to be a new development approach that is relevant for all countries regardless of their current development status. As it states, the reflection of the ‘new model’ of society and how to build it makes it possible to make the most of knowledge which leads to imagining a new, collaborative development model based on a guarantee, by government, of ‘public property’, where growth is no longer viewed as an end in itself, but simply as a means to reach the target, by giving knowledge an unprecedented accessibility, and by engaging in capacity-building for everyone. In this sense, Lor and Britz (2007) argue that the knowledge society is not a goal but a likely outcome of an apparently irreversible development process, which Carrillo (1997, 1999, 2002) would refer this process to the “knowledge-based development”.



### **2.3.2 The movement toward KBUD**

From the above discussion, it is noted that KBUD became an area of study was not an incidental invention but a combination of several factors that emerged to become the dominant forces driving human development. With this societal evolution, knowledge has become more and more important. Therefore, how to effectively manage knowledge so that it can better serve development behaviour has become an emerging area of research interest, which consequently engendered a new discipline in the academic community – Knowledge Management (KM) (Davenport and Prusak, 1997). Once came to being, KM becomes immediately a strategic management approach not only applicable to the business world but also to the “human organisations in general” (Carrillo, 2002, p. 379). Laszlo and Laszlo (2007) refer to the application of KM to cities, regions, countries and other social systems as a “natural expansion” (p. 494). For this reason, the following few paragraphs discuss the evolvement of KM and its application at the social level.

#### ***2.3.2.1 Knowledge management***

KM is perhaps the most influential movement at the turn of the 21<sup>st</sup> century, which primarily emerged in business as a response to the changing global environment where value creation became increasingly reliant on knowledge. To this end, the notion of “knowledge capitalism” (Burton-Jones, 1999) has emerged to be conducive to the knowledge economy. According to Burton-Jones (2003), facing the challenge posed by the knowledge economy, both individuals and firms “must focus on nurturing and enhancing their biggest asset: knowledge capital (p. 144)”. From this perspective, the concept of KM has been defined as: “the collection of processes that govern the creation, dissemination and leveraging of knowledge to fulfil organisational objectives” (Davenport and Prusak, 1997, p. 2). The way of managing knowledge is to constantly exploit and identify the organisation’s knowledge assets and knowledge gaps (see Figure 2.2 in next page).

Since the 1990s, KM has gone in a fulgurant take-off, from being the fastest-growing business consultancy to becoming the dominant factor in development policies throughout Western countries. KM, therefore, has evolved into a strategic management approach. In relation to this movement, studies on Knowledge Management have evolved from “dispersion” to “contraction” and to an “institutionalisation” phase (Carrillo, 1999).

Explicit	What we know we know	What we know we don't know
Tacit	What we don't know we know	What we don't know we don't know
	Knowledge assets	Knowledge gaps

**Figure 2-2 Organisational knowledge**

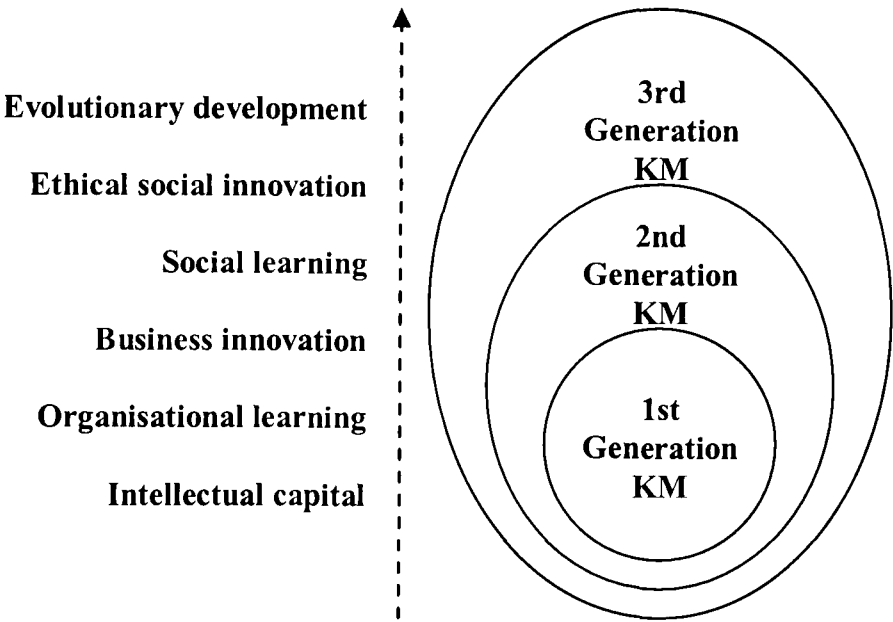
**Source** Burton-Jones (2003, p. 144)

Furthermore, some authors have characterised the movement of KM through the description of “generations”. McElroy (2000) for example, identifies two generations of KM. The first generation is characterised as knowledge sharing namely on how to distribute existing knowledge. The management focus is on the information flows. The second generation, which focuses on knowledge creation – how to satisfy the needs for new knowledge through the processes of learning and value creation, is seen to be linked to the convergence of managing information flows, organisational learning, and new growth theory. Attempts have been made in this generation to develop assessment or measurement tools and methodologies (Hearn and Bradier, 2002).

Following this line of thought, Laszio and Laszlo (2002) classify the third generation of KM in which they suggest that it is relevant beyond business applications that connect knowledge and innovation ecologies. The focus of the third generation is on human-centred knowledge networks.

According to Laszlo and Laszlo (2002), while the first generation of KM describes “what is” by capturing collective intelligence through intellectual capital technologies, promoting best practices, the second generation looks for “what could be” through the processes of learning and innovation. Differing from the first two generations which are basically descriptive, the third generation is prospective in nature and aims at exploring

“what should be”, which is presented as a provocative invitation to engage in the purposeful response to the need for ethical social innovation and for explicit commitments to contribute to “evolutionary development”. The evolving trend is illustrated in Figure 2.3.



**Figure 2-3 Illustration of evolving KM**  
**Source: Adapted from Laszlo and Laszlo (2002, p. 408)**

Based on how knowledge is understood, Carrillo (1999) distinguishes the three generations as: object-centred, agent-centred, and context-centred shown in Table 2.2 (next page). The third generation of KM expresses all significant forms of KM processes. This combined with the New Growth Theory, fertilised the emergence of knowledge-based development.

**2.3.2.2 Knowledge-based development**

When and how the concept of “knowledge-based development” (KBD) was originated is not clear and there is even no clear definition, but it has become a “fashionable” concept

for development (OECD, 1996, 1999, World Bank, 1998). One of the common views is that it is an expansion of the KM agenda (Laszlo and Laszlo, 2007).

**Table 2-2 Three KM generations**

<div> <div>KM Approaches</div> <div>Features</div> </div>	I Generation: Object-centred	II Generation Agent-centred	III Generation Context-centred
Knowledge concept	Record	Flow	Alignment
Capitalisation process	Keeping and accumulating stock	Facilitating and increasing circulation	Attaining sustainable value balance
KM definition	KM is a tool for identifying, storing, keeping, organising and retrieving the organisation’s K-base	KM is a method to identify, codify, structure, store, retrieve, and diffuse experience	KM is a Strategy to identify, systemise and develop the organisation’s value universe

**Source:** Adopted from Carrillo (1999, p. 8).

The initial and obvious implication of KM was that it was a source for the competitive advantage of firms: “KM provides the means to generate, distribute, and use knowledge in ways that add value to business activity and provide new opportunities for enterprise” (Clarke, 2004, p. 192). In other words, KM became yet another management approach by which to continue to pursue the unquestioned “business as usual” motive: profits and growth (Gonzalez *et al.*, 2004).

The advantages of KM have been found not only in strengthening competitiveness but also in enhancing sustainability (Ergazakis *et al.*, 2006b), and therefore applicable to all kinds of organisations and even to the whole society (Aubert, 2005, Bounfour and Edvinsson, 2005a, Carrillo, 2002, Smedlund and Poyhonen, 2005). KM has thus been extended to the social level and the relevance soon became apparent (OECD, 1996, 1999, UNDP, 2001, World Bank, 1998). A new development approach “knowledge-based development” as labelled by Knight (1995) and Carrillo (2002) has accordingly come to

the fore. As Carrillo (2002) put it: “as KM comes of age, it is evolving into a strategic management approach, applicable to purposeful human organizations in general” (p. 379). Laszlo and Laszlo (2007) note that as it makes sense, “the application of more sophisticated knowledge strategies to cities, regions, countries and other social systems is a natural expansion of the applicability of the KM movement” (p. 494).

### ***2.3.2.3 The purposes of KBD***

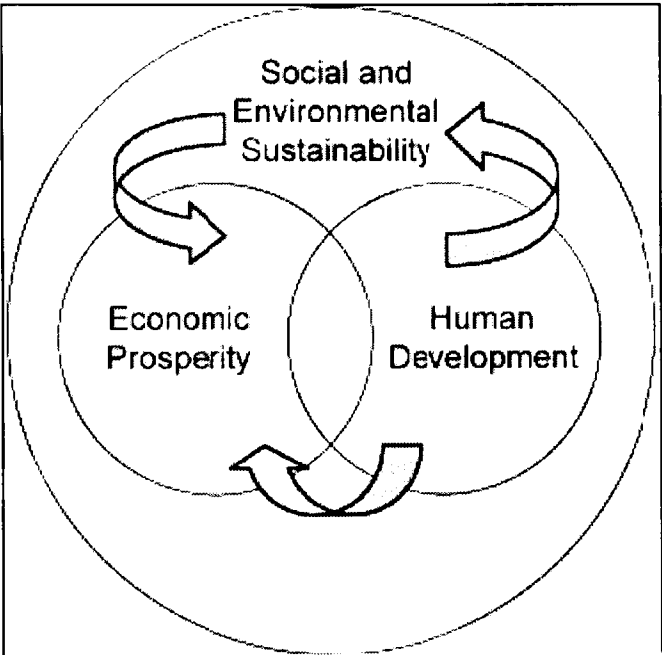
Any efforts of development are purposeful. While well-intentioned development efforts around the world are criticised as being responsible for major environmental damage and widening the gap between rich and poor on a global scale, Laszlo and Laszlo (2002) assert that there is a need for a “new” look at the purposes of development. By doing so, they distinguish between growth, development, and evolution. According to them, “growth” is an increase in size or quantity; “development” is an amelioration of conditions or quality; “evolution” is a tendency toward greater structural complexity and organizational simplicity, more efficient modes of operation and greater dynamic harmony. In this regard, KBD is rather a “revolutionary development”, which

seeks to promote future-oriented human activities with vistas beyond homocentric values and perspectives, taking evolution as the teacher of lifeaffirming and opportunity increasing processes and outcomes. ... involves designing new ways of learning, working and living that embody social and environmental integrity. It is about creating a simpler and more meaningful way of producing what we need in order to reestablish the balance between our human systems, the biosphere and the geosphere in which they rest (Laszlo and Laszlo, 2007, p. 498).

They thus present that there are three main purposes of KBD: economic prosperity, human development, and socio-environmental sustainability (see Figure 2.4 in next page). The current literature on KBD is dominated by an economic perspective. Most see KBD as a powerful strategy for economic growth and the post-industrial development of cities and nations to participate in the knowledge economy. While cities and nations compete over the knowledge economy, it requires the intention to increase the skills and knowledge of people as a means to achieve the objective. This motivates individuals to acquire and create knowledge (both formally and informally) and share it with others. The third purpose of KBD can provide it with both context and directionality: the purpose of contributing to a socially and environmentally sustainable society as the enabler of an evolutionary future or futures (Laszlo and Laszlo, 2007).

**2.3.2.4 The evolvement of KBD**

KBD is not born in perfect. Rather, it is comprehended hand in hand with the evolvement of the concept of “knowledge” and “development”. Carrillo (2004) studied the relation between them and found that KBD evolves in three successive stages (shown in Table



**Figure 2-4 The three purposes of KBD**

**Source: Adapted from Laszlo and Laszlo (2007, p. 497)**

2.3 in next page). At the first stage, when knowledge was understood as merely a tool for development, KBD was to promote economic growth. At the second stage, when knowledge was understood as the production factors to replace the traditional materialised capital, KBD moved on to the development of human capital. Last but not least, when the concept of knowledge for development was broadened to include all kinds of human knowing and wisdom, KBD became a directional strategy toward social, economic, and environmental sustainability on the global scale where a knowledge society could be approached.

2.3.2.5 The geographical basis of KBD

Research into the correlation between urban development and knowledge can be traced back to few decades ago (e.g. Knight, 1974). However, the relationship between KBD and its geographical scale, for example, a city or a region, has not been made clear by the current literature. Nevertheless, what can be sure is that globalisation has made it possible for cities and/or regions to compete directly on a global scale without limitations from national boundary, cities are becoming increasingly the focus when study into KBD. As Knight (2008) put it, cities are centres where knowledge is produced, marketed and exchanged. With the globalisation and the emergence of knowledge society, greater attention needs to be paid to cities to enhance cultures that produce knowledge locally and regionally and to transforming that knowledge into local development. From this perspective, Yigitcanlar *et al* (2008) refer to the geographical basis of KBD at the city level as Knowledge-Based Urban Development (KBUD).

Table 2-3 The three KBD generations

Attribute \ Label	I Generation: Object-centred	II Generation Agent-centred	III Generation Context-centred
Knowledge concept	Information Record	Capacity Flow	Value Alignment
Capitalisation and development process	Accumulate and retain stock	Facilitate and increase circulation	Dynamically adjust to a sustainable value balance
KBD definition	KBD is a infrastructure to increase the social stock of knowledge	KBD is a policy to appreciate the social flow of knowledge	KBD is a development strategy based on the identification, systemisation and sustainable balance of social knowledge capital

Source: Adopted from Carrillo (2004.p.34)

### **2.3.2.6 Forms and approaches of KBUD**

Although the term of KBUD was introduced very recently, the movement has not been suddenly emerged by accident. On the contrary, it is deliberate attempts to help control and guide fundamental transformations that affect society, economy, and territory, and redefine the conditions and processes of local and regional development (Castells and Hall, 1994). In fact, this phenomenon can be dated back to more than half a century ago when the first Science Park – the Stanford Research Park – was established in the United States in the 1950s (Link and Link, 2003). The evident success of Silicon Valley in the 1970s and 1980s stimulated many national and regional governments to encourage the formation of high technology industry complexes and the like. This movement was further accelerated by the radical advancement of ICT in the 1980s, followed by the rediscovery of the vital role of knowledge in socioeconomic and environmental development in the 1990s and thereafter (OECD, 1996, World Bank, 1998).

From this perspective, KBUD can be roughly divided into two successive phases: the earlier phase, which is economic centred and the later phase, which can be characterised as trying to balance the social, economic, cultural, and environmental dimensions of development. Despite numerous terms have been used by many different authors, the earlier phase of KBUD was referred to by Castells and Hall (1994) as “technopole”, while the later phase can be called generally “knowledge city”.

The former is based on the “linear model” assumption assuming that there is a linear relationship between technology advancement and economic growth, whereas the latter is underpinned by the assumption of an “interactive model”(Cooke, 2001), which assumes that relationship between knowledge and urban development are having far-reaching consequences on the way we think about (Adams *et al.*, 1980, Laszlo and Laszlo, 2007, Ouchi, 1984). Starting from this point, the next two sections discuss the two streams of thought and the related approaches.

## **2.4 Technopole as a form of KBUD**

The term “technopole” is a French word with its original meaning being planned development. Castells and Hall (1994) appropriated this term for the English language to refer to various deliberate attempts by governments in association with universities and



private companies, to plan and promote technologically innovative and industrial related production within one concentrated area, to generate the basic materials of the information economy. Scott (1988) describes a technopole as the “command centre”, a growth pole that is driven by high-tech industry. The development of technopole was a common phenomenon worldwide during the last twenty years of the 20<sup>th</sup> century.

Nevertheless, the definition is still somewhat nebulous, and several terms are used to describe similar phenomenon. Among which the most commonly used terms are science parks, research parks, technology parks, technopolis, innovation centres, and science cities. The precise distinction to be made between these various concepts is difficult to ascertain. In fact, distinctions are not always made: some authors use different terms to define different entities (Allesch *et al.*, 1985, Bass, 1998), whereas others use the terms interchangeably (Joseph, 1989, Luger and Goldstein, 1991, Malecki, 1997). For Castells and Hall (1994) the term technopole is used as a generic term which refers to all these kinds of phenomenon. Under this umbrella term, they distinguish four types: industrial complexes of high-tech innovative milieu (industrial clusters), technopolis, science parks, and science cities. Following this category, this section discusses the features of these four types of technopoles in the context of urban development.

## **2.4.1 Science park**

### ***2.4.1.1 The concept of science park***

The term “science park” has been used to refer to schemes under various similar names such as “research park”, “technology park”, “science and technology industrial park”, “high technology development”, “innovation centre”, and “technology incubator” (Zhang, 2005). There is no consensus as to which one is more generic than the others. Intuitively, “science park”, “research park”, and “technology park” are more frequently used (DITC, 1989, Joseph, 1989, Macdonald, 1987, OECD, 1987). Link and Link (2003) use “science park” to refer to parks with some or all abovementioned names.

Again, there is no precise definition for “Science Park”. Matthias (1986) sees a science park is “a planned development of and high-technology enterprises in an attractive physical environment with closely links to a university” (p. 23). Goddard *et al* (1994) refers to a mechanism for setting up an infrastructure in which the interaction between

university and industry might be forged and strengthened. The International Association of Science Parks (IASP) definition is: a science park/technology park is a property-based initiative which

- has operational links with universities, research centres and other institutions of higher education;
- is designed to encourage the formation and growth of knowledge-based industries or high value-added tertiary firms, normally resident on site;
- has a steady management team actively engaged in fostering the transfer of technology and business tenant organisations.

(IASP website, accessed on 06/11/2007)

The Association of University Research Parks (AURP) defines a university related research park or technology incubator as “a property-based venture” which has four components:

- existing or planned land and buildings designed for private and public research and development facilities, technology and science based companies relating to support services;
- a contractual and/or operational relationship with a university or other institution of higher education;
- a role in promoting research and development by the university in partnership with industry, assisting in the growth of new ventures, and promoting economic development;
- a role in aiding the transfer of technology and business skills between the university and industry tenants.

(AURP website, accessed 06/11/2007)

Regardless of vague definitions given to science parks, it generally appears that at the core of the science park schemes, which may appear with different names, lay three common characteristics:

- Property development schemes: all parks are based on well planned and developed physical spaces;
- Players: mainly involves universities or other institutions of higher education and technology-intensive firms;

- Mechanism: deliberately designed institutions to facilitate the transfer of technology and business skills between players.

Although there has been a tendency to distinguish schemes under different names in literature (Zhang, 2005), for the sake of the current research, it will focus on their common role in relation to urban development.

#### ***2.4.1.2 Formation and typology of the science park***

From the literature, it is acknowledged that the science park has been evolving over time, and the way in which a science park is developed and operated has changed significantly. Science parks were first established by universities in the United States as a means of complementing academic programmes and raising income (LaValle, 1982), better exploiting academic enterprise and research (Lowe, 1985), and capitalising on land resources and encouraging greater academic entrepreneurship (Grayson, 1993). The university-oriented objectives continuously dominated science park schemes until the mid 1980s. The main aims of such science parks are:

- to provide a mechanism whereby companies formed by academics can spin out or off from the academic environment to form a focus for new enterprise development;
- to create a structure within which technology/knowledge can be transferred at the least cost between academics and business practitioners;
- to be a means whereby academic research keeps in touch with commercial priorities;
- to create a culture whereby academics and industrialists generate research and enterprise synergy within their own groups

(Lowe, 1985, p. 36)

Before the early 1980s, there were very limited number of science parks both in the United States and Europe (Zhang, 2005). However, the success of some early science parks such as the Stanford Research Park, the Research Triangle Park in the United States, and the Cambridge Phenomenon in the UK in the 1970s, together with the economic boom around them, led many officials in regions whose economies were disproportionately concentrated in slow-growth or declining industries and hard hit by back-to-back recessions to attempt to emulate them (Bass, 1998, Luger and Goldstein,

1991). The aims of science park were thus shifted to become economy-oriented. Many science parks were established by governments and tended to be part of either regional or national government structures, belonging to a ministry or a government agency (Grayson, 1993, McQueen and Haxton, 1998, Porter, 1989). This shift reflects that the function of a science park is no longer a tool used only by universities, but by governments for their macro objectives (Zhang, 2005). As Luger and Goldstein (1991) put it, “research parks have become a prominent element in state and regional development strategies in the USA, as well as in Western Europe, and Japan, Australia and many other developed countries” (p. ii)

With the shift from a university-orientation to an economy-orientation and the involvement of governments worldwide, the development of the science park and the way in which it is managed varies. Link and Link (2003) for example, classify three types of American science parks: real estate parks with no university affiliation, university research parks with tenant criteria, and university research parks with no tenant criteria. Zhang (2005) distinguishes park/campus-style science parks, centre/incubator-style science parks, and city/region-style parks, based on their physical manifestation and subsequent attributes such as internal actors and organisational features (see Table 2.4 in next page). Park/campus style science parks, which are usually adjacent to a higher education institution, are what the original science park schemes in the United States look like (Porter, 1989). Centre/incubator style schemes are usually located in inner cities, close to university departments. The main focus of such schemes is on assisting the growth of start-up firms offering accommodation and business support (Currie, 1985, DITC, 1989, McQueen and Haxton, 1998). “Innovation centre” or “technology incubator” is often used instead of “science park” in this scheme (AURP, 1998, Carter, 1989). City/region style science parks can be either a city or a region in terms of geographical scale. Bass (1998) refers to this style as “technopolis”. Such schemes are mainly invested by central governments with intent to create technology-orientated cities to serve as engines of growth for their respective regions (Lin, 1997).

#### ***2.4.1.3 Science park in relation to local development***

The exemplified success of Stanford Research Park and the Research Triangle Park in leading to the rapid growth of the regional economy in the United States has led to

science park being widely touted as a potentially important source of technological spillovers and regional economic growth in particular in the last two decades of 20<sup>th</sup> century (Audretsch, 2001). Science parks have thus become an international phenomenon (Phan *et al.*, 2005). Not surprisingly, studies into science park have become a hot area. Among these studies, Phan *et al* (2005) distinguish four streams: studies that focus on the companies located on sites; those that attempt to provide an assessment of the science parks themselves; those that focus on the systemic level of the university, region or country; and those that examine the individual entrepreneur or teams of entrepreneurs in the parks (Phan *et al.*, 2005). The current study will look at science parks as a whole in relation to local and regional development.

**Table 2-4 Attributes comparison of different park styles**

Attribute	Park/campus-style	Centre/incubator-style	City/region-style
Size	Medium	Smallest	Largest
Appearance	Low density with well designed landscape, green field and aesthetic quality	High density with little landscaped areas for communal use	A city a region either new or restructured
Internal actors	Tenant firms of various sizes and stage of development	Start-up tenant firms	Resident actors (existing/new)
Organisation feature	Have	Have	Have not

**Source:** Adapted from Zhang (2005, p. 147)

In this respect, literature has shown that science parks were often seen as, or were hoped to be, the solution to complex political and economic issues in society (Hansson *et al.*, 2005), thereby being examined as a tool of regional development policy. Studies following this stream usually focus on the aspects of parks related to regional economic impact. The generation of new jobs, the creation of small technology-based firms and the revitalisation of the local economy are topics that have received intensive examination by researchers and all those involved with local, regional or national policy and planning.

Three common objectives of a science park are often mentioned as follows: economic development, transfer of technology, and property development (Grayson, 1993). Massey *et al.* (1992, 2003) added “local benefits” as another motivation of local governments. The International Association for Science Park (IASP) (2007) presents that science and technology parks promote the economic development and competitiveness of regions and cities by:

- Creating new business opportunities and adding value to mature companies;
- Fostering entrepreneurship and incubating new innovative companies;
- Generating knowledge-based jobs;
- Building attractive spaces for the emerging knowledge workers.

Nevertheless, regardless of what kinds of typology have been used, all were in one way or another tied to the ability of the park to grow both in terms of the number of companies and the number of employees (Link and Scott, 2006). In this context, several recent studies have concluded that science parks tend to fail significantly in delivering the following widely expected benefits: tenants’ research productivity (Siegel *et al.*, 2003), employment growth in high-tech sectors (Shearmur and Doloreux, 2000), extraordinary growth or performance of R&D-intense firms situated in the park, and the development of strong and operational ties between firms, university research, national laboratories and other research institutions (Bakouros *et al.*, 2002). Monsted (2003) argues that science parks have generally failed to play a noteworthy function in establishing network relations between university researchers and firms located in the science park.

In terms of contributing to regional/local development, the results from recent studies have shown that:

the old role of science parks, defined mainly by a linear conception of the relationship between science and innovation and a concept of science parks as providers of infrastructure in a broad sense (from laboratories to IT facilities), may need to be replaced by an interactive, dynamic and network-oriented understanding that emphasises learning instead of a narrow understanding of scientific innovation and regional development (Hansson *et al.*, 2005, p. 1041).

## **2.4.2 Industrial complexes of high-tech innovative milieu**

Industrial complexes of high-tech innovative milieu are spontaneously formed geographical agglomerations of R&D facilities and related manufacturing establishments (Castells and Hall, 1994). A typical example of this kind is Silicon Valley in the United States. The current study, based on the existing literature, explores both success factors and lessons of Silicon Valley in terms of regional development as a whole.

### ***2.4.2.1 The success factors of Silicon Valley***

The story of Silicon Valley has been told many times because of its great success in economic terms, which allured many followers around the world. Numerous studies have been conducted (e.g. Aoki and Takizawa, 2002, Chhatbar, 2004, Leslie and Kargon, 1996, Mintz and Hamel, 2000). Each has been carried out from different disciplines with intra-disciplinary conclusions. In terms of regional development, the review of the literature illustrates that the success of Silicon Valley lies on four decisive factors: a far foresight pioneer, the decisive demand of national defence competition during the Cold War, extraordinary social networks, and the unique Silicon Valley culture.

As well known, the first foundation stone of Silicon Valley was the establishment of the Stanford Industrial Park, which later became known as the Stanford Research Park. The pioneer of this was Frederick Terman, who was regarded as the “godfather” or the “central figure” of the Silicon Valley story. As Castells and Hall (1994, p. 56) explain, “he was of the crucial need to link university and industry, he used all his connections, his influences, and sometimes his own money to encourage his best graduates to start up electronic firms”.

Both Castells and Hall (1994) and O’Mara (2005) note that the military and aerospace demand provided the first mass market for the infant microelectronics industry concentrated in Silicon Valley, and facilitated the necessary capital for high-risk investment, while making possible the diffusion of technological breakthroughs among the firms. The national defence competition during the Cold War imposed on the most innovative technologies, which, in turn, made the National Defence Department willing to pay high prices for such technological innovation. This played the role of subsidisers of R&D for Silicon Valley firms.

Saxemian (1993) emphasises the decisive role of social networks and of a shared culture in leading to the success of Silicon Valley. The social networks here are spontaneously formed informal networks, which play the following vital roles:

- Facilitate face-to-face interactions over common interests, especially technical and professional issues, which constituted the very basis of the process of innovation;
- Provide an informal but efficient marketplace for job changing. Job change has been made very easy, frequently because the timely information derived from the networks;
- Create a cultural sphere that emphasises the value of technological excellence and free market entrepreneurialism;
- Create a self-support financial system in which the first wave electronics firms reinvest part of their wealth in fostering the next generation of entrepreneurs.

The success of Silicon Valley may not be true without the presence of the predominant Silicon Valley culture. Much has been written about this culture (e.g. Basilico *et al.*, 2008, Benner, 2002, Chhatbar, 2004, Finn, 2001, Lee, C.-M., 2000, Leslie and Kargon, 1996, McKendrick *et al.*, 2001, Saxenian, 1996, 2005). Rogers and Larsen (1984) point out that the patterns of social values and behaviour in Silicon Valley are formed by the values and lifestyle of executives, engineers, technicians, and skilled workers who spontaneously create the human basis of this leading milieu of innovation. The main features of Silicon Valley culture could be synthesised as below:

- The centrality of work. Hard and intense work is the basic feature of life for most Silicon Valley workers;
- Endless innovation. For most high-tech professionals, being at the cutting edge of technology is sense important;
- Entrepreneurial spirit. For many high-tech workers, the endless innovation and fast growing business sphere provide the ground for endless spin-offs.



In addition to the abovementioned four elements of success, spontaneity is seen as a key to their development. Although the university and government play important roles, they are not deliberately planned (Ylinenpaa, 2001, Zhang, 2005).

#### ***2.4.2.2 Lessons to be learned***

In contrast to its economic success, Silicon Valley also has to confront the reality of problems generated by economic growth without social control. The disruptive social and environmental effects produced by fast-track development in the area on its residents, and on the industry's workers are criticised as the "dark side of the chip" by Siegel and Markoff (1985). The most striking examples of this are: urban environmental deterioration, social polarisation, and social ills.

Urban environmental deterioration resulted from the rapid industrialisation between 1950 and 1990 and the endless expansion in the area, which inevitably caused traffic jams, high residential density, and air pollution. First, the intensity of the process of growth put economic pressure on scarce land, both for industrial development and urban life. Land and housing prices skyrocketed, which in turn added speculative pressures to functional demands such as urban services, transportation, and public space (Castells and Hall, 1994). Second, the supposedly "clean" industry caused chemical pollution in many areas in this region, which became a serious health hazard (Krantzler and Krantzler, 2002, Siegel and Markoff, 1985). Third, the endless expansion of the urban area led to worse than average transportation problems such as huge traffic jams.

During the process of the constant social upgrading of Silicon Valley, social polarisation occurred. Although on average, and in relative terms to other areas, Silicon Valley holds an undeniably high standard of living for the majority of the population, the unskilled workers and traditional ethnic minorities found fewer and fewer jobs. Life became harder and harder for them in this highly valued area (Leslie, 2001). As a result, they were being pushed out to the outlying areas (Saxenian, 2005). In addition to the urban segregation, poverty, discrimination, and exploitation are also present in Silicon Valley as in all class societies (Castells and Hall, 1994).

The so-called "social ills" (Rogers and Larsen, 1984) is seen as another characteristic of Silicon Valley. The aggressive competition, between both individuals and between firms

led to loose moral standards in professional relationships. The merciless competition and all-out struggle to keep ahead engendered the widespread social and psychological stress in their manifestations. As a result, alcohol and drugs, and family disruption became increasingly integral parts of many people's lives in the area.

Meanwhile, despite problems, Silicon Valley has been regarded as a model of the "best practice" and duplicated by policymakers throughout the world. However, very few have been found to be successful (Owen, 2007). Hospers (2006) studied European regional policy from Schumpeterian thinking, economic geography, and comparative public policy perspectives, noting that the copycat behaviour in regional policy has generally overlooked those conditions that explain the success of a particular region, which are the most difficult elements to learn from. Moreover, Pike *et al* (2006) warn that the internal "contradictions of unsustainable growth" may challenge Silicon Valley as the "best practices" model.

In summary, Silicon Valley presents a typical example to the world in terms of local and regional development. Positively, it demonstrated the magic power of linking technological innovation with economic growth. Negatively, the associated widespread "social ills" threatened the socio-environmental sustainability both in the regional and global contexts. Moreover, when placed in the historical context, the uniqueness of its development trajectory made it hard to duplicate in any other regions.

### **2.4.3 Technopolis**

#### ***2.4.3.1 The concept of technopolis***

The term "technopolis" is a combination of "techno" and "polis", where "techno" is the abbreviation of the word "technology" and "polis" is the Greek word for city-state. Put together the term reflects the efforts that interactively link technology commercialization with the public and private sectors to spur economic development and promote technology diversification in a new type of city-state. The concept of technopolis was originated in Japan and soon became the worldwide phenomenon in the 1980s (Breheny and McQuaid, 1987, 1988, Castells and Hall, 1994, Gibb, 1985, Glasmeier, 1987, Smilor *et al.*, 1988a, Tatsuno, 1986).

In the large body of literature, however, almost in all academic writings the concept is used without defining it, with few exceptions. Preer (1992), for instance, defines the technopolis as a region that generates sustained and propulsive economic activity through the creation and commercialization of new knowledge. Similarly, Quere (1990), from the economic perspective, sees the technopolis as a metropolitan region whose economy is significantly influenced by technology development.

These relatively simple definitions may not be able to describe the full characteristics of technopolis, especially when considering its considerable heterogeneity. Over time, it seems that the term “technopolis” has evolved to become a generic term which refers to cities or regions whose economic growth more or less relies on high-tech industries.

Phillips (2006), differentiates technopolis simply as an industry cluster, which tend to reflect a broad swath of industries, supporting high-technology industries that prosper in environments with readily available infrastructure and strong inclinations toward public-private partnerships. According to Phillips, a technopolis also has a concentration of industry or business in at least one high-tech cluster and support global communications. The welcoming environment fosters emerging companies, the influx of diverse employees, and a combination of environmental, social, educational, and economic policies that support business growth. The role of universities and their technology incubators are highly emphasised.

Okubo (quoting in Gonzalez *et al.*, 2004) suggests that there are certain criteria for the development of a technopolis:

- Incorporate technological advances in a basic infrastructure and utilities;
- Comprise institutions and resources that hasten the application and diffusion of technological innovation;
- Enhance or protect the quality of life and overall human condition; and
- Link the inhabitants of the technopolis globally for the widest possible range of forms of communication and transaction.

Studies into technopolis are generally empirical. Smilor *et al* (1988a, 1988b) for example, developed a conceptual framework – “technopolis wheel” – based on the study of the dynamics of high-technology development and economic growth in Austin, Texas. The “technopolis wheel” consists of seven segments: the university, large technology companies, small technology companies, federal government, state government, local government, and support groups (see Figure 2.5). From the study, they found that the most important thing in the development of a technopolis is cooperation instead of competition, which emphasises the role of influencers who provide leadership in each segment while networking the different segments to form new institutional alliances. A coordinated approach is vital to nurture the development and maintenance of new technologies for emerging industries, the attraction of major technology companies, and the creation of home-grown technology companies.

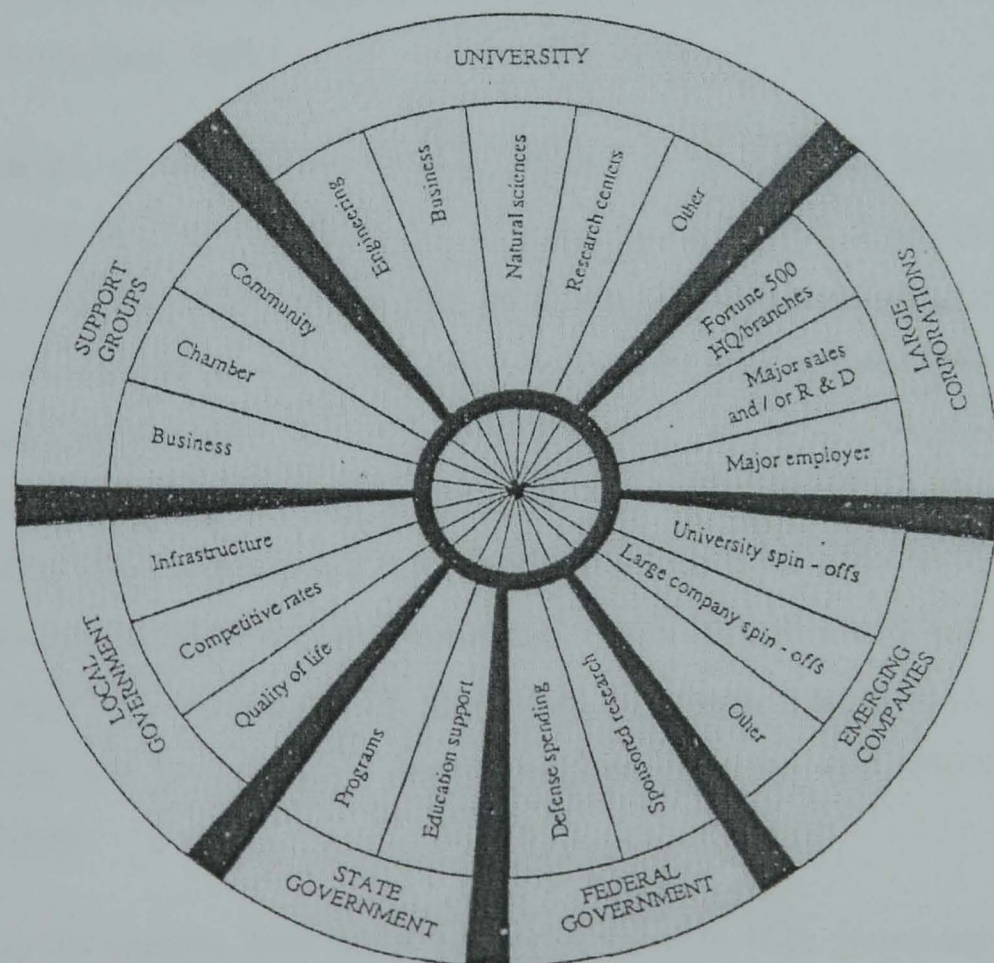


Figure 2-5 The Technopolis Wheel

Source: Adapted from Smilor et al (1988a, p. 3)

#### ***2.4.3.2 The development of technopolis worldwide***

The emergence and success of Silicon Valley and Route 128 brought attention to the geographical basis of high technology development, leading to the various kinds of regional high technology policies in countries around the world. Started in Japan, Britain, France, Germany, Canada, Australia (Breheny and McQuaid, 1987), and later on in South Korea, Singapore, and Taiwan (Castells and Hall, 1994), every country has taken policy initiatives to encourage the creation of technopolis to facilitate the nurturing of high-tech industries (Wang *et al.*, 1998).

In 1980, the Japanese Ministry of International Trade and Industry (JMITI) introduced the policy to develop “technopolis” aiming to create a new model of cities in which scientific research, high-tech industry and high-quality living are all brought together in an organised relationship (Bloom and Asano, 1981, Nishioka and Takeuchi, 1987). The national technopolis programme was enacted in 1983 based on the Technopolis Law. In the following six years, 26 regions were designated to be developed into technopolis (Stohr and Ponighaus, 1992).

The designation of the technopolis was decided at the national level by the JMITI, authority of the enabling legislation. In so doing, the JMITI set forth the guidelines and the prefectural governments submit their technopolis development plan accordingly. Not all prefectures were allowed to attend such applications because criteria were also set out, which include, for example, the existence of a ‘mother’ city with a population of 200,000 or more, an airport or bullet train station, and a potential for high technology industry (Fujita, 1988). Once a prefecture was qualified, it became eligible for various kinds of financial assistance including tax exemptions, direct subsidies, and low-interest loans. Incentives were also made available directly to companies located in the technopolises for machinery and buildings, tax breaks, low-interest loans and relocation assistance (Tatsuno, 1986).

The technopolis regions have attracted employment in high technology industries in Japan and the immediate success provoked enthusiasm in many countries which share the same view that high-tech industries were the “panacea” for economic development and regeneration (Breheny and McQuaid, 1987). As a result, the technopolis became a common view in the 1980s (Wang *et al.*, 1998).

#### 2.4.3.3 *The limits of technopolis*

Despite the hype, not many planned technopolises have been successful (Malecki, 1997). This prompted some observers to conclude that the model of Silicon Valley (which is the building model of most technopolises), cannot be cloned elsewhere because it was never planned by the government, and other locales may not have the necessary entrepreneurial culture that nurtured Silicon Valley (Tatsuno, 1986).

Numerous studies have tried to make an assessment of the technopolis across the world and found that there were mixed results in terms of the technopolis' potentialities as a centrepiece of regional development. Castells and Hall (1994) present the evidence from the case studies of Tsukuba Science Park in Japan and Taedok Science Town in Korea, concluding that there was little scientific network and synergy produced by the spatial agglomeration of research activities within Taedok. No milieu of innovation formed in the area and no linkage or feedback developed with manufacturing or application of any kind in the first two decades of its existence.

Ohoka (quoting in Bass, 1998, p. 397) refers to one of the Japanese technopolises – Kyushu's "silicon island" as "silicon colony", because the integrated circuit production attracted by its technopolis consisted only of branch plants, which has led to a new spatial division of labour.

Grayson (1993) points to the assumption where the technopolis is based and argues that the assumption that technological innovation leads to economic growth remains an unanswered question and important issues concerning the dynamics of creating and sustaining the technopolis need to be addressed and better understood. One of the most important issues is how the technopolis works as an instrument of regional innovation policy and for stimulating technology-led economic development.

Oh (2002), among many others, points out that the technopolis is just one of the means for the promotion of regional development through the advancement of regional technology. Although some authors (e.g. Gonzalez *et al.*, 2004) mentioned the importance of quality of life and overall conditions in the development of the technopolis, these were used to serve the purpose of economic growth, reflecting the overall limitation of understanding the meaning of development.



#### 2.4.4 Science city

The concept of “science city” has already been used in many places with very different institutional contexts since the 1960s, which makes it difficult to draw direct conclusions for urban development. Castells and Hall (1994) studied the earlier experiences (from the 1960s to 1980s) of the science city programs: Akademgorodok in the former Soviet Union (now in Russia), Taedok Science Town in South Korea, Tsukuba and Kansai in Japan, found that the distinctive characteristics of science cities in that period were their focus on the science and research, which was independent of their impact on their immediate productive environment and generally conceived as supports to national scientific development. Accordingly, they define a science city as a new settlement which was generally planned and built by governments, aiming to generate scientific excellence and synergistic research activities by concentrating a critical mass of research organisations and scientists within a high-quality urban space. However, these science city programs were generally failed

as a regional development project, as an instrument of technological modernisation, and as an attempt to create a scientific complex. The quality of research in its institutes was very high, simply because of the quality of the scientists who went to work there. But little added value resulted from the spatial proximity between the institutes, as they rarely related to each other (Castells and Hall, 1994, p. 56).

For Oh (2002) and Cooke (2001), these science cities remained exotic enclaves in their regional environment. These programs were condemned by local authorities and people as a waste of resources, unconnected in any way to the regional economy, generating few jobs, of which the most skilled go to scientists and technicians from outside the areas. Abe (1997) comments Tsukuba as an “isolated island”, while Stewart (2001) sees the Kansai science city managerial organisation “puts a significant drag on the ability of Kansai Science City to move forward at the pace the early architects of this otherwise well-intended concept intended” (accessed on 08/09/2008).

In the recent literature, it seems that the term ‘science city’ is used interchangeably with ‘science park’ or ‘technopolis’ when their geographical scale is the entire city (e.g. Bass, 1998, Wang *et al.*, 1998, Zhang, 2005), while for some authors (e.g. Bloom and Asano, 1981, Dearing, 1995, Edgington, 1989, Fujita, 1988, Glasmeier, 1987, Masser, 1990, Nishioka and Takeuchi, 1987, Tatsuno, 1986) science city can be understood as the

creation of city in which scientific research, high-tech industry and high-quality living are all brought together in an organised relationship. For Zhang (2005), a science city is the city/regional style of science park schemes. Maruyama (1985) observes that a science city presents “a healthy living environment with cultural amenities, combined with high technology industries away from existing overcrowded industrial centres and adapted to local characteristics”(p. 76). Grayson (1993) maintains that a science city must have at least one existing university providing courses in high technology, and have sufficient local enterprises to form a nucleus of entrepreneurial skills and good communications links, to encourage development in areas that are relatively lightly industrialised.

The very recent understanding of science city refers it to the “extended science park” (Benneworth, 2008), which is expected to offer benefits of proximity and collaboration, promoting “open innovation”, and drawing on the existing advantages of core urban locations to provide the creative people, creative places and creative partnerships. This involves a fundamental change of the basic assumption over the technopole movement, which sees technology transfer could take place by fostering the simplistic linear relationships between researchers and user, between universities and companies. The new theoretical foundation of the science city is based on which Cooke (2001) would call an “interactive model”, where the “triple helix” of government, industry and universities interactions (Leydesdorff and Etzkowitz, 1998) are seen necessary to foster an “open innovation” (Leadbeater, 2000) milieu. Benneworth (2008) argues that “triple helix” makes science city more meaningful for urban development than the “linear model”. In this respect, science city can be regarded as a form of knowledge city.

#### **2.4.5 Summarising literature on technopole**

Bring together literature on the four forms of technopole, it is noted that ever since the emergence of the technopole movement, it has become a hot area of studies. However, most studies were empirical based, from which authors paid considerable attention to the identification of success factors of technopoles. These factors can generally be categorised into tangible and intangible factors (Koh *et al.*, 2005, Yoshizawa *et al.*, 2001). While the tangible factors refer to the “hardware” components that can be planned, organised and physically created, intangible factors point to the “software” components



that need to be fostered either spontaneously or deliberately. Tangible factors can be classified as:

- Physically built environment — sufficient land or buildings with good quality environmental conditions for companies and research institutes to take up residence and conduct research and technology development;
- Research facilities and institutes — universities and other institutes of higher education, national and public research institutes, and private and third party sector research institutes;
- Exchange facilities — facilities and institutes which conduct a variety of services, including research exchanges, training and information provision, in order to support research and technology development and industrial activities;
- Incubators — facilities and institutes which conduct a variety of specialist services for individuals and groups starting new businesses and companies which have just been established to support industry creation and provide business and technological support.

The “software” factors include the following three components:

- Growth mechanisms — the factors and capabilities that sustain a technopole and enable it to grow over time;
- Technological capabilities — the development and strengthening of R&D capabilities and the creation of competitive advantages in specific technology sectors;
- Global role and market integration — the linkages between the region and the global or national economies, the degree of integration with regional or global markets, and the creation of the region’s niche in the global system.

Nevertheless, the development of technopoles normally takes place in a designated area within a city that aims at promoting knowledge intensive industries. Knowledge here is limited to scientific knowledge and is understood as an important productive factor. As criticised by Laszlo and Laszlo (2002), the partial understanding of knowledge and

development would inevitably result in a situation where the faster the economic growth, the worse the negative impact on social and environmental development.

## **2.5 Knowledge City**

The last decade has witnessed an evolution of the KBUD concept from early articulations of the “technopole” into the “knowledge city” which is characterised as being more viable, vibrant, and sustainable in the way of urban development (Yigitcanlar *et al.*, 2008). Carrillo (1999, 2006) attributes this evolution to the global trend that the 21<sup>st</sup> century is being the “century of knowledge” where knowledge is the driving force of development (Drucker, 1993), as well as the ‘century of cities’ where the majority of the world population will live in urban areas. Carrillo (2006) refers to the knowledge city as the combination of these two trends. In the real context, knowledge cities have embarked on a strategic mission to firmly encourage the nurturing of innovation, science and creativity, within the context of an expanding knowledge-based economy and society. In this regard, Landry (2000) argues that only a few aspects of today’s world may better characterise the dawn of the new millennium than the transformation of cities and regions into knowledge societies, and their economies into knowledge economies. This section explores the state of the knowledge city movement.

### **2.5.1 The knowledge city concept**

#### ***2.5.1.1 Terminological issues***

The review of existing literature noted that the term “knowledge city” is tended to be used as an umbrella metaphor for geographical entities, which apply nearly the same principles, to embrace other similar KBUD movements, such as “knowledge region” (Etzkowitz and Klofsten, 2005), “knowledge capital” (Chatzkel, 2004, Garcia, 2004), “knowledge corridor” (Ramasamy *et al.*, 2004), “knowledge harbour” , and “knowledge village” (for example, Dubai Knowledge Village), and “knowledge innovation zone” (Amidon and Davis, 2006a). Knowledge city is also used interchangeably to a certain degree with similar evolving concepts such as “Ideopolis” (Work Foundation, 2005), “intelligent city” (Komninos, 2002), “creative city”(Landry, 2000, Landry and Bianchini, 1995), “learning city/region” (Florida, 1995), “digital city”(Aurigi, 2005), and “Smart City”. However, each of these terms begins from a different starting point to address the

different aspects of the knowledge city. Furthermore, there are also some terms such as “knowledge cluster” (Arbonies, and Moso, 2002), “knowledge parks” (Bugliarello, 2004), “knowledge community”, “knowledge network”, and “knowledge Ba” (Baqir and Kathawala, 2004a), which are seen as the subsets of the knowledge city.

#### ***2.5.1.2 Definitions of knowledge city***

There is no commonly accepted definition given to “knowledge city” (Carrillo, 2006). In the current literature, almost all authors start their work with defining the terms. Indeed, both the terms “knowledge” and “city” appeared easy to use but hard to precisely define in the present context. What compounds the problem is the disparity between the interpretations of the terms “knowledge economy” and “knowledge cities”, not only because of the varying vitality of a nation’s economy and the advancement of society as a whole (Amidon, 1993), but also of the varying demands placed on the concept (Dvir and Pasher, 2004). As mentioned above, the term “knowledge city” appears to be associated with many other related terms and may be understood from different perspectives, and so the definitions vary accordingly.

From a socially sustainable development perspective, Alraouf (2008) refers to the concept as a new paradigm for sustainable cities of the future. Dedijer (2002) refers to the knowledge city as social intelligence that sees a city’s capacity to understand, to adjust, and to generate growth through the efficient use of all types of resources and, mostly, by pushing education as an element that differentiates a society. According to Dedijer;

a city with a knowledge approach represents an intelligent entity whose management uses its contacts for the detection of signs of development in order to learn and adapt as quickly as possible. In order to provide sustainability, a city must focus on innovation. One of the aspects of this type of innovation is social intelligence, which is a society’s ability to learn from its environment, its context, its self, in order to build its future. Social intelligence is not only limited to being informed, but also to understanding and connecting the variables, focusing on sustainable behaviour (p. 112).

Gonzalez *et al* (2004) compiled the KBUD initiatives worldwide and suggest that:

a knowledge city is one that searches for the creation of value in all its areas and develops high standards of life, cultural support and economic development, among other aspects. Compared to other cities in advanced economies ... knowledge cities

invest significantly more of the community's income in education, training, and research (p.107).

As societies become increasingly knowledge-based, the nature of city development changes because activities in the knowledge sector are becoming more important and they require conditions and environments which are very different from those required by commodity-based manufacturing activities in the production sector (Knight,1995). In this regard, Michaud (2003) presents that:

a knowledge city is notable primarily for the intensity and constancy of its dynamics of knowledge creation. Beyond the sheer volumes of knowledge produced, a city's capacity to rapidly transform that knowledge capital into innovative products, processes and services is paramount (p. 9).

According to Michaud (2003), knowledge city is distinguished by intensity of knowledge, which is determined by three main components: the degree of knowledge production, the pace of assimilation and use of new knowledge types, and the scope of knowledge circulation (Figure 2.6 next page). For a knowledge city to succeed in the 21<sup>st</sup> century, it must build on its uniqueness, its openness to diversity, and on easy access. It must also offer the artistic and cultural activities highly appreciated by those working in knowledge intensive fields.

The Work Foundation (2002) defines the knowledge city as an “Ideopolis” – a sustainable knowledge intensive city that drives growth in the wider city region – which can be referred to incubators of knowledge and culture. Knowledge city forms a rich blend of theory and practice within its boundaries, and is being driven by knowledge workers through a strong knowledge production.

For Landry (2000), knowledge city is a process that changes mindsets in generating will, commitment, and energy. Such change will enhance a city's creativity through thinking creatively, planning creatively, and acting creatively, to lead the city to become an innovative hub.

Laszlo and Laszlo (2007) suggest that knowledge city may be thought as the hardware, the infrastructure for learning and knowledge creation. Meanwhile, the learning society can be regarded as the software, the culture of learning, creativity and innovation that distributes the benefits of access to knowledge across the society by offering a higher quality of life and greater opportunities for meaningful living.

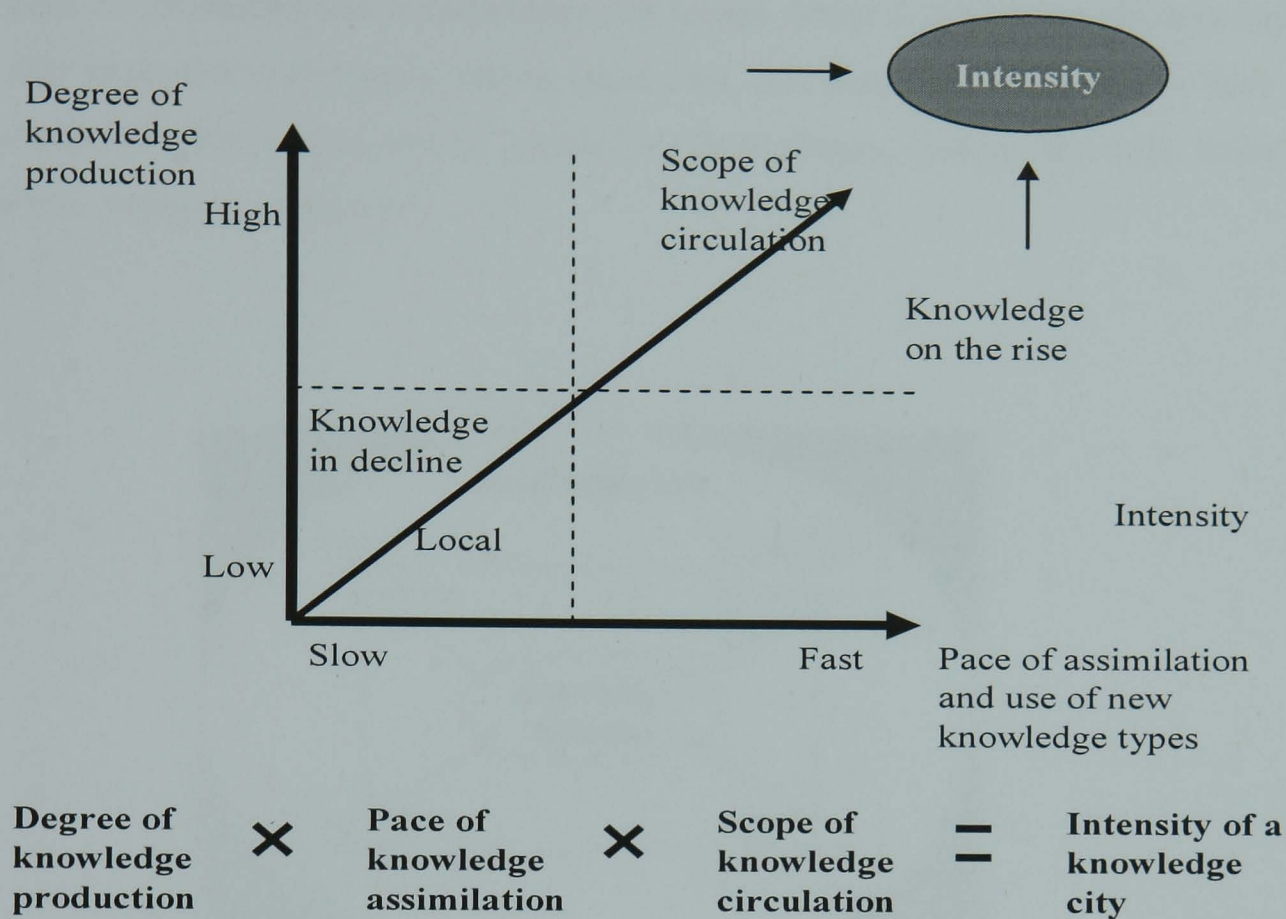


Figure 2-6 Knowledge intensity of a knowledge city

Source: Adapted form Michaud (2003, p. 18)

Some authors define the concept from a development perspective. Dvir and Pasher (2004) for example, argue that knowledge city encompasses the underlying assumption that knowledge and ideas are created mainly through conversations, where open, informal places are the space for knowledge to be liberally shared (see also Garcia, 2006). In his work, Dvir (2006) sees the knowledge city as “a collage of human knowledge moments”. He puts that a knowledge city can be described as “a milieu which triggers and enables an intensive, ongoing, rich, diverse, and complex flow of knowledge moments” (p. 247). Dvir refers to the term “knowledge moment” as a spontaneous or planned human experience in which knowledge is discovered, created, nourished, exchanged, and transferred into a new form. It is, in essence, a conversation between people in a particular place, using structured or unstructured processes aimed at explicit or implicit purposes.



Figure 2.7 illustrates Dvir’s knowledge city model, where a knowledge moment happens at the intersection of people, places, processes, and purposes. Eight places have been identified as knowledge places: school, stock exchange, piazza, the café, town hall, library, museum, and home.

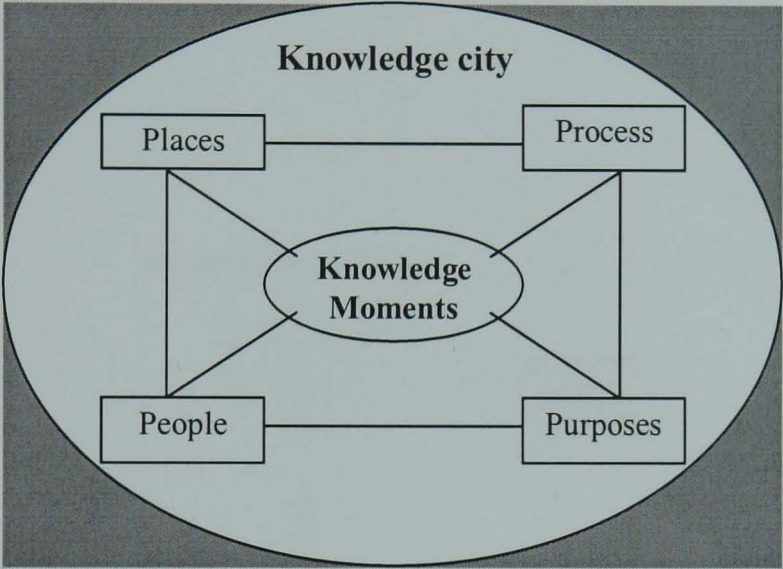


Figure 2-7 Knowledge city model

Source: Adapt from Dvir (2006, p. 246)

The fundamental rationale behind the model is based on the principles of co-evaluation – through the dense stream of knowledge moments. All actors act in the city co-evolve toward sustainability.

Ergazakis *et al* (2004) note that the term “knowledge city” means much more than a modern, well-developed urban environment. They highlight a city’s strategic objectives, and present that:

a knowledge city is a city that aims at a knowledge-based development, by encouraging the continuous creation, sharing, evaluation, renewal and update of knowledge. This can be achieved through the continuous interaction between its citizens themselves and at the same time between them and other cities' citizens. The citizens' knowledge-sharing culture as well as the city's appropriate design, IT networks and infrastructures support these interactions (p. 7) (see Figure 2.8 in next page).

This definition presents a multi-layered view that involves developing a path toward a more reliable, vibrant development, which encourages firmly the nurturing of innovation, science, and creativity within the context of an expanding knowledge economy and society. In this regard, Alraouf (2008), sees the knowledge city as an integrated entity, which physically and institutionally combines the functions of a science park and civic and residential facilities (p.243).

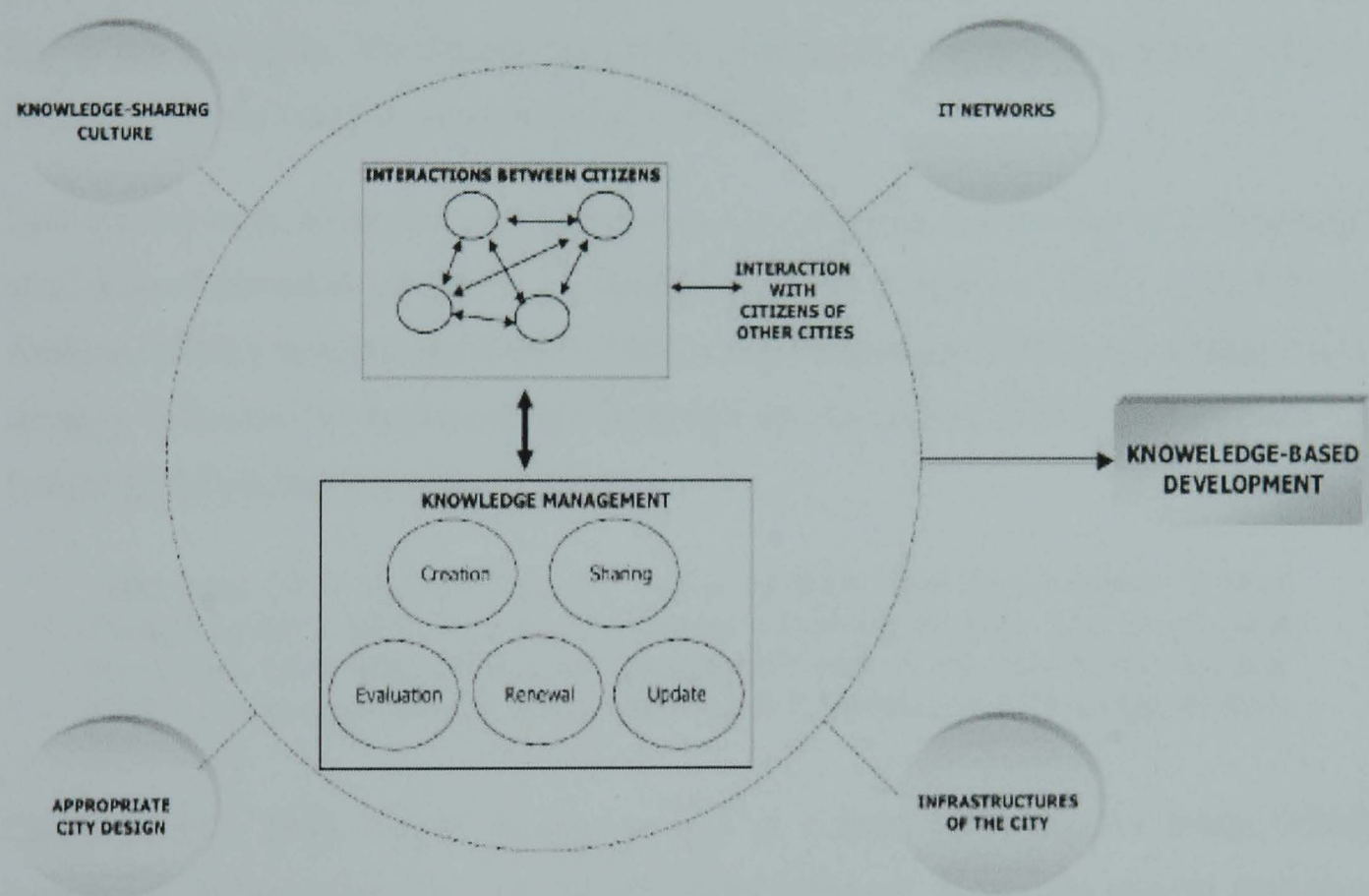


Figure 2-8 The illustration of knowledge city

Source: Adapted form Ergazakis *et al* (2004, p. 8)

Komninos (2002), from an Information Technology perspective refers to the concept as an “intelligent city”, which focuses on the production of knowledge in the form of investigation, technology transfer, innovation, and networking. The interactions have both real and virtual spaces through digital technologies. The basic attributes of this type of cities are: the creation of clusters or innovation communities, the use of tools for virtual work, and the capacity of integration among physical and virtual communities.

In relation to innovation, Amidon (1993) argues that “Knowledge” and “Innovation” are strongly interrelated, thereby formulating the so-called “Knowledge Innovation”. For Amidon & Davis (2006a), a “knowledge city” is seen as a “knowledge innovation zone”, which can be defined as:

geographic regions, economic sectors or communities of practice where knowledge flows from origin to the point of highest need or opportunity (p. 1).

They argue that the concept is no longer a theoretical proposal. Rather, it became a global phenomenon being applied in scattered places all over the globe, such as in Panama, Barcelona, Shanghai, Manchester, Sao Paulo, Rotterdam, Calgary, Monterrey, Vilnius, Mauritius, Kuala Lumpur, Johannesburg, and Dubai.

Last but not least, perhaps most significantly, the economic perspective of a knowledge city received pervasive attention. As argued by Work Foundation (2005), Smith (2003), Amidon, (1993), Amidon and Davis (2006a), and Chesbrough (2006), knowledge city is strongly connected to the knowledge economy. In this regard, SGS Economics and the Eureka (2002) define knowledge city as:

short hand for a regional economy driven by high value added exports created through research, technology and brainpower. Compared to other cities in advanced economies, knowledge cities invest significantly more of the community's income (GDP) in education, training and research (SGS Economics and the Eureka Project, 2002, p. 3).

Carrillo (1997, 2002, 2004) assumes a city as a kind of productive entity, which constitutes “value collectives” or “human value systems”. Given the current transition from industrial to knowledge-based production, cities are becoming increasingly knowledge-based, and therefore can be regarded as emerging knowledge-based value systems. A knowledge city is:

a permanent settlement of relatively higher rank in which the citizenship undertakes a deliberate, systematic attempt to identify and develop its capital system in a balanced, sustainable manner (p. 33).

Friedmann (1995) defines knowledge city as a world-class of cities that play a leading role in the spatial articulation of the global economic system or designate a dimension of all cities that in varying measures are integrated with this system.



In summary, literature on the definition of knowledge city has emphasised the following points: knowledge city is purposefully for sustainable development; the presence of social intelligence; high standards of life; knowledge economy; knowledge infrastructure; facilitating knowledge creation and circulation, and the presence of knowledge citizens. Drawing on these definitions, however, one can find still hard to draw a whole picture of what a knowledge city looks like.

2.5.1.3 *The attributes of knowledge city*

Apart from the attempt to define the knowledge city, some authors have attempted to synthesise its main characteristics. Ergazakis *et al* (2004), for example, compared the main attributes of the knowledge city with modern well-developed cities (Table 2.5), present that one of the significant differences between them is the understanding of knowledge and its application.

Table 2-5 The comparison of knowledge city and modern city

Knowledge city	Modern, well-developed city
Provision of access to the new communication technologies for all citizens;	High quality of life;
Research excellence which provides the platform for new knowledge-based goods and services;	Provision of efficient, dependable and cost competitive access to infrastructure for transport of people, goods and information;
Provision of instruments to make knowledge accessible to citizens, in a systematic, efficient, and effective way;	An urban design and an architecture that incorporate the new technologies;
Ability to generate, attract and retain highly skilled citizens in different domains;	Central educational strategy including all cultural facilities and services;
Existence of civic centres being open to diversity and fostering face-to-face relations	Economy with enough "critical mass" to support world competitive specialization;
	Networks of commercial influence, in order to attract funds;
	Market access and awareness, that is to say high capacity in sustaining robust trading relationships with other markets;
	A business culture, which is at once collaborative and competitive;
	Responsive and creative public services;
	Open, tolerant and merit based culture and inclusive society

Source: Compiled from Ergazakis *et al* (2004, p. 6-7)

Building on the analysis of successful stories worldwide, Michaud (2003, p. 16) suggests the following characters:

- Significant growth in leading-edge service and novel groundbreaking economic sectors
- Strong dynamics of innovation across all sectors of economic activity and within all institutions
- Culture of knowledge (knowledge is disseminated and valued) across all sectors
- 'Flow' of information (open circuits, accessible information)
- Pronounced acknowledgement of and support for creative activities
- Strong link between arts/culture and scientific/technological knowledge and innovation
- Significant proportion of labour force working in creative positions
- Citizenry actively involved in the development of their city, its identity and its unique character
- Abundance of places and events valued by knowledge workers (e.g. open-air activities, cultural events, vibrant neighbourhoods).

and points out that

knowledge city is distinguished by the pace of assimilation and use of new types of knowledge, and by their dissemination and sharing, the promotion of which in turn ensures that these new knowledge types rapidly acquire economic and social value (Michaud, 2003, p. 18).

Ergazakis *et al* (2006a) drawing from the development and operation perspectives present some common features among successful knowledge cities (See Table 2.6 in next page).

Similarly, in his empirical study, Martinez (2006, p. 29) identified the following common actions among knowledge cities:

- Embrace Knowledge-based Development as a conceptual and value framework.
- Integrate all major stakeholders from the initiative's birth throughout its development.
- Recognise all major value elements (Capital System).
- Structure and understand those value elements (where they are, how they are produced, and how they can be maximized).
- Advance in the quality of operationalisation as understanding advances.
- Carry out measurements.

- Diagnose gaps between current condition and desired condition.
- Develop strategies for closing gaps or developing capitals potential. Strategies should always include the following: required resources, work plan, key success and failure factors, quality assurance procedures.
- Create a monitoring and evaluation system.
- Select and appoint evaluation agents.

**Table 2-6 Common features among knowledge cities**

<p><b>Development</b></p> <p>Political and societal will is indispensable</p> <p>Strategic vision and development plan is crucial</p> <p>Financial support and strong investments are necessary</p> <p>Setting-up of agencies to promote the development of knowledge-based region is essential</p> <p>International, multi-ethnic character of the city is necessary</p> <p>Metropolitan website is very important</p> <p>Value creation to citizens is indispensable</p> <p>Creation of urban innovation engines is significant</p> <p>Assurance of knowledge society rights<sup>[1][2]</sup> of citizens is substantial</p> <p><b>Operation</b></p> <p>Low cost access to advanced communication networks is imperative</p> <p>Research excellence is indispensable</p> <p>Existence of public libraries' network is necessary</p>
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**Source: Adapted from Ergazakis (2006, p.10)**

By referring to the knowledge city as “regional intellectual capital”, Bounfour and Edvinsson (2005a) create a composition of the outstanding attributes of an intelligent city as below:

- Attraction toward knowledge workers
- Favourable geological position
- Established networks for high-knowledge capacity communities and spaces
- Flow and logistics for an effective community
- A corporative society with high quality levels of exchange
- Quality of life: health, beauty, security, and cohabitation
- Culture and high social value experience
- Focused on the creation of value

(Bounfour and Edvinsson, 2005b, p. 67)

Similarly, Abu-Anzeh and Ledraa (2007) emphasise the key ingredients of a knowledge city. As they put it,

[a] knowledge city is notable primarily for the attraction of talented innovative people and the proliferation of its knowledge institutions, like learning establishments, research centres, businesses, etc. A true knowledge-based city abounds not only with different types of networking innovation models based on a physical concentration of R&D activity but also by the number and quality of the organizations and institutions that take root there, and the competence of the knowledge workers and the dynamics of their interrelationships (p. 3).

According to Abu-Anzeh and Ledraa (2007), knowledge city must offer an appealing and high quality urban environment so that such talented workers can stay, live, learn and work in the city. The knowledge city must have a pool of knowledge workers fed by qualified individuals attracted to positions that ascribe value to their creative talents. These qualified workers are what Florida (2002) calls the “creative class” that includes employees in information and communications technologies, architecture, engineering, science, education, arts and design, as well as in health care, management, finance, legal affairs, and marketing. Convergent media, telecommunications and computing grids are thus basic integrating infrastructures underpinning the shift towards intensely interconnected planetary urban networks.

These studies actually infer that the distinctive features that a knowledge city should have are: an attractive visible and invisible environment; the presence of knowledge citizens, especially the creative class; a mechanism for knowledge creation, transmission, and utilisation; a cultural environment that values knowledge.

#### ***2.5.1.4 The benefits of knowledge city***

Drawing upon the attributes presented in the literature, some authors also addressed the significant advantages of knowledge city (e.g. Arbonies, A. and Moso, M., 2002, Malone and Yohe, 2002, Mansell, 2002, Scheel, 2002). According to these authors, the main benefit of knowledge city is that it functions in such a way that is in favour of its KBUD, in other words, knowledge city fully corresponds to the needs of KBUD (Ergazakis *et al.*, 2006b). Yigitcanlar (2007) synthesised the major benefits ascribed by other authors and divided them into three categories: economic, social, and environmental benefits (Table 2.7).

Table 2-7 Benefits of knowledge city

<b>Economic and organisational benefits</b>
Creation of more rewarding and well-paid employment
Faster growth in community's income and wealth
A more sustainable economy, by technological innovations and off-shore investment;
Revitalisation of traditional industries;
A boost to the city's pride and confidence for the reinvestment of local capital into the local economy;
Promotion of measured risk taking that helps build an entrepreneurial culture;
Creation and innovation are central elements of its development; and
Constant connection between universities, enterprise and creators.
<b>Social and cultural benefits</b>
Great opportunities to share the wealth through investment in the public domain and better funding of social safety nets;
Creation of knowledge communities that will provide "just-in-time" knowledge when it is needed;
Better education services and networks of school connected;
Creation of a tolerant environment towards minorities and immigrants;
Leader of cultural production and the culture industry;
Instruments that make knowledge accessible to citizen, and
Access to the new communication technologies for all citizens.
<b>Physical and environmental benefits</b>
Leader in the incorporation of premise of the digital area;
An urban design and architecture the incorporate the new technologies;
Uses and exploits its monumental architectural and natural heritage as an attractiveness factor;
Improved capacity to enhance and repair natural and built environment; and
Greater community commitment to environmental decision making.

Source Adapted from Yigitcanlar (2007, p. 6)

2.5.2 The state of knowledge city study

Given the fact that study into knowledge city is still in its infancy, literature in this domain has yet to be systematically developed. Many studies are focusing on the identification of success factors or attempting empirically to develop theories and approaches. This section discusses the “state of the art”.

2.5.2.1 Key success factors of knowledge city

The creation of a knowledge city is neither a simple nor a quick process (Carrillo, 2004). It involves many factors both in tangible and intangible forms. Studies into this stance have tried to identify the success factors that could lead to the long term success of knowledge city.

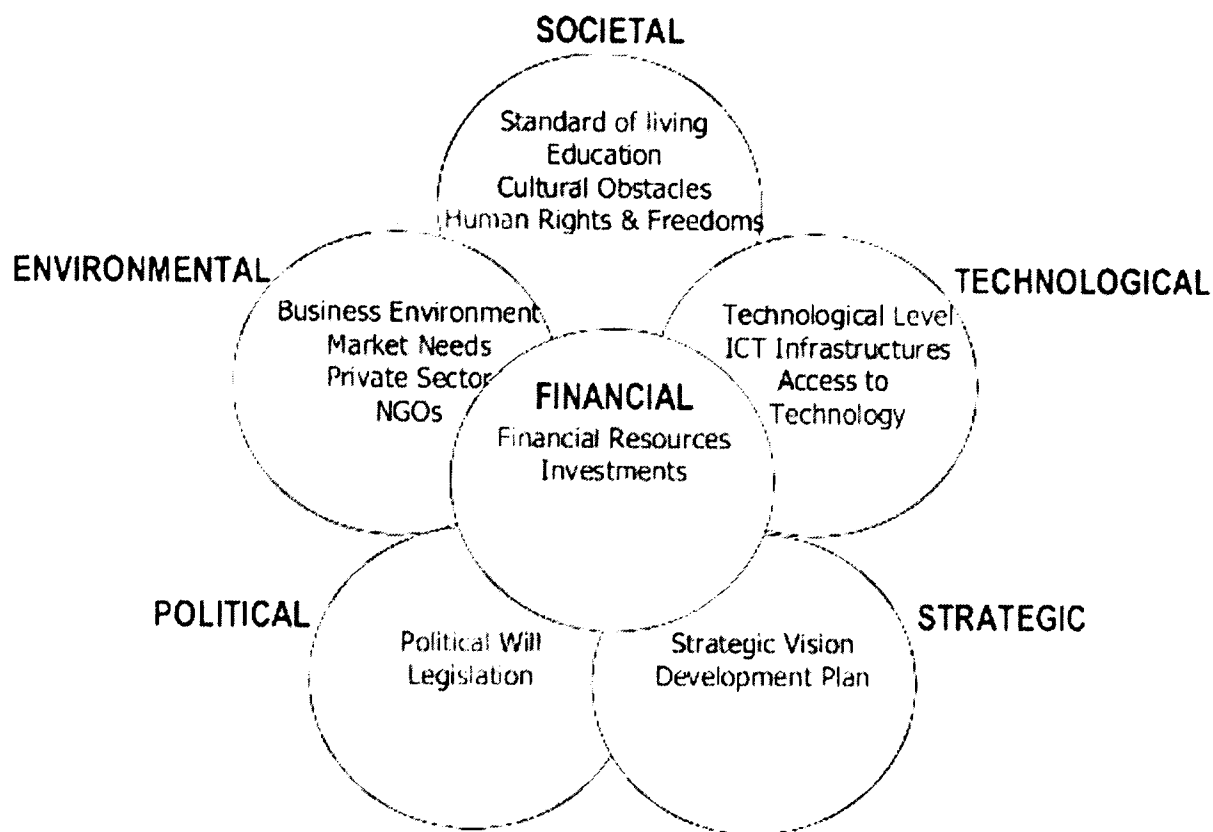
SGS Economics and Planning (2002), for example, identifies key success factors for the creation of knowledge city as targeting skills, research excellence, networks of

commercial influence, collaborative and competitive business culture, infrastructure for connectivity, market access and awareness, and open, tolerant and merit based culture with an inclusive society.

Carrillo (2003, p. 2) suggests the following factors to be considered in knowledge city initiatives:

- a leadership committed with the sustainable wellbeing of its community;
- a critical mass of change agents having a sufficient understanding of the qualitative differences of knowledge city;
- a conceptual and technical capacity to articulate and develop the social system of capitals;
- a rigorous and transparent state of knowledge-based social capital;
- a series of strategic initiatives to reach an optimal capital balance, and feeding on the best global practices; and
- an international network of relationships with leading entities in knowledge-based innovation.

Ergazakis *et al* (2004) building on an empirical study group the key success factors under six categories. These categories include political, strategic, financial, technological, societal and environmental factors (Figure 2.9 next page). Among these categories the “political will” is the most important factor as it is the initiator of any further action. The “strategic vision” should incorporate and take into account the entirety of in-depth knowledge concerning the city status, and it results in a set of specific objectives and series of measures and actions. A strong ‘financial program’ is needed for the implementation of the strategic plans and to ensure appropriate funding for the initiatives and support programs. “Technological modernisation” is necessary to supply a high-level ICT infrastructure for the city. Easy access to these technologies should be also provided for citizens. “Societal goals” should take prime consideration as increasing the quality of life which would attract more skilled workers and accelerate knowledge creation with in the city. Lastly, the “business environment” and the market needs are significant factors and should be analysed thoroughly.



**Figure 2-9 Success factors of knowledge city**

Source: Adapted from Ergazakis *et al* (2004, p. 8)

Abu-Anzeh and Ledraa (2007) argue that a knowledge city must be performing in three main areas: economy, innovation, human capital and culture. All these elements must work together in order to establish an entrepreneurial city that develops a platform to foster economical development based on a sustainable interaction between innovation, technology and arts. This has to link to an intense initiative for education and training of human capital.

In addition, in the real life context, planning policies are often seen to be simplified to attract international investment and encourage economic growth through creating social amenities and communities (Chen and Choi, 2004, Martin, 2001). Social relationships and quality of life have been identified as being the key factors in attracting knowledge workers and foreign investors (Leamer and Storper, 2001, Mathur, 1999, Robinson, 2002, Santagata, 2002).

Apart from the abovementioned factors, a knowledge city must first of all be a learning society (Laszlo and Laszlo, 2007), where knowledge citizens are seen as decisive factor for the long term success of knowledge city.

Overall, the current literature seems to suggest that if a city is to develop a knowledge city, it must have: a strong leadership with a political will; a leading scientific and technological base; the presence of high-skilled knowledge workers; and a sound entrepreneurial and business culture. However, as stated by the literature, all these factors are aimed at economic growth.

#### ***2.5.2.2 Theories and approaches of knowledge city***

Since the emergence of the knowledge city concept, attempts have been made intensively to develop theories and approaches for designing, implementing, and analysing it. The rest of this section explores the most cited theories and approaches.

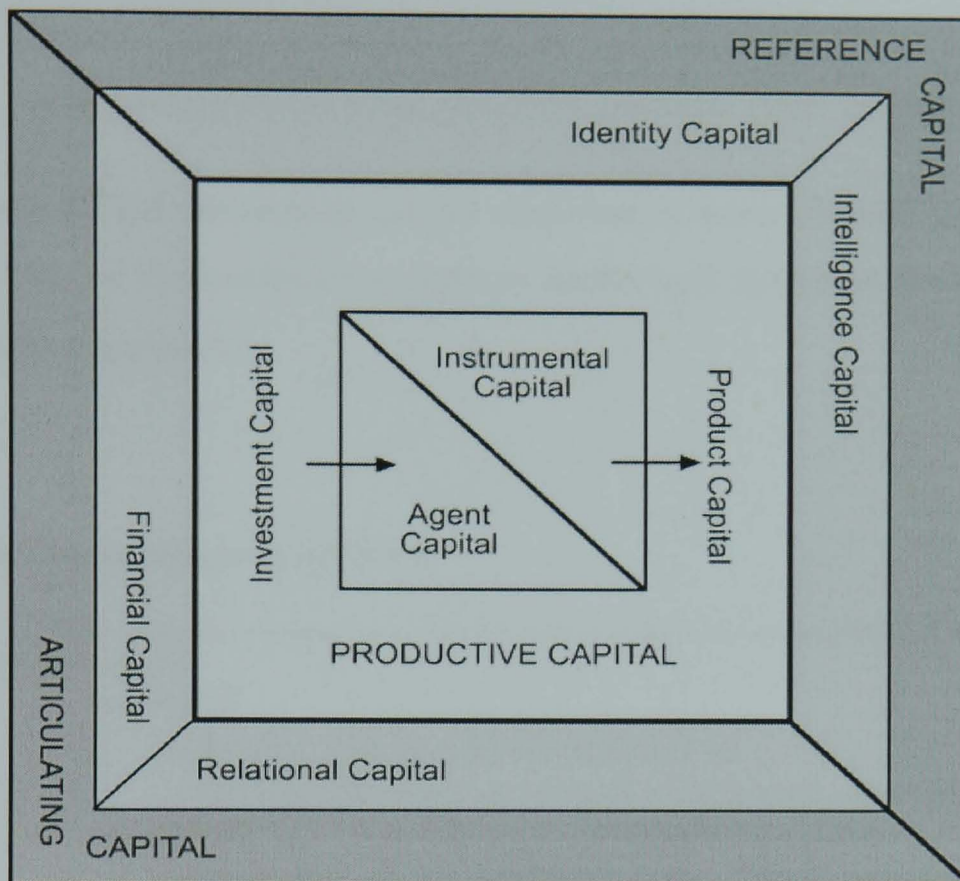
##### **Knowledge City Capital System**

The “Knowledge City Capital System (KCCS)” was originated by Carrillo (2002) as a Generic System of Capitals (Figure 2.10 next page) drawing on the knowledge-based value systems approach (Carrillo, 1997) for knowledge-based development.

According to Carrillo, all forms of human organisation (whether a tribe, a country, or a contemporary company) can be regarded as productive entities. Production here denotes the generation of any form of collective value: a function in which there is a positive difference between total input value and total output value. Value denotes all objects of preference (either tangible or intangible) - for a given community, such as material, artistic or relational. Accordingly, production as the basis of social organization can be referred to as activities which increase social value.

Based on this assumption, all forms of human organisation throughout history constitute value collectives or human value systems. Value-balance tends to evolve from a focus on the most fundamental means of survival and welfare, to an increasing array of desired intangibles, such as education, culture and other forms of human development.





**Figure 2-10 Generic System of Capitals**

**Source:** Adapted from Carrillo (2002, p. 53)

A city is ideally a human value system, because the key factor that makes a city exist is neither size nor importance, nor any other parameter on the basis of which a particular human settlement is commonly distinguished above others, but the fact that a significant community of people organise their lives around a recognisable value system and decide to settle down and stay together. Given the current transition from industrial to knowledge-based production, cities as value collectives are becoming increasingly knowledge-based. Cities can therefore be regarded as emerging knowledge-based value systems – KCCS (Carrillo, 1997).

Carrillo (2004) distinguishes three main capital dimensions:

- capitals which are the product of human activity throughout history and have left a mark - whether physical, social, economic or cultural – meta-capitals;
- capitals which constitute the current fitness or evolutionary potential of that city, in terms of collective competencies for sustainability – human capitals;

- capitals which pre-existed as the foundation of the city, mainly the natural settings determined by geographical position – instrumental capitals.

The three KCCS dimensions can be classified in more detailed disaggregation (see in Table 2.8). As the system disaggregates further and further, it becomes more and more specific to a given city.

**Table 2-8 Basic categories of KCCS**

Meta-capitals
Referential
Identity: clarity and differentiation
Intelligence: responsiveness to relevant external entities and events
Articulation
Relational: social integration and cohesion; equality and legality
Financial: financial states
Human Capital
Individual base
Ethnic diversity
Health
Education and learning
Socio-economic
Collective base
Live culture(s)
Evolutive capacities
Instrumental Capital
Tangible
Natural: existing before the settlement
Artificial: created or incorporated by settlers: infrastructures
Intangible or symbolic
Public institutions, systems and procedures
Private institutions, systems and procedures
Information platforms
Memory contents

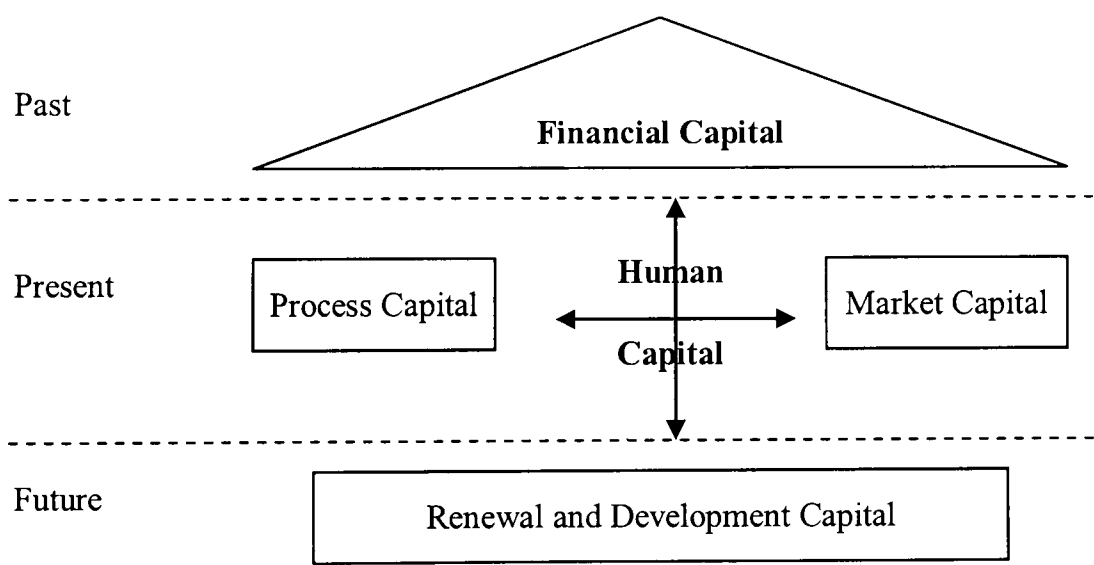
**Source:** Adapted from Carrillo (2004, p.37)

KCCS has been applied to several cities in their real life context to evaluate the state of art of a given city toward a knowledge city. It is useful in analysing a city’s static situation. However, as Carrillo (2006) himself noted, the development of a knowledge city is a dynamic process; those static factors are changing constantly and are driven by

the dynamic forces. The KCCS failed therefore to provide a dynamic model to analyse the process of knowledge city.

**Cities Intellectual Capital Benchmarking System (CICBS)**

The CICBS is a methodology and framework to evaluate and manage the cities’ Intellectual Capital (IC), developed by Viedma (2003). It is based on Edvinsson and Malone’s (1997) IC Navigator model (Figure 2.11), which was initially created for the Swedish Insurance Company Skandia. The IC Navigator model provides a balanced and holistic picture of both financial capital and intellectual capital, which has been found to be also applicable to evaluate a nation, a community, or a city’s IC (Bounfour and Edvinsson, 2005a).



**Figure 2-11 IC Navigator House Metaphor**

**Source:** Adapted from Edvinsson and Malone (1997, p. 21)

The development of CICBS is heavily dependent on the IC Navigator model specifically for measuring and managing the intellectual capital of cities (Viedma, 2003). It consists of two approaches (Figure 2.12 next page): the Cities’ General Intellectual Capital Model and the Cities Specific Intellectual Capital Model. The former is a transversal approach

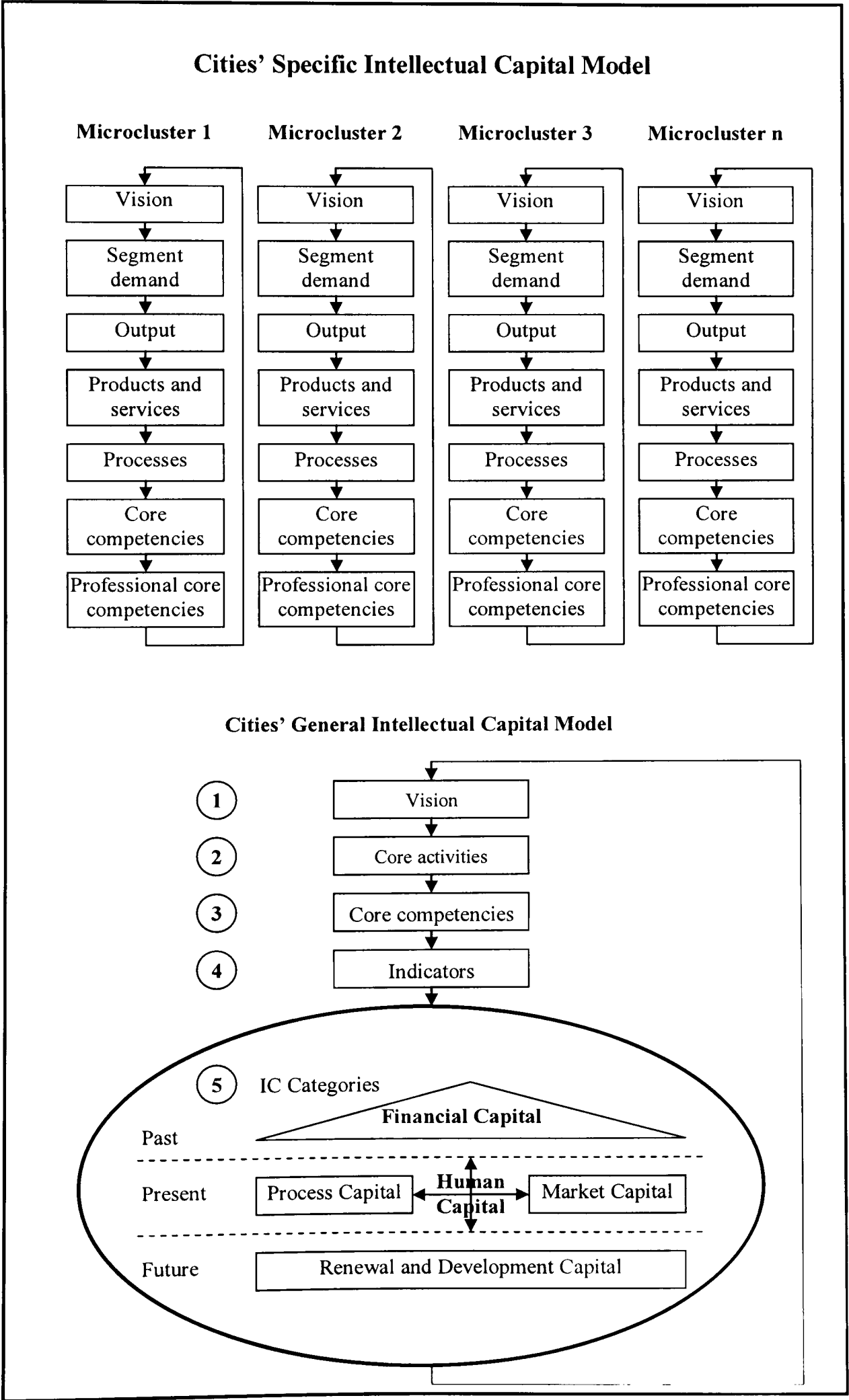


Figure 2-12 CICBS Model

Source: Adapted from Viedma, (2003, p. 22)

that covers all economic activities of the city or all the economic microclusters by which the economic activities are assembled. The evaluation process goes through the following phases: vision, core activities, core competencies, indicators, and intellectual capital (IC) categories. The IC categories cover financial capital, human capital, process capital, market capital, and renewal and development capital.

The Cities Specific Intellectual Capital Model is a longitudinal approach that deals specifically with each city's relevant economic activity or relevant economic microcluster, in a particular and distinctive manner. The evaluation process includes vision, segment demand, output, products and services, processes, core competencies, and professional core competencies.

These two models are related. The Cities' General Intellectual Capital Model is generally used for measuring and managing the intangible assets a city possesses, which is to develop a set of different economic activities, and these assets are assembled into the so-called "microclusters" according to certain criteria of homogeneity. It is basically about managing the creation and development of a common and general knowledge — an intellectual capital platform — that strengthens the existing microclusters of a city and nurtures the building of new ones. The Cities' Specific Intellectual Capital Model is to measure and manage the intellectual capital of each of the relevant industry microclusters that exist in the city.

It must be noted that the four areas of focus with regard to intellectual capital here have been assigned new meanings compared with the initial IC Navigator model for companies. Viedma (2003) describes their meaning below:

1. Market capital: refers to the markets of which the city has national and international contacts. Assets in this focal point include customer city loyalty, the satisfaction expressed by strategic customers, the value of brand;
2. Process capital: intellectual structure for cooperation and flow of knowledge such as software, information systems, databases, laboratories, organizational structure, and management structure. Process capital lays the foundation for keeping and increasing the level of human capital ;

3. Human capital: refers to knowledge, experience, intuition and skills that individuals have to complete the tasks and goals of the city. Human capital includes cultural values and the city's philosophy;
4. Renovation development capital: reflects the city's capacity, the current investment in its future development, and its renovation through the exploitation of its competitive strength in future markets. Renewal and development assets include investments in research and development, patents, trademarks, start-up companies, and the like.

The CICBS model is used for assessing the intellectual capital of a city within a competitive environment for the purpose of economic growth.

### **Urban innovation engines**

The term “urban innovation engine” is used to describe a complex system which can trigger, generate, foster, and catalyze innovation in a city. The notion was conceptualized by Dvir and Pasher (2004) to explain a co-evolving system that includes the interactions between people, relationships, values, processes, tools, technology, physical and financial infrastructures, from which novelty, spontaneity, and creativity can be emerged. At the core of the “urban innovation engines” lies the creation of conversations, which Dvir and Pasher would argue to be the foundation of most innovations.

An “urban innovation engine” must work in a supportive milieu – innovation ecology. Innovation ecology, as defined by Hale (1996), is the work or an urban environment, a setting that can enable, encourage, foster, and catalyze the generation of ideas and creation of value out of them. It supports individuals, teams, and the whole organization in the journey towards sustainable development and success that is based on on-going innovation.

Dvir and Pasher (2004) distinguish 14 elements for an urban “innovation ecology”: time, organisational structure, physical space, tolerance of risk, strategy, recognition and incentive systems, virtual space, structured and spontaneous processes, knowledge management, financial capital, diversity, attention to the future, challenge, and the unifying principle – conversations.

These elements, combined with intangible factors such as a strategic intention, an explicit vision to use it as an innovation engine, exceptional leadership, a stimulating physical space, an urgent need or challenge, and a special team, are vital in turning ordinary urban organs into innovation engines.

Dvir and Pasher (2004) identified 11 generic innovation engines: the café and other “third places” (in contrast to home and work), the big event, the library, the museum, the gate, the future outlook tower, the university, the capital market, the digital infrastructure, the industrial district and science park, the brownfield industrial zone, and the urban virtual space.

According to Dvir and Pasher, a common thread within these innovation engines is that they provide the ecology for conversation, which has been argued as being necessary in spontaneous knowledge creation and informal knowledge management.

The innovation engines are not limited to the abovementioned 11 scenarios. Rather, every urban space, event, and activity can be interwoven into the dynamics of innovation engines within coherent innovation ecology. Moreover, Dvir and Pasher (2004) note that the innovation engines must not become isolated ivory towers. They must be connected continuously to each other as well as be integrated in all cities’ flows.

Urban innovation engines actually provide insights on fostering a cultural environment for encouraging, promoting, and facilitating knowledge creation and dissemination informally. They are indispensable building blocks of a knowledge city, but not all about.

### **Triple Knowledge Lens**

The use of Triple Knowledge Lens for analysing knowledge city was introduced by Amidon and Davis (2006b). According to the model, the Triple Knowledge Lens is the balanced triangulation of successful and sustainable results across the knowledge-based economy (business), the knowledge-based society (people), and the knowledge-based infrastructure (organization, technology, and environment) (Figure 2.13).



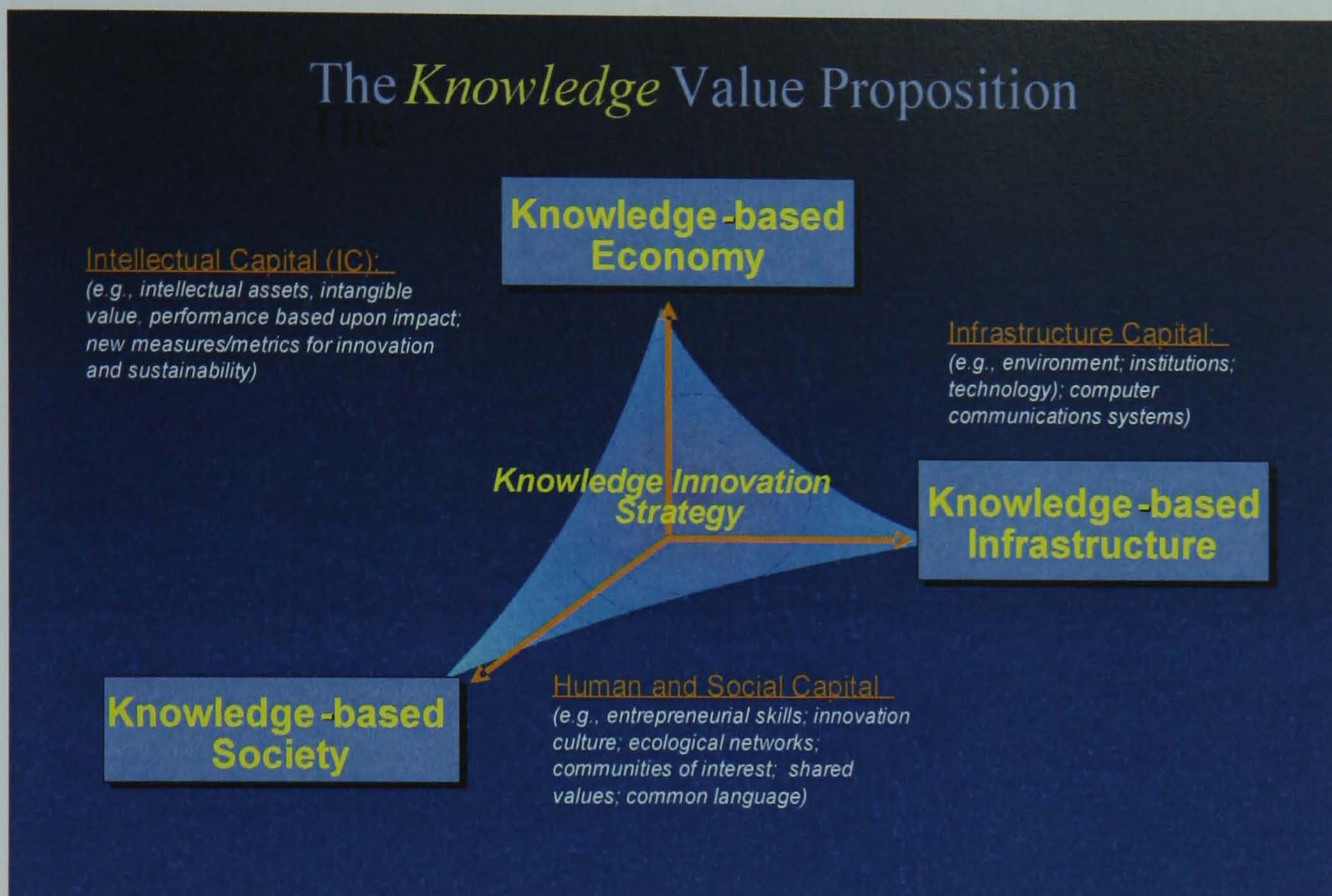


Figure 2-13 The Triple Knowledge Lens model

Source: Adapted Amidon and Davis (2006b, p. 3)

This model is based on a new value proposition that emerged as a shift from the economics of scarcity and the limited supply of material to the economics of abundance – the inexhaustible supply of knowledge. Unlike other production factors, knowledge is a resource to be created, shared and converted into products and services to benefit a stakeholder community. This applies to the Law of Knowledge Dynamics which states that:

- Knowledge multiplies when shared.
- Innovation value is created when knowledge moves from origin to of highest need.
- Collaboration for mutual leverage provides optimal utilization of tangible and intangible resources.

(Amidon and Davis, 2006b, p. 6)



Under each knowledge line, Amidon and Davis selected several key factors as shown in Figure 2.13. When this model is applied to the analysis of a specific “knowledge innovation Zone” (knowledge city) (Amidon and Davis, 2006a), the following issues are taken into account:

- Knowledge-based economy: fulfilling the promise of knowledge economy, responding to the challenge of attractiveness, creating effective models for knowledge exchange, and be ready for future challenge;
- Knowledge-based society: open for change and adaptation, internalizing a continuous innovation culture and mindset, willing to take political risks, and responding to knowledge leadership challenge;
- Knowledge-based infrastructure: responding to the digital divide, be respective of and protecting of intellectual property rights, forecasting and assessing future movement of technology, and good governance.

These factors are measured by a set of indicators (Table 2.9). As it shows, for each knowledge line, Amidon and Davis adopted several indicators. However, these indicators are useful when examining the knowledge lines separately, but take no consideration of the relationship between them.

Table 2-9 Measures of the Triple Knowledge Lens

Triple Knowledge Line Model		
Knowledge Economy & Knowledge Business Indicators	Knowledge Society, Community, & Culture Indicators	Knowledge Organization, Infrastructure, & Environment
Wealth in Intellectual Capital Index (WICI) = (WHCI+WRCI+WSCI)		
Wealth in Human Capital Index (WHCI)	Wealth in Relationship Capital Index (WRCI)	Wealth in Structural Capital Index (WSCI)
Knowledge-Based Economy Strength Index (KBESI)	Population Knowledge Motivation Index (PKMI)	Knowledge Enabling Technology Index (KETI)
Knowledge Markets Maturity Index (KMMI)	Creative Affinity Index (CAI)	Knowledge Ecologies Index (KEI)
Knowledge Based Business Innovations Index ( KBBII)	Knowledge Stakeholder Interactions Innovations Index (KSIII)	Principles, Policies, Practices, Processes, Innovations Index (7PII)
Key Performance Indices		

Source: Adapted from Amidon and Davis (2006b, p. 7)

The Triple Knowledge Lens model emphasises for the first time the importance of the balanced development of society, economy, and infrastructure. Nevertheless, a knowledge city is not only sustainable in these three dimensions but also cultural and environmental ones.

### **Ideopolis**

The Ideopolis is a framework developed by the Work Foundation (2005), a leading think-tank with research expertise both in political and commercial terms, for developing knowledge-intensive cities that will be driven by the creative search for and the application of ideas, thinking and knowledge and is firmly rooted in the creative transfer of ideas, to opportunities, to innovation and, eventually, to production.

This framework includes six key elements:

- New Economic Environment, in which entrepreneurship, innovation and knowledge are juxtaposed and are uniquely well suited to the environment of a knowledge economy;
- Talent Workers, whom Florida (2002) calls the creative class – a fast growing, highly educated, and well-paid segment of the workforce on whose efforts corporate profits and economic growth increasingly depend;
- Knowledge edge, a knowledge hub, probably a university or cluster of universities;
- Linkages, both physical and virtual accessibility and connectivity;
- Environments, physically attractive built environment and high quality and high amenity facilities that associated with high quality social provision, as well as high art and cultural milieu;
- Values and Dynamics, urban diversity – high level of tolerance for a wide range of people.

These key elements can be measured by analysing the nine Ideopolis drivers (Work Foundation, 2006c, p. 2):

1. Creating the physical knowledge city – having the architecture and accommodation that knowledge intensive businesses and workers require;
2. Building on what's there – recognising the city's existing strengths and weaknesses and playing to these
3. Diverse specialisation – having a diverse range of economic specialisms for which the city is known
4. High skill organisations – organisations that rely on the 'high road' to productivity through high quality jobs and highly skilled people
5. Vibrant education sector embedded in community and economy – one or more universities linking closely with the city and businesses, supported by good education institutions helping all individuals develop their skills
6. Distinctive 'knowledge city' offer – a distinctive offer for knowledge intensive businesses and workers who are considering investing, working and living in the city, supported by diverse cultural and leisure facilities
7. Leveraging strong connectivity within and outside the city-region – good communications infrastructure combined with quick links both within the city and to other cities via air, rail and road
8. Strong leadership around knowledge city vision, supported by networks and partnerships – civic or private sector leadership around the vision of a knowledge intensive city, based on strong networks across different industries
9. Investing in communities – investing in strategies to ensure the benefits of knowledge intensity are experienced by the whole community.

The nine drivers should work in conjunction with a complementary strategy that allows benefits to be experienced by the whole community, rather than by-passing those in deprived communities or with lower skills.

According to the framework, an Ideopolis can help cities to increase their knowledge intensity in driving economic growth and an improved quality of life. It offers national policymakers an insight into how the knowledge economy works at a regional and sub-regional level, and into the policy levers that facilitate knowledge-based cities and knowledge-based growth.

This framework however, draws on all of the cases from post industrial cities where some of these cities are striving to transform to a knowledge economy, even though not all cities can become Ideopolises. According to the Work Foundation (2006c), when examining a city using the Ideopolis framework, the following conditions must be

applied: having high levels of knowledge intensity (25 percent of its industries are knowledge intensive<sup>1</sup>); having niche strengths in more than one knowledge intensive industry; having 20 percent of high skilled workers in the workforce; having at least one vibrant university that is closely linked to the local industries and embedded in the local communities; having good ICT links and good transport links to an airport, railway station and nearby motorways; having something distinctive that is able to entice investors and knowledge workers, and being at the centre of the city-region.

Concerning the current research, because the focus is on the cities which are experiencing radical industrialisation which means that the preconditions that the Ideopolis required do normally not exist, this may make it not applicable as an analytical framework to the cases of developing cities.

### **van den Berg et al's (2005) analytical framework**

In the study of “European Cities in the Knowledge Economy”, van den Berg *et al* (2005) developed a research framework for analysing nine European cities which are regarded as being at the forefront of development towards knowledge cities. The research framework consists of two fundamental elements: foundations and activities of the knowledge city (Figure 2.14 next page). While the foundations of a knowledge city measure the cities’ infrastructure, the activities deal with the knowledge process in the context of the knowledge economy.

As shown in Figure 2.14, there are seven foundation stones that have been selected. The knowledge base refers to quality and quantity of tacit knowledge, codified knowledge, and knowledge infrastructure (Lever, 2002), and the presence of a creative class (Florida, 2002). Economic base refers to the diversity of urban economy. Quality of life includes quality of built environment, rich variety of cultural milieu, and quality of social facilities. Accessibility refers to both ICT connectivity and multimodal accessibility from globe, nation, region, and within the city region. Urban diversity means diversified groups of inhabitants. Urban scale refers to the size of cities. Social equity measures urban poverty and inequality.

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<sup>1</sup> See for definition of knowledge intensive industries in the Work Foundation, 2006b.

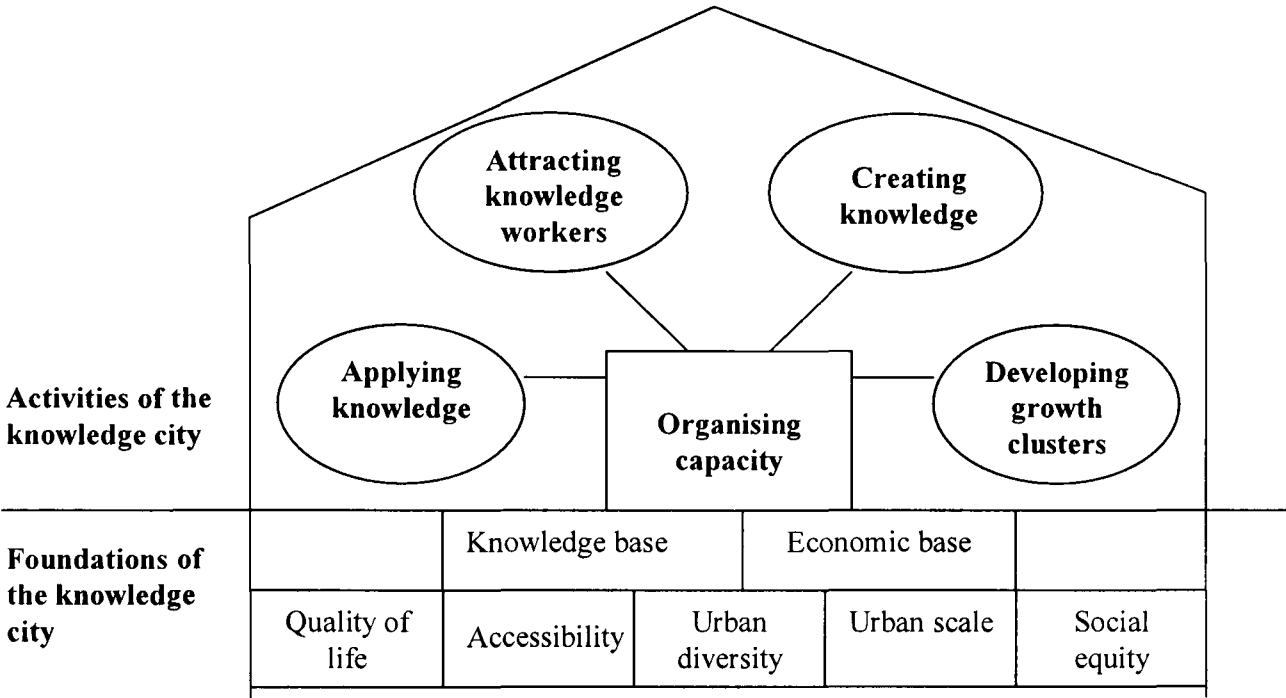


Figure 2-14 The foundations and activities of a knowledge city

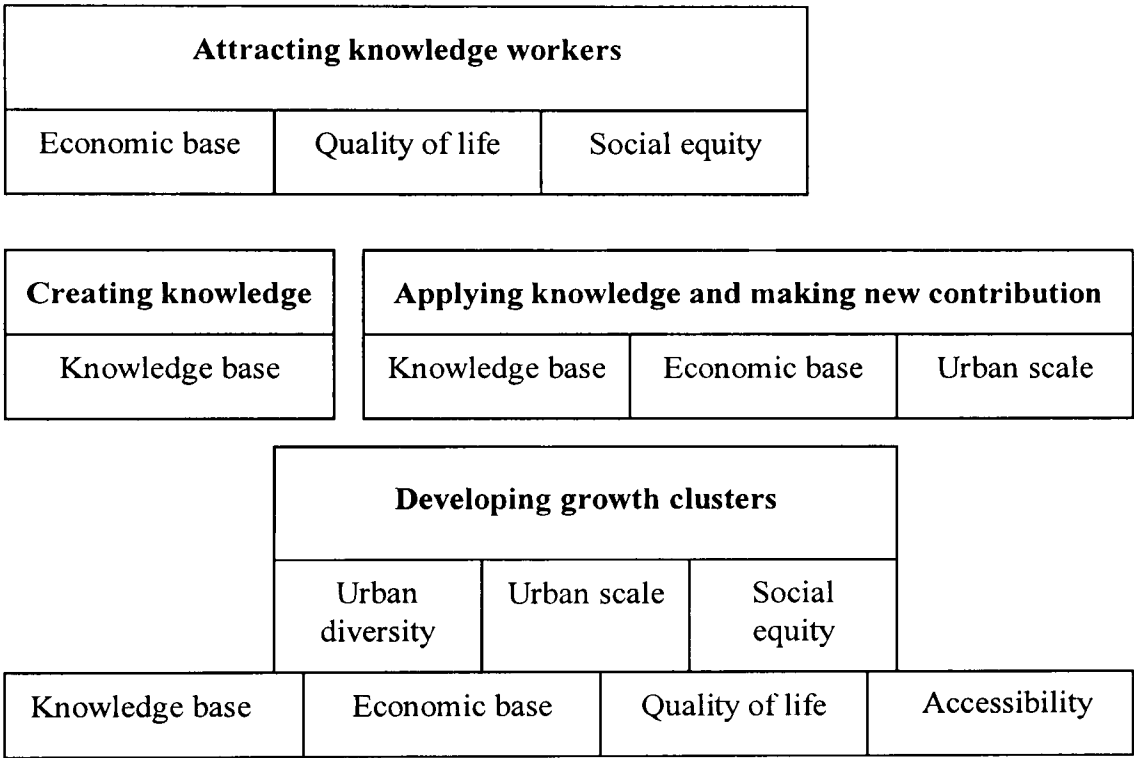
Source: Adapted from (van den Berg *et al.*, 2005, p. 16)

The framework distinguishes four core activities of a knowledge city: attracting and remaining knowledge workers, creating new knowledge, applying new knowledge and making new combinations, and developing new growth clusters. These activities need to be well organised involving the entire process from the identification of certain needs, through the development of strategies and policy, to the implementation of the policy and the monitoring of the results.

To ensure the success of these knowledge activities, the quality and quantity of the foundations of a city have to be sufficient and balanced to sustain the certain needs of a given knowledge activity (see Figure 2.15 in next page). This requires sufficient organising capacities involving the development of strategic vision, leadership, networks building, political, and societal support and communications.

Nevertheless, as stated in the purpose of their study, the focus of the research framework is on the economic development where the selected foundations (which are objectively important elements for knowledge cities), are used to serve the goal of economic growth.

However, since economic development is not an objective per se, but a means for achieving wellbeing based upon the culture and the conditions of certain populations (Pike *et al.*, 2007), the knowledge city, as defined at the beginning of this section, should not simplified to achieve the economic objectives only.



**Figure 2-15 Activities of a knowledge city and the necessary “building blocks”**

Source: Adapted from (van den Berg *et al.*, 2005, p. 19)

**“Ba”**

From the technological perspective, Baqir and Kathawala (2004b) developed a knowledge city model based on the construction of knowledge homes which are linked through a knowledge network (Figure 2.16 next page). The knowledge homes are built using a groundbreaking knowledge sharing and management system supported by the technological pillars that include intelligent agents, semantic webs, web services, ontologies and global computational grids. These knowledge pillars are futuristic applications that need to communicate with each other to give birth to a unified and



shared context of knowledge. The roof of this home, resting upon the knowledge pillars, demonstrates the provision of the shared context – “Ba” (Figure 2.17 next page). Ba is a Japanese word which means a place or a platform. Traditionally, Ba is a physical place providing a meeting place. It has now extended to include virtual spaces which can also provide platforms for the shared context of knowledge (Nonaka and Teece, 2001).

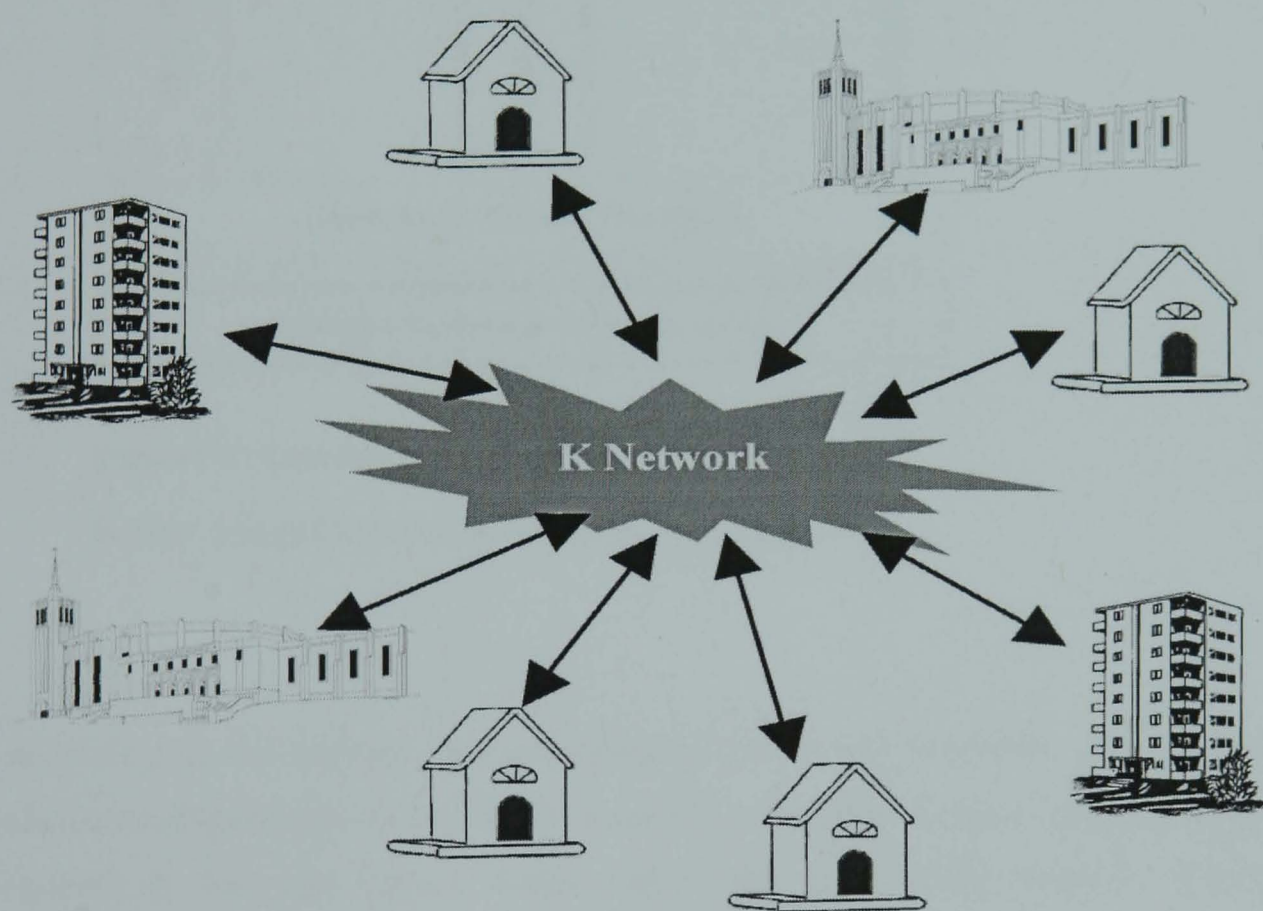


Figure 2-16 Ba for knowledge city model

Source: Adapted from Baqir and Kathawala (2004, p. 92)

The knowledge network consists of knowledge hubs, such as community computing, community networking, collaborative work sites, digital meeting places, electronic educational settings, social informatics, spatial information processing, virtual communities, and visualization, which incorporate the underlying building blocks of a knowledge city.

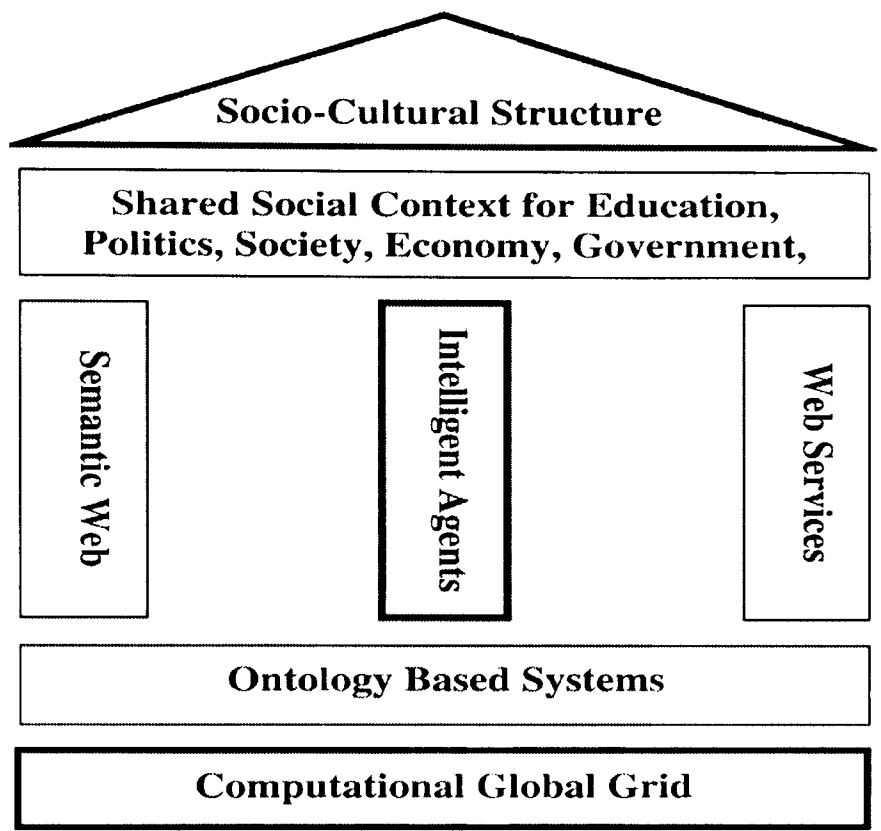


Figure 2-17 Knowledge home

Source: Adapted from Baqir and Kathawala, (2004, p.86)

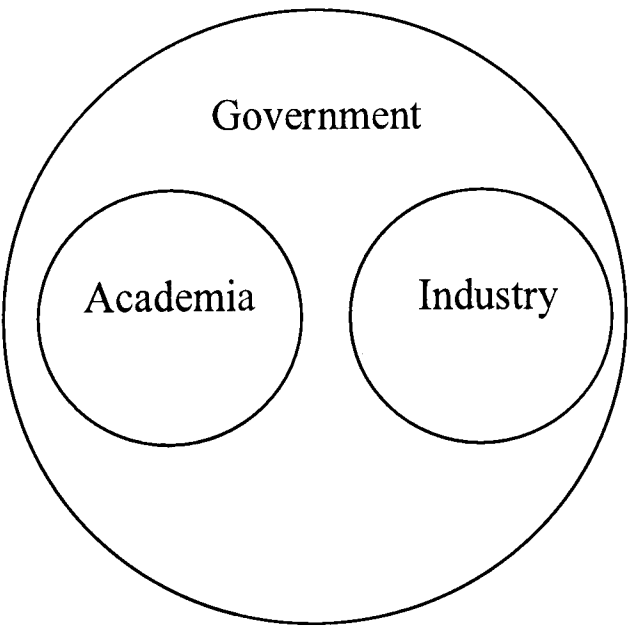
According to the authors, this technological model of knowledge city would meet the educational needs and determine the quantity and quality of socio-cultural interactions of citizens. It will also play a major role in the economical, political, governmental, religious, and environmental aspects of the citizens.

This model, according to the authors themselves, presents a remedy for the problems being faced by data and information overload and combines the best of the futuristic research in communication systems development. However, as noted by the UNESCO (2005), the emerging problem that the global knowledge society is facing is the digital divide. In this respect, Laszlo and Laszlo (2002) argue that knowledge is not used to empower the elite few who can access knowledge but to empower all so that they may engage in meaningful and sustainable forms of social organisation.

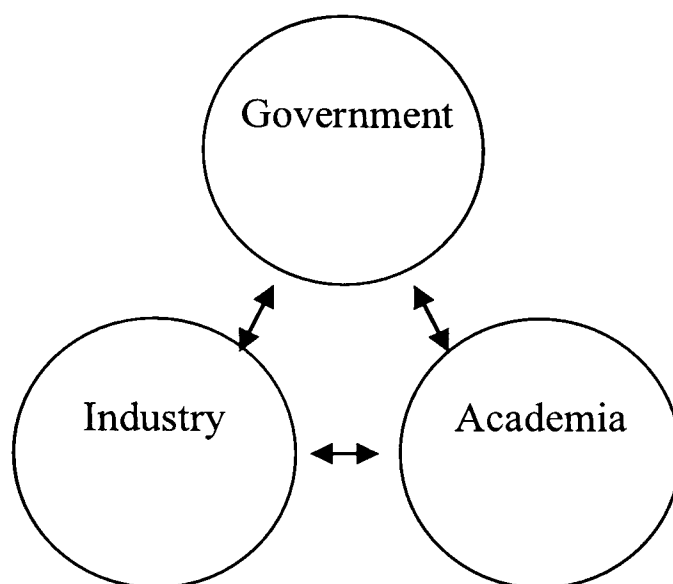


**Knowledge-based innovation systems and Triple Helix**

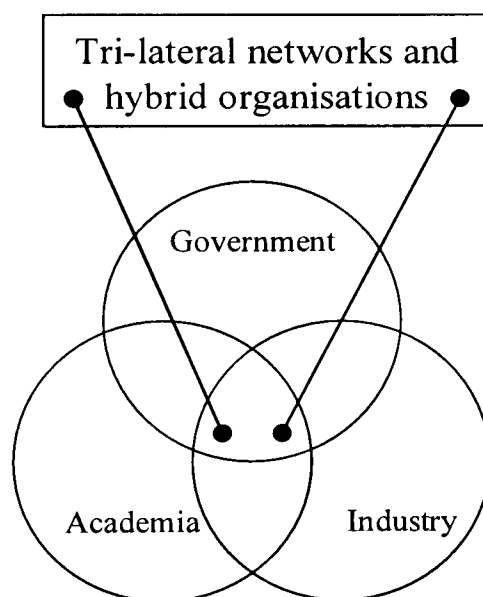
For Etzkowitz, Leydesdorff, and Klofsten (2005, 2000, 2001), the core of knowledge-based development is a knowledge-based innovation system which involves dynamic non-linear interactions of three core institutional spheres of government, industry and academia forming a key innovation network to transcend the existing techno-economic paradigms, known as the Triple Helix theory. According to the Triple Helix, there are three general patterns of relationships between the three institutional spheres. In the first, the government encompasses both industry and academia and directly mandates relationships between them (Figure 2.18). In the second, government, industry, and academia are separate institutions with strong borders and limited interaction (Figure 2.19 next page). The third pattern is characterized by institutional integration and normative convergence between government, industry, and academia (Figure 2.20 next page) (Etzkowitz and Leydesdorff, 1999). The active collaboration among these three institutional spheres generates a knowledge network, which overlaps institutional spheres, with hybrid organisations emerging at the interfaces.



**Figure 2-18 First pattern of relationship between government, academia, and industry**



**Figure 2-19 Second pattern of relationship between government, academia, and industry**



**Figure 2-20 The illustration of triple helix**

**Source:** Adapted from Etzkowitz and Leydesdorff (2000, p. 111)

According to Etzkowitz and Klofsten (2005), the triple helix model comprises three basic elements. First, it presumes more equal prominent roles for the university, industry and government in a knowledge-based society. Second, innovation policy becomes increasingly an “outcome of interaction rather than a prescription from government”,

which can be seen as a result of the collaborative relationships among the three major institutional spheres. Third, the institutional spheres of university, industry and government in addition to fulfilling their traditional functions, each “assume the role of others”.

The Triple Helix itself is a dynamic model in which each stand may relate to the other two which can develop an emerging overlay of communications, networks, and organisations among the helices (Etzkowitz and Leydesdorff, 2000). This implies a transition of culture in which the institutional spheres are no longer synchronised a priori and fitted together in a pre-given order, but generate puzzles for actors to solve.

The Triple Helix focuses mainly on the production, dissemination, commodification, and capitalisation of scientific knowledge in the context of the knowledge economy, which ease the knowledge process by cooperating over the creation and enhancement of knowledge intensive industries. Such cooperation can usually be found in the development of science and research parks, centres of excellence, incubators, and science cities. Nevertheless, in the context of the knowledge society, KBD goes beyond the Triple Helix interactions, involving significantly local communities to produce social, cultural and ethic knowledge, metaknowledge, and wisdom – “Model 2” knowledge (Carrillo, 2002, Gibbons, 1994, Graham and Dickinson, 2007, Laszlo and Laszlo, 2002, Nowotny *et al.*, 2003). The involvement of the local community changed once again from the roles that government, academia, and industry used to play.

### **Learning region**

The “Learning Region” as a theoretical construct “emerged out of a concern to channel insights from the broader literature on national systems of innovation into a new regional science” (MacKinnon *et al.*, 2002, p.300) as a consequence of the emerging learning economy, where knowledge becomes the most important strategic resources and learning the most important process (Lundvall, 1992). Here the emphasis was placed upon tacit knowledge, which Lundvall (1992) sees it as collective in nature wedded to its human and social context. By bringing together innovation studies and economic geography, Storper (1995) rejected the argument which claims that the world has been reduced to a “placeless” entity by the globalisation, and argues that the region has assumed central theoretical status in the process of capitalist development, where untraded

interdependencies play a vital role in the process of economic and organisational learning and co-ordination. From this perspective, the learning region is differentiated from other ordinary regions as being able to provide facilities for collective learning. The process of collective learning, on the one hand, makes the creation and transmission of tacit knowledge easy through close interpersonal and interfirm relations (Morgan, 1997, Storper, 1997), and further stimulates agglomeration on the other. The crucial factor that underpins collective learning is trust (Morgan, 1997). Such a relation may extend beyond the dynamics of individual optimisation which formed the basis of neoclassical conception of economic exchange (MacKinnon *et al.*, 2002).

From a policy perspective, the concept of learning can be applied both to less favoured regions and more advanced ones. While Morgan (1997) focused on the former, Florida (1995, p. 528), from an economic perspective, defines learning region as

function as collectors and repositories of knowledge and ideas, and provide an underlying environment or infrastructure which facilitates the flow of knowledge, ideas and learning. Learning regions are increasingly important sources of innovation and economic growth, and are vehicles for globalization.

Based upon this definition, Florida (1995, p. 533) presents a set of features for learning region, as below:

- Sustainable advantages based on
  - Knowledge creation
  - Continuous improvement
- Knowledge based production
  - Continuous creation
  - Knowledge as sources of value
  - Synthesis of innovation and production
- Firm networks and supplier systems as sources of innovation
  - Knowledge workers
  - Continuous improvement of human resources
  - Continuous education and training
  - Globally oriented physical and communication infrastructure
  - Electronic data exchange

- Mutually development relationships
- Network organisation
- Flexible regulatory framework

These elements are actually partial conditions of the “learning region” defined by Florida. The “region” here is rather a spatially concentrated industrial innovative milieu, which in favour of post-industrial cities. From a development perspective, these conditions are emphasising more on “what is there” rather than the “process of learning”.

In relation to the current research, the idea of collective learning as a process of knowledge creation and dissemination is meaningful only if it is directed for social inclusion. However, as Morgan (1997, p. 501) noted, it was “not designed to do so”.

### **Knowledge cluster**

In addition to the above theories, approaches, and models, knowledge cluster has also been used to help the understanding of knowledge city. Scheel (2002) proposes a knowledge cluster framework (Figure 2.21 next page) which sees knowledge city as an agglomeration of a variety of knowledge clusters. From an economic perspective, a knowledge cluster is capable of gathering and empowering firms from the industrial sector to develop necessary clusters for easing knowledge creation, dissemination, and application. This framework empowers firms to: reach competitive leverages; link and align knowledge clusters to their empowerment external drivers (namely, academia, banking, complementary industries, and government); benchmark the cluster performance against the best practices and learn from the gaps; and lead and integrate the well performing clusters into world class value systems.

This framework, as it stated, was developed based upon the notion of industrial cluster, which assumes that spatial proximity plays an important role in facilitating knowledge transfer. However, as argued by some authors, the cluster alone will not work successfully without the presence of attractive cultural and social environment. From this perspective, therefore, knowledge cluster can only partially explain the feature of knowledge city.

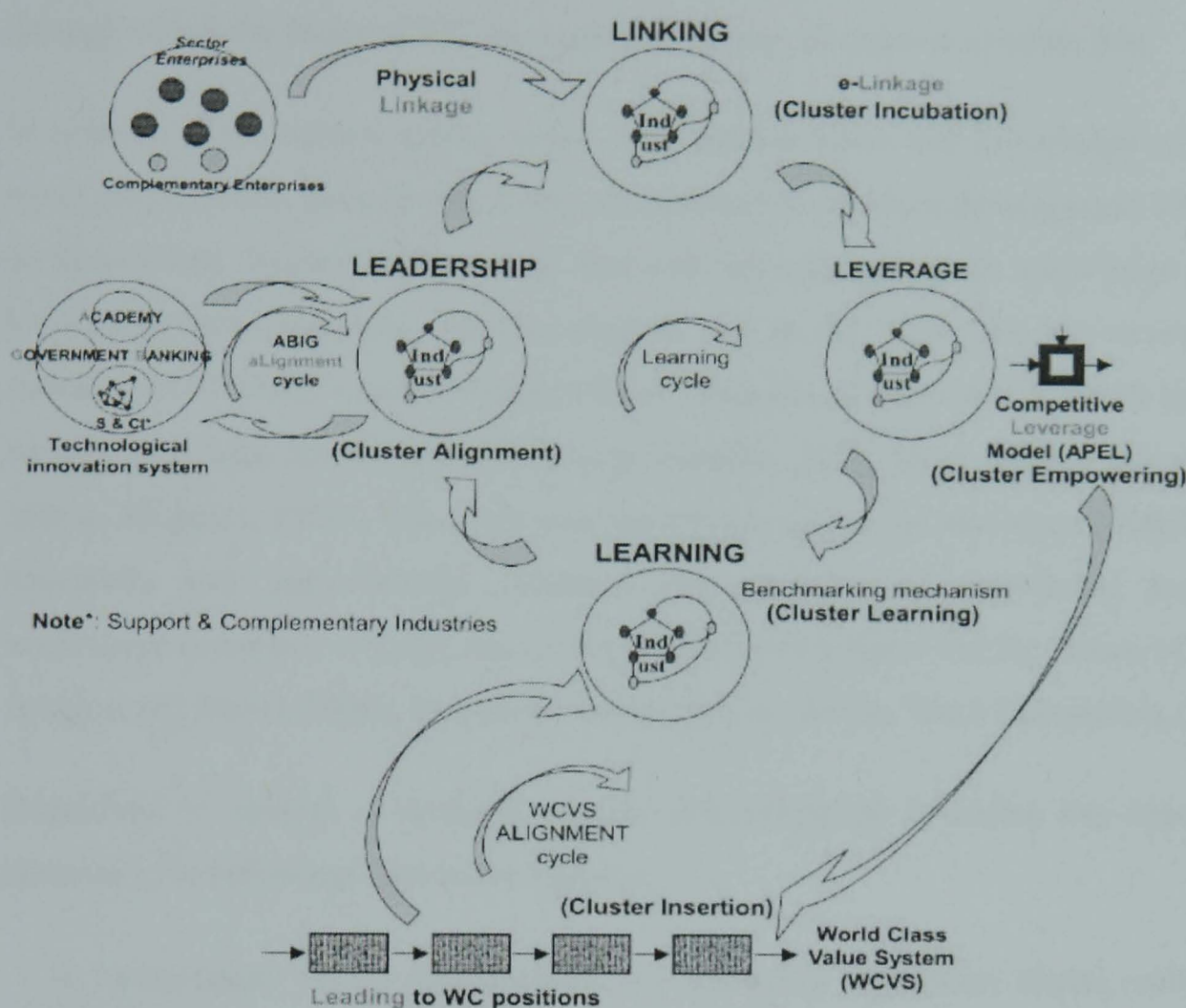


Figure 2-21 Knowledge clusters of a knowledge city

Source: Adapted from Scheel (2002, p 358)

### 2.5.3 Synthesis of literature on knowledge city

This section has examined the current state of work on knowledge city. It first reviewed definitions given to the emerging concept and its distinctive features. The 10 well cited approaches and analytical frameworks were then scrutinised. Given knowledge city is an emerging area of study, there is no commonly accepted definition for it. Most authors start their studies with defining what they mean by the knowledge city. Nevertheless, because the concept is so comprehensive, each study has drawn only a small part of the picture. Drawing on the literature, the concept of knowledge city is understood generally from two perspectives: technological (narrow sense) and socioeconomic (broad sense). In the narrow sense, some authors refer to it as the presence and involvement of ICT in the city, as evidenced by the studies on digital city, intelligent city, dot.com city, smart city,

Ba, internet city and so on. In this regard, knowledge city is a technological advancement, through which the fruits of ICT are applied to almost all aspects of urban life.

In contrast to the narrow stance, some other authors claim that knowledge city is not a novel phenomenon but a revolutionary transformation of urban development which relies on knowledge. Studies in this stance deal with knowledge capital, knowledge corridors, knowledge hubs, Ideopolis, learning regions, and so on. There are two streams in this stance. One of which sees knowledge city as a process of urban development that aims to sustain long term human betterment (e.g. Carrillo, 2006, Dvir, 2006, Ergazakis *et al.*, 2006a, Michaud, 2003). The other sees knowledge city as an outcome of KBUD, which physically and institutionally combines the attributes of knowledge society and knowledge economy, to offer one of the desirable paradigms for the future of city (e.g. Amidon and Davis, 2006a, Bounfour and Edvinsson, 2005a, Work Foundation, 2005).

Regardless of stances or streams, studies that attempted to define the concept have presented the following distinctive features:

- knowledge city is purposefully for balancing economic, social, cultural, and environmental development in a sustainable manner based on sophisticated use of knowledge -- wisdom;
- a knowledge city will provide an attractive visible and invisible environment and offer high standards of life;
- promote social intelligence through constant knowledge creation, transmission, and utilisation;

According to the current literature, to be a knowledge city, a city must operate on knowledge economy, though the definition of knowledge economy remains unclear. At the same time, the city must also have a first-class knowledge infrastructure, a critical mass of knowledge workers, a cultural environment that values knowledge and a sound entrepreneurial and business culture that provide more rewarding and well-paid employment. All of these are led by a strong leadership with a political will committed with a strategic vision to lead the knowledge-based development.

Majority of the 10 approaches or analytical frameworks reviewed in the current study are either economic centred which assume knowledge city for the purpose of knowledge economic growth or focused on a specific aspect of knowledge city. In both cases there are many questions remained unanswered, among which the following four are important. The first is what kinds of knowledge are needed and how they are used for the making of knowledge city. Although studies on the knowledge society have extended the definition of knowledge to include all types, it has not been clearly addressed in the study of the knowledge city. In many cases, authors limited it to scientific or codified knowledge. The second fundamental question is about knowledge city for what. This is a question which should be answered preliminarily to defining the concept, but unfortunately not, which resulted in the situation where there is a confusion on whether knowledge economy for knowledge city or contrariwise. The third question is knowledge city for whom. Many studies emphasise the presence of knowledge elites and how the city should create an environment that is in favour of those knowledge elites, while little has been written on how knowledge city should engage people of the whole community as opposed to creating isolated, gated, and excluded centres for knowledge elites. Last but not least, knowledge city for where, this is another confusion in the literature that whether knowledge city can be developed from the basis of well developed (post-) industrial city or not necessarily so. Drawing on these points, the current study is motivated to answer these questions.

## **2.6 Chapter summary**

This chapter reviewed a wide range of literature from the debate of knowledge concept and development, knowledge economy, knowledge society, knowledge-based development, to technopoles and knowledge city, which are all argued to be closely related to KBUD. In particular, great attention has been made to review the literature on two successive forms of KBUD: technopoles and the knowledge city. The review has developed the researcher's understanding of KBUD.

Drawing on the variety of disciplines of the existing literature, it can be observed that KBUD, in particular, knowledge city has been regarded as a form of urban development that fully correspond to the needs of balancing social, cultural, economic, and environmental development in a sustainable manner, though literature on KBUD itself



has not been well developed. In fact, some important questions, such as those mentioned in section 2.5.3, regarding how knowledge is understood and defined for the needs of KBUD; what and whom the KBUD is for; and where or which city can go for KBUD, remain unclear. More often, studies into KBUD tend to limit the meaning of “knowledge” to “model 1” knowledge production and bias KBUD with knowledge-based economic growth. Although some studies do mention the social and cultural benefits of KBUD, they generally failed to answer the question of “how”.

Combining the findings from literature on understanding of knowledge, development, knowledge society, and other related emerging areas, the concept of KBUD can be refined as to embrace all types of knowledge, the wisdom, to rule development behaviour in a sustainable manner. The development of knowledge city is about engaging people of the whole community to make consensual efforts to the fair distribution of knowledge so that it can benefit all. Based on this definition, this study argues that the need for knowledge for the making of knowledge city should include all types of knowledge, the wisdom. In this regard, any attempt to limit knowledge to a certain type will bias the concept of KBUD. The second argument this research has made is that the knowledge city is the advanced form of KBUD, which embraces the concept of both the knowledge society and the knowledge economy in a broad sense. Regarding the question of knowledge city for whom, it argues that the fundamental of knowledge city lies in its justice and inclusion. It is developed equally for all members of the whole community.

Building upon the above arguments, the following four themes are argued as being central for cities to develop toward KBUD:

- Local definition of knowledge for development: understanding the holistic meaning of knowledge and defining it for development. The need for knowledge for development should include all types of knowledge and need to be used for the great collective of interests.
- Development activities need to address not only economic growth but broad dimensions including social, cultural and environmental aspects. Only if development behaviour corresponds fully to the challenges posed by the results of unsustainable development in the past, it can enhance the sustainability.

- The crucial point is to develop a cohesive environment, which encourages the engagement of whole community for fairly creating, transmitting and utilising knowledge for upgrading urban development behaviour toward the sustainable manner. This kind of environment may be called “knowledge environment”, which involves improving the quality of place, fostering a knowledge culture, and building a reliable knowledge base. The quality of place as addressed in the literature refers to an appealing and high quality urban environment for all people to stay, live, learn, and work. Knowledge culture is distinguished as a value in which the pattern of knowledge creation, transmission and utilisation is conducive to the transformation into knowledge society. Different from cultural products, knowledge culture is social beliefs, attitudes, and socially transmitted patterns. The reliable knowledge base is to provide knowledge that is needed by development activities.
- Establishing institutional mechanisms and policy frameworks for synergising knowledge resources to serve development activities. As affirmed by many authors, knowledge resources are valuable only if they are put in use effectively for development activities. This requires a consensus among all players working together to develop a vision and to act cooperatively to facilitate knowledge creation, transmission, and utilisation.

Local understanding of knowledge and defining it for development is a foundation and a pre-condition for KBUD. Only if all types of knowledge are integrated for the great consensual efforts of development toward sustainability, can it become KBUD. As “local and regional development has recently broadened to encompass economic and social as well as environmental, political and cultural dimensions” (Pike *et al.*, 2006, p.253), a city’s development efforts addressing such dimensions is paramount. Given the above refined definition of KBUD, a quality knowledge environment is both a pre-condition for a city to develop toward KBUD and the outcome for all of its members to share. Meanwhile, establishing and developing efficient institutions and policies play the leading and organising role in mobilising and utilising internal and external knowledge resources to balance development dimensions and create a cohesive knowledge environment. These themes and sub-themes will serve as an initial framework for the current research to conduct empirical analysis in its later stages.

In order to properly fulfil this purpose of the current study, a reliable approach through which the research can be conducted is required. The next chapter will therefore present a detailed discussion of the choice of research methodology to ensure the research aim and objectives are fully achieved.

## **3 Research methodology and methods**

### **3.1 Introduction**

In chapter two, existing literature on knowledge, development, knowledge society, knowledge economy, forms of KBUD, and so on, have been reviewed. Building upon the research gaps identified, research questions for this study emerged. Nevertheless, in order to achieve the research objectives, there is a need for a reliable approach through which the research questions can be answered. In order to do so, this chapter moves the discussion onto methodological and method issues that will be applied to this research. It starts with a discussion of the choice of research strategy, in which the researcher presents a detailed justification of why a case study following a qualitative method is the most suitable way to conduct this study. Drawing upon this choice, a design of the research process is justified. Much of the discussion is concerned with the way in which the author collects appropriate data to explore the research questions. This is followed by the consideration of the methodological limitations.

### **3.2 The choice of research strategy**

#### **3.2.1 Research strategies in social science**

According to Bell (1999), when deciding to conduct a research project, the first important thing that needs to be done is to decide how the research can be carried out. There are several ways of conducting social research such as experiments, surveys, histories, analysis of archival information, and case study. Each of them has specific applications. The choice of research strategy depends on three conditions (Yin, 1994, p. 5-11):

- The type of research questions posed;
- The extent of control an investigator has over actual behavioural events;
- The degree of focus on contemporary as opposed to historical events

Research questions fall into the five basic categories of “who”, “what”, “where”, “why”, and “how” (Hedrick *et al.*, 1993). Different types of questions that a research is focused on indicate the different inquiries, and therefore require different strategies to fulfil the research endeavour. For instance, “what” questions are justifiable rational for exploratory studies where surveys, experiments or case studies can be used as the inquiry strategies; “who” and “where” questions are likely to favour survey strategies or the analysis of archival records, whereas “how” and “why” questions are more explanatory in nature and are likely to lead to conducting case studies, histories and experiments study.

When considering the position of researchers to the objects being studied, if researchers can control behaviour or their behaviour has an influence upon the objects, the experiment strategy<sup>2</sup> is preferred, otherwise survey, history, archival analysis and case studies are thought to be relevant (Yin, 1994). Furthermore, while the use of experiments, surveys, case studies, or archival analysis is likely appropriate for the research focusing on the contemporary phenomena within some real-life contexts, the study of historical events may favour a history strategy.

Overall, the current research investigates a contemporary phenomenon – knowledge-based urban development. The research questions have been defined mainly as the “How” and “What” questions as outlined in chapter one. However, while the inquiry stresses the “how” and “what”, other substantive phenomena may be hidden behind the “Why” question. This is also acknowledged as being necessary for the sake of the research focus. Given the social nature of the study, the researcher is regarded in no way to control the social movement. Case study is therefore considered to be an appropriate research strategy.

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<sup>2</sup>In the case of real world research, “social experiment” has emerged to allow researchers undertaking a field trials design to evaluate complex social phenomenon. See, for detailed discussion, in Boruch and Foley (2000).

### 3.2.2 Case study as the research strategy

#### 3.2.2.1 *Rationale of the case study approach*

Having discussed theoretically the justification of the case study, there is a need to consider its validity in practice. According to Gilgun (1994), case study is useful to study problems in depth, to understand the stages in processes, or to understand situations in context (see, also in Greene and David, 1984, Yin, 1989). For the current research in particular, firstly, case study has long been in favour with researchers undertaking urban studies. The best example can be traced back to 1929 when Lynd Robert and Lynd Helen spent one and a half years investigating American life in a medium-sized city. The final report of the study takes 550 pages to present the social life in the Midwestern United States which covers six major topics include getting a living, making a home, training the young, using leisure, engaging in religious practices, and engaging in community activities. The resulting work has been very successful and is still in print, even today (Yin, 2004). Other studies into complex urban phenomena have too chosen case studies as the inquiry strategy (e.g. Knight, 1995, van den Berg *et al.*, 2005, Work Foundation, 2002). The current study puts knowledge in a wide context in cities in different situations, aiming to receive insights about how cities interpret and respond the global KBUD movement. It covers a wide range of interrelated aspects upon which a city is seen as a complex social entity. In order to gain a holistic understanding of the arts, it is argued that the best way is to analyse cities in their real-life context.

Secondly, since the current study investigates how cities act toward KBUD, it involves first of all exploring knowledge-based activities taking place in cities. However, it is argued that there is no single template through which the art of knowledge-based activities can be explained because each city has its distinctive features. This implies that there is a need to understand the contextual elements such as the institutional, historical, and cultural contexts which may play an important role in a city's knowledge activities. Taking a city as a case to analyse its knowledge activities within its unique context, is therefore crucial for the current study.

Another practical reason for adopting case study over other research strategies such as experiments and surveys lies in the constraints of these options which are unable to reflect and support the research purpose. As has been discussed, the current research

requires the researcher to understand knowledge-based activities within the wide context of a city. This involves collecting a variety of data which are contextualised in nature, whereas survey research is often limited to focusing on influencing factors which were pre-hypothesised from a positivist perspective, collecting systematically quantifiable data in respect to a number of variables which are then examined to discern patterns of association (Bryman, 1989). This may prevent the researcher from exploring the full richness and variety of issues involved in a city's knowledge activities, consequently lead to wrong or inconsistent conclusions. As such, experimental research investigates cause-and-effect relationships between inputs and outputs which can be established through experimental designs (Bryman, 1989). The current research aims to explore how knowledge is understood and used by a city. Because knowledge-based activities exist everywhere and involve various interrelated factors, and a city's development needs these factors combined together to engender the driving force, it is hardly to limit to selected factors to examine their causality. Similarly, this study is set to concentrate on the contemporary social phenomena – a city's historical background may have a heavy impact on how the city uses knowledge. Likewise, archival analysis may be necessary for this research, but this can only help in analysing codified knowledge. As knowledge can also be tacit/implicit and the use of this kind of knowledge is often unrecorded, the use of archival analysis in this regard is therefore unhelpful. For this reason, archival analysis can only serve as part of the research strategy.

In summary, a case study approach has been argued as the most appropriate research strategy for this research. However, this does not mean the methodological consideration has been completed for the study. In fact, a case study can be either positivist based, that is, on the use of quantitative methods or constructive/interpretive which are qualitative in nature (Gilgun, 1994), or a mix of both (Yin, 2003, p. 15). For this reason, a discussion regarding quantitative and qualitative methods is needed so that the most suitable research method can be obtained.

### ***3.2.2.2 Research methods***

In the academic tradition, there has been a long and sharp debate between quantitative and qualitative research. According to Yin (2003), the distinction between them was originally not on the basis of the types of evidence but on the basis of wholly different

philosophical beliefs (see also in Huberman and Miles, 2002, Smith and Heshusius, 1986). The distinction of the philosophical paradigm has been discussed briefly in the previous section. Here, the intention is to look at the different uses of the two methods.

Quantitative methods in urban studies tend to use surveys and/or other aggregate data to test certain hypotheses where influencing factors were pre-arbitrarily selected (e.g. Denters, 2002, Eldersveld *et al.*, 1995, Mourizen and Svara, 2002, Rose, 2002). The problem within this method, as noted by John (2005), is the difficulties of gathering comparable data and the more ambitious studies, the more comprehensive data would be collected. For the current research, as it tends to address knowledge activities in a whole range of a city, it would be impossible to arbitrarily select favourable factors while ignoring others.

On the other hand, a qualitative methodology appears to be appropriate when research that elicits multiple constructed realities, tacit knowledge and subjective understandings and interpretations, delves in depth into complexities and processes, and seeks to explore where and why policy and local knowledge and practice are at odds (Lincoln and Guba, 1985, Marshall and Rossman, 2006). Within urban studies, the city as an object of analysis has been unbound. Approaches relying on qualitative methods have expanded the range of disciplines and perspectives that scrutinise the whole urban setting in recent decades. Notably, Jacobs (1993) argues that as a qualitatively different place, the city is now open to the qualitative approaches of those working within interdisciplinary fields.

Taking the above discussion into account, when exploring the whole range of knowledge activities in a city, to understand and interpret multiple interrelated realities become central. This requires the researcher to probe thoroughly into the complexities of the real-life and typical meanings contained within them. This is thought to be exploratory in nature. To be consistent with interpretivism, the qualitative methodology would be more appropriate to answer the research questions than the quantitative one.

### ***3.2.2.3 Techniques for data collection***

Following the qualitative approach, there are several methods to collect data. For case studies, it needs to rely on a variety of sources rather than being limited to a single source of evidence (Yin, 2003, p. 85-97). Considering the current research focus, multiple



sources of evidence are needed regardless of primary or secondary sources (Blaxter *et al*, 2002, Brewer and Hunter, 1989). To ensure the chosen method is adequate to answer the research questions and consistent with the strategy outlined earlier in this chapter, this research employs the analysis of archival records and documents, observation, and interviews as the data collection techniques.

Analysing documentary and archival sources of data is widely used for various types of urban research (Andranovich and Riposa, 1993, Murphy, 1980). Documentation and archival records can take many forms such as communiques, agendas, announcements, administrative documents, computer files and records (Yin, 2003). In this study, policy documents, corporate websites, strategic documents, websites, newsletters, journals/articles, organizational charts, internal memos, presentation materials, and publications are collected under the explicit data collection plan. These data are analysed and used for triangulating the interview findings.

Observation is one of the data collection techniques in the social sciences since the second half of the 20th century (Webb, 1966). Webb presents that observation is to focus “on situations in which the observer has no control over the behaviour or sign in questions and plays an unobserved, passive, and non-intrusive role in the research situation” (Webb, 1966, p. 112). The use of observation permits a lack of “artificiality or reactivity” so as to be able to garner precise and reliable information about naturally occurring events and episodes (Gillham, 2000, Lee Raymond, 2000). Moreover, continuous observation can provide a comprehensive in-depth picture of a particular setting over time (Bailey, 1996). Observation is adopted in this research to complement the interview and documentary analysis.

It is perceived that one of the most important sources of case study information is the interview. It is particularly useful for researchers to probe deeply and solicit expansive responses, thereby uncovering hidden details which may open up new lines of enquiry (Burgess, 1982). According to Kahn and Cannell (1957), the interview is a relatively informal style that involves two or more people in a conversation or discussion. Unlike the “question-answer” format, a qualitative interview is more active and interactive between researchers and informants and thus makes it highly attractive for the collection of qualitative data (Bryman, 2001). There are many different types of research interview.

In case study research, the most recognised categories are open-ended/unstructured interviews, focused/semi-structured interviews, and structured interviews (Bryman, 2004, Yin, 1994).

The open-ended interview gives interviewees the opportunity to talk freely about the case. However, it has been criticised that open-ended interviews are very complex and hard to control (Bryman, 2001). Mason (2002, p.62) argues that the term ‘unstructured’ interviewing is a “misnomer” because “no research can be completely lacking in some form of structure”. It may be too risky to adopt this technique for new researchers who are unlikely to be able to control the interview effectively.

Structured interview is along the lines of a formal survey (Yin, 2003). It is ideal when answers appear to be “yes” or “no” and a score in a “lineal-scale” manner and can be undertaken within a group or simply mail-out. Such interviews are likely to produce quantitative data. As has been discussed in the previous sections, it is not suitable for this study because it does not give the researcher the opportunity to probe deeply in order to discover the stories behind the informants’ experiences. In this sense, it is not appropriate either for the current research.

In contrast, the focused/semi-structured interview is characterised as a “guided conversation”. Within this type of interview, although the researcher pursues a consistent line of inquiry, the stream of questions is likely to be fluid rather than rigid (Rubin and Rubin, 2005). Throughout the interview process, it still remains open-ended and assumes a conversational manner, but following the lines of inquiry guided by a certain set of questions which themselves are derived from the research protocol (Merton *et al.*, 1990). By adopting this kind of interview, on the one hand, will allow researchers to approach the full richness and variety of issues involved in the cases being studied, and may help to avoid the risk of being overly dependent on the interviewees (Yin, 2003). For this reason, in relation to the current research questions, this study adopts the focused interview as the main method to collect data.

### **3.3 Research design**

Designing the process of research is guided by the chosen research strategy which is justified earlier. It involves how research data is to be collected and analysed to answer

the research questions. Having chosen the case study as the research strategy, the current research is designed to follow a case study process suggested by Yin (2003). The design provides a guideline for the researcher to conduct this research consistently throughout the whole research process (Figure 3.1). As it shows, the researcher's personal knowledge in conjunction with preliminary literature search helped to generate the research questions, which are then used to guide a critical review of literature to gain a further understanding of this field of study.

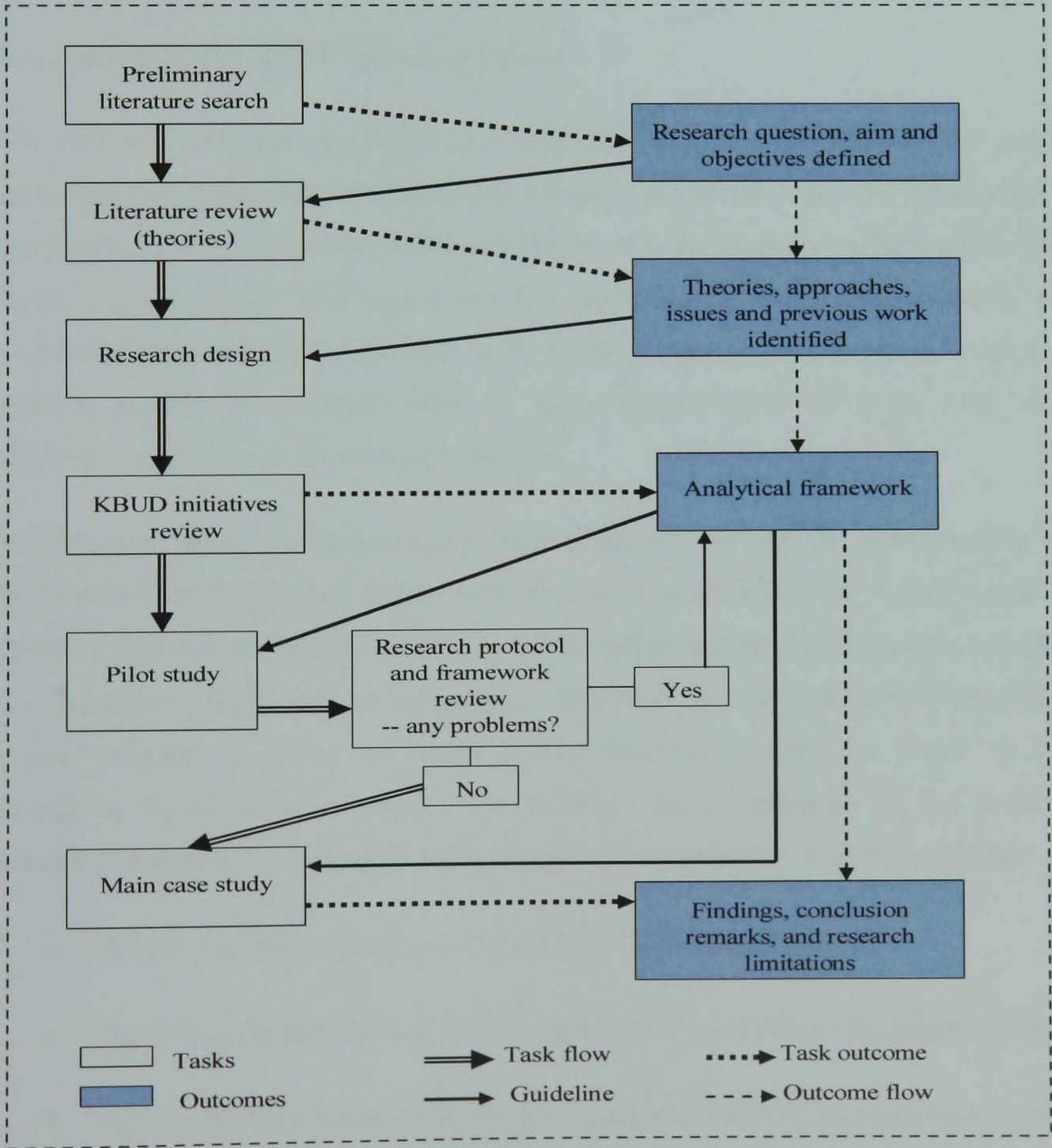


Figure 3-1 The illustration of research process

### 3.3.1 Literature review

A comprehensively detailed review of literature is always important for research in the social sciences (Bell, 1999). For the current research, it is argued to be indispensable for two reasons. Firstly, as an emerging field of study, there is no concrete theoretical foundation that has been made available. Therefore, a literature review will help the researcher to gain a holistic understanding of what the KBUD is about and what is the state of previous work. Secondly, based on the critical review of literature, it will help the researcher refining the research questions.

### 3.3.2 International KBUD initiatives review

The review of literature in chapter two identified there is a lack of empirical research exploring the general trend of KBUD movement in the global scale. However, under the circumstance of globalisation, urban development is increasingly influenced by global trends. For this reason, it is argued that any attempt to study KBUD must be put in the context of global trends. For the sake of the current research interest, therefore, there is a need to conduct an empirical study on international KBUD initiatives prior to the Chinese case studies to fill in the research gap.

Nevertheless, given the PhD research project, considering that the main purpose is to study KBUD in the Chinese context as well as the concern of limited time and costs, the study of international KBUD initiatives will be based on the secondary data. Thanks to the compilation work done by Gonzalez *et al* (2004) and the Entovation International, which compiled the most successful KBUD initiatives worldwide. Based on these resources, 79 cities were audited. The process was co-ordinated by the search of empirical studies and maintained that each case had to satisfy the following criteria:

- The city has been working on the initiatives towards KBUD;
- The detailed information of KBUD initiatives is available in the English language;
- The city has been studied empirically in relation to KBUD elsewhere (available in existing literature);
- The city is willing to help accessing information if necessary.

Additionally, considering the intended main case study cities are going to be regional centre cities rather than national capital cities or global cities, the selection of international cases should also adhere to this stipulation.

After a careful screening process, Manchester, Newcastle upon Tyne in the UK, Austin in the United States, Munich in Germany, Delft in the Netherlands, Barcelona in Spain, Singapore, Melbourne in Australia, Hsinchu in Taiwan, Cyberjaya in Malaysia, and Dubai in the United Arab Emirates were selected to conduct the review. The results are presented in Chapter four.

### **3.3.3 Pilot study**

Pilot studies are common to test the validity of the questionnaire in quantitative research. However, it has also been found useful and even ‘invaluable’ in qualitative research (Sampson, 2004). In fact, regardless of quantitative and qualitative research, a pilot study has been widely used to refine and develop research instruments (Gillham, 2000), frame questions (Ball, 1993), or collect background information and adapt the research approach (Fuller, 1993). Bell (1999) observes that it is essential to give the project a trial run, otherwise there is no way to ensure the research is running successfully. In a case study research, Yin (1989) suggests that a pilot case helps researchers to refine the data collection plans with respect to both the content of the data and the processes to be followed as well as conceptual framework of the research. In addition, the provisional findings from the pilot case can be also useful in establishing a chain of evidence for the research (Glaser and Strauss, 1967). A pilot case study was designed in conjunction with the current research strategy to allow the researcher to:

- Identify reliable sources of data and key informants;
- Assess the reliability of selected data collection techniques;
- Assess the appropriateness of the selected data analysis techniques;
- Further develop understanding on the subject in its real context.

The city of Zhengzhou (China) was chosen to conduct the pilot case study for the following reasons: a) Zhengzhou is a typical provincial capital city whose development

has been influenced entirely by the central government's regional policy; b) the city is in the process of transition, in which traditional manufacturing industries are shrinking whilst new manufacturing and services industries are growing with the emergence of knowledge intensive industry; c) the city is the researcher's hometown where he used to work as a planning officer in a government department, thereby making access to informants much easier. The result of the pilot case study is presented in chapter six.

### **3.3.4 Main case study**

The preparations undertaken in the previous stages enabled the researcher to conduct the main study with clear directions. Firstly, the research framework derived from the review of literature and KBUD initiatives worldwide has been tested and refined through the pilot study. Secondly, the key informants were defined and the time of completing each interview has been checked. Thirdly, data collection techniques have been tested during the pilot study, and finally, the appropriateness of the data analysis techniques chosen for this research has been ensured. Based on these preparations, the researcher commenced the main research. This section discusses the process of the main study and explains how the data collection and analysis activities were properly organised in helping the researcher to achieve the research aim and objectives.

#### ***3.3.4.1 Multiple vs. single case study design***

When it comes to the main case study design, the first issue comes to the researcher's consideration is whether it should be a single-case or multiple-case design. Indeed, each has significant strengths and weaknesses (Yin, 2003). A single-case design is eminently justifiable when the study falls into one of the following: a) A critical test of existing theory; b) A rare or unique circumstance; c) A representative; d) Revelatory; e) Longitudinal purpose. A multiple-case design is chosen when the study involves more compelling evidence to robust the research findings (Herriott and Firestone, 1983).

Given the fact that China is such a big country where there exists regional disparity, a single case will not be able to represent the whole circumstance. In order to achieve the research aims and objectives, a multiple-case study is therefore argued to be necessary.

### **3.3.4.2 Cases selection**

There are more than 660 designated cities in China (NBSC, 2007) and over 100 cities have announced to develop knowledge-based creative cities (Wang and Cui, 2006). Each is characterised by its distinctive culture and development status. However, except a few world class cities (such as Beijing and Shanghai), the rest can be categorised into three groups according to their social and economic state (Zhu, J., 2004): the eastern coast region, the central region, and the western region. This classification is often seen as the basis for national development policy making (e.g. the National Five-Year Development Plan, 2001, 2006). Accordingly, any attempt to understand China's contemporary urban development must include all these three regions as a whole. In this regard, the researcher chooses one typical city from each of these three regions as a representative to conduct the current study.

The selection of representatives within each region is set to follow the guidance of the case screening process in a single-case study design suggested by Yin (2003). In so doing, three factors were taken into consideration: representability, comparability, and knowledge intensity. Representability took into account whether a city can represent the given region's circumstance of urban development.

Nevertheless, China has distinctive city systems at the regional level varying along demographic, industrial, and infrastructural dimensions (Chen, X. , 1991). According to the current Chinese administrative system, cities are classified in four tiers: provincial-level municipalities – Shanghai, Beijing, Tianjin, and Chongqing (since 1997), vice-provincial-level cities (15 in total as listed in Table 3.1), prefectural-level cities, and county-level cities (NBSC, 2007). The administrative autonomy corresponds to this classification, that is, the higher level a city is classified, the more autonomy it enjoys. County-level cities are administrated by the upper level cities and may be integrated into the later ones as a result of urban expansion.



**Table 3-1 China’s vice-provincial level cities**

Region	City
Coastal region	Guangzhou, Shenzhen, Xiamen, Hangzhou, Nanjing, Ningbo, Jinan, Qingdao, Dalian, Shenyang, Changchun, Haerbin
Central region	Wuhan
Western region	Chengdu, Xian

**Source: Author developed from NBSC (2007)**

The provincial-level municipalities are special both in terms of urban development policy and the state of development. Much has been written about these cities, though they may not reflect the majority of Chinese cities. Meanwhile, prefectural-level cities differ significantly from region to region, not to mention county-level cities. Compare to these three level cities, the vice-provincial level cities are designated not for administrative reasons but because of their similar state of development (Chen, Xiangming, 1991). This made them comparable to each other (Ma, 2005). Moreover, these cities are the best to represent the region in which they are located (Chen, 2002, Song and Zhang, 2002).

Accordingly, the selection of case study cities is limited to the vice-provincial level cities. As shown in table 3.1, only one in the central and two in the western region are available, and all of these three cities are capital cities of the provinces in which they are located. In order to make the representatives comparable, the city in the coastal region should be capital city of the province too. These cities are: Guangzhou, Hangzhou, Nanjing, Jinan, Shenyang, Changchun, and Haerbin.

Knowledge intensity can be assessed by the “Chinese City Creativity Indicators (CCCI)” (Chinese Creativity Study Group, 2005). Ni *et al* (2007) studied the progress of creativity of the 15 vice-provincial cities between 2004 and 2007 using the CCCI. Their result is shown in Table 3.2:



**Table 3-2 The average scores of annual progress of the 15 cities’ creativity (2004-2007)**

Region	City	Score
Eastern and Coastal region	Ningbo	12.24
	Hangzhou	12.06
	Shenzhen	11.82
	Jinan	9.88
	Dalian	9.47
	Nanjing	9.06
	Guangzhou	8.59
	Xiamen	8.35
	Qingdao	8.29
	Changchun	8.24
Central region	Shenyang	7.41
	Haerbin	7.06
Central region	Wuhan	7.71
Western region	Chengdu	11.53
	Xian	5.24

**Source:** Adapted from Ni *et al* (2007, p. 44) (in Chinese)

From this result, it is clear that in the west region, Chengdu scored higher than that of Xian and is therefore selected. Wuhan stands for the representative of the central region with no competitors. In the coastal region, Ningbo has the highest score, but it is not the capital city of the province. Considering the fact that the representatives of both the western and central regions are capital cities of the located provinces, the representative then goes to the city of Hangzhou.

### **3.3.4.3 Data collection**

#### **Defining the sources of data**

There are various sources that can provide case study evidence (Marshall and Rossman, 1989), but the most commonly used ones are documentation, archival records, interviews, direct observations, participant-observation, and physical artefacts (Yin, 2003). Each has its comparative strengths and weaknesses. According to Yin (2003), documents are always relevant to any data collection in doing case studies because of their stable, exact and broad coverage. However, documents “must be carefully used and should not be accepted as literal recordings of events that have taken place” since they might be selected and “deliberately edited” because of bias or any other reason. Like documents, the usefulness of archival records needs to be carefully ascertained and used in conjunction with other sources of information because “most archival records were produced for a specific purpose and a specific audience” other than the case study investigators. Therefore, the condition under which they are produced must be fully appreciated. Interviews provide targeted and insightful information for case studies, but the information gained from interviewees may be biased because of many reasons, such as types of questions, interviewees’ personal reasons, atmospheres when conducting the interview, and so on. Direct observation can provide reality and contextual information but sometimes it might be costly. Participant observation is a specific mode of observation which requires the observers assuming a role within the events being studied. It provides certain unusual chances for collecting case study data, but it may be difficult for observers to distinguish themselves from the events and therefore produce biases. Physical artefacts have been used extensively in anthropological research but are less relevant to most case studies.

In order to collect reliable data, Eisenhardt (1989) suggests that evidence needs to be triangulated. This has been supported by Denzin and Lincoln (1998a), as they caution that one needs to use as many sources as possible to collect evidence since “no single source has a complete advantage over all the others (Yin, 2003)”. As for the current study, considering the large scale of the phenomenon, documentation, archival records, interview, and direct observation are selected sources to collect main case study data.

### **Data collection techniques**

Documentation and archival records can be gained from policy documents, corporate websites, strategic documents, websites, newsletters, journal/magazine articles, organizational charts, internal memos, presentation materials, publications about the cases, and newspapers (Blaxter *et al.*, 2002). This can be done through two channels: desk-based survey and on-site collection (Jones, 1999). While desk-based survey is undertaken constantly throughout the study, some documents and archival records are collected when visiting the cities (both at the time when undertaking direct observation and interview). In order to maintain a chain of evidence, a case study database was created as suggested by Yin (2003). Furthermore, both qualitative and quantitative evidence were collected in this stage.

For the primary data collection, direct observation and interviews are adopted in this study. Direct observation, as defined by Webb (2000), is “focused on situations in which the observer has no control over the behaviour or sign in question and plays an unobtrusive, passive, and non-intrusive role in the research situation”. It was carried out in this current study through attending typical knowledge events such as “reading festivals”, “residential communities’ learning workshop”, “high-tech Fair”, and visiting city libraries and internet cafes, and so on.

The interview has become the most important method widely employed for primary data collection (Bryman, 2004). The use of interviews can help researchers to directly collect relevant data to the research questions and objectives (Huberman and Miles, 2002, Meredith *et al.*, 1989). Adhering to the chosen philosophical approach and research strategy, the semi-structured interview was adopted for the main study data collection in this study. The process of conducting interviews is discussed in section 3.6 in this chapter. Alongside the formal interview, informal conversations during the process of observation have also been fully recorded which provide complementary evidence (Eisenhardt, 1989).

### **3.4 Validity of the research design**

The case study approach is viewed sceptically by researchers who consider it lacking in rigour and objectivity, it is also concerned whether the measure used in the research will produce the same results when applied to the same subjects by different researchers. In

dealing with these issues, Yin (1994) suggests that the case study as a research strategy can be ensured by validation. This can be achieved through the construct validity, internal validity, external validity, and reliability (Yin, 2003).

Construct validity can be ensured through cross-validation (Marshall, 2006). In so doing, this research is designed in a set of successive stages. Firstly, findings from the literature review are triangulated through the review of KBUD initiatives worldwide. Secondly, the research framework and data collection methods are piloted through the pilot study. Thirdly, primary data collected through direct observation and interview is triangulated by secondary data, and finally, the multiple-case design can make sure to eliminate the problems associated with single-case design.

Internal validity can be maintained by making sure that all rival explanations and possibilities are considered before making any inferences (Bresnen, 1988). In this research design, data validation is managed based on the research framework, which is derived through the combination of the literature review and the review of the KBUD initiatives, and will be piloted through the pilot study. First of all, the research data that is needed is justified by the research framework. Secondly, in order to collect reliable primary data, a case study protocol was well prepared and discussed with the supervisory team and tested during the pilot study. Thirdly, the interviewees were carefully selected after consulting with a leading researcher in the Chinese National Institute of Spatial Planning and Regional Economy (CNISPRE). To ensure the researcher develops a full picture of the operational practices of KBUD activities, the profile of the key informants that were interviewed ranges from politicians, senior government officials, top business executives and senior managers, directors and academic researchers from universities and officials from public sectors, who are all involved in the KBUD initiatives with different functions and at various levels of management. Furthermore, in order to avoid misunderstandings, all interviews were conducted using the Chinese language. The transcriptions were sent to the interviewees and their feedbacks were received. This confirmed that there were no misunderstandings during the interview process. What is more, the analysis of data is also ensured by the research framework, and interpretation will be drawn from triangulated data sources.

The external validity and reliability are enhanced by the multiple-case design and variety of sources of data. A pilot study report was presented at the school research seminar and constructive feedback and suggestions were adopted to improve the research framework. Bias is eliminated through data triangulation and the validity of data analysis approach.

**3.5 Conducting fieldwork**

Given the multiple-case design, there would be a large amount of data need to be gathered. This made the collection of primary data much more complicated than a single-case design. As mentioned above, in order to organise and document various data, a database was created. Secondary data was collected through a desk-based survey before starting to conduct fieldwork. This section discusses the process of primary data collection. As discussed in the research design section, two techniques, semi-structured interview and direct observation are adopted.

**3.5.1 Interview**

The process of conducting an interview is set to follow four successive steps: identification of key informants, approaching participants, conducting the interview, and data transcription. This will be discussed subsequently.

**3.5.1.1 *Identifying key informants***

Key informants are vital for collecting the desired data for the case study. Given the complexity of China’s political and administrative system at the city level, finding out which organisation and who should be involved in the study is essential. In this regard, the researcher’s personal knowledge derived from experiences of many years working as a government official and senior manager in state-owned companies was found to be helpful in identifying the key informants. In doing so, the researcher drafted an initial list of key informants (positions in government departments, public, and private sectors). The list was then sent to one of the researcher’s personal contacts who holds a senior position at China’s National Development and Reform Commission for comments. The final list of key informants was testified through the pilot case study. The operational list of key informants is shown in Table 3.3.

**Table 3-3 Key informants for the study**

Job title	Organisation
Secretary General	Mayor’s Office
Director General	Development and Reform Commission
Director General	Science and Technology Bureau
Director General	Culture Bureau
Director General	Education Bureau
Director General	Economic Commission
Vice President (development)	State University
Vice President (development)	Provincial University
Vice President (development)	Local University
Managing Director	University Science Park
Director General	High-Tech Development Zone
Director General	Economic Development Zone
Executive Chair	Association for Industry (Local)
Executive Chair	Association for SMEs (Local)
Executive Director	Academy of Social Science (Local)
Chair(s)	Local Community

From the above list, one may recognise that all of the key informants are either political or professional elites in the local context. This was because on the one hand, the current study on the KBUD itself is basically driven by these organisations in Chinese cities; on the other hand, as noted by Denzin and Lincoln (1998b), concentration on a few key informants may help the investigator to acquire a better picture of the norms, attitudes, expectations, and evaluations of a particular group than he could obtain solely from less intensive observation or through conducting a great number of less intensive interviews. The concern about how to conduct the elite interviews is discussed in the following sections.

### ***3.5.1.2 Approaching participants***

Having identified the key informants for the study, the next step is how to get them involved. As suggested by Johnson (2001), access to targeted organisations and interview informants is extremely difficult since not all informants have sufficient motives or interests to be interviewed. Although the researcher has made good use of his personal contacts he established before he approached the key informants, it was not good enough to reach all of them because of the unique Chinese political culture. Moreover, this has been made even harder due to the fact that these three cities are spatially located in different regions.

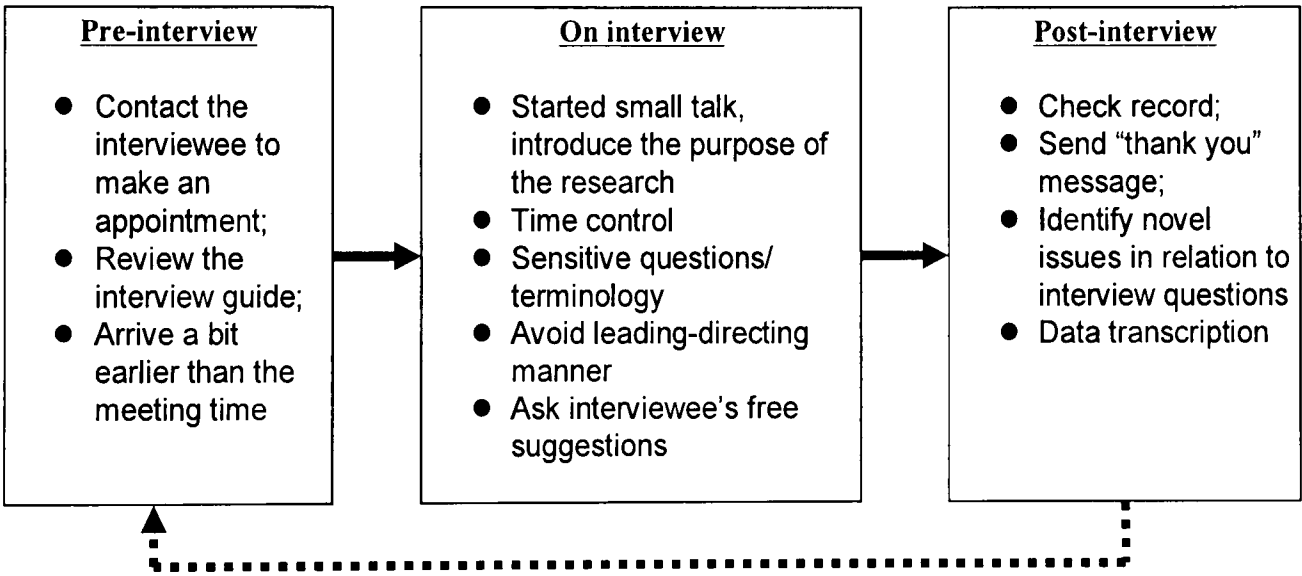
In these circumstances, in order to be able to gain access to all informants, a “gatekeeper” is required. In playing this role, a person must either be politically in a very high position or hold an academically outstanding reputation. Potentially, the author can have both for help from a ministry level and the help from a politician may make the task much easier. However, in order to avoid the political pressure it may cause, the researcher decided to ask for assistance from one of his academic contacts at CNISPRE who is known nationally as the leading researcher in this field. In so doing, the researcher asked the “gatekeeper” to contact the Executive Director of the local Academy of Social Science who would play a role of “secondary gatekeeper”. By doing so, the researcher was able to approach all targeted key informants except the Secretary General of the Mayor’s Office to whom the researcher was advised to ask help from higher level politicians. This has been the case in all three cities. The author then asked the Minister’s Office of the National Development and Reform Commission for help and all three informants participated in the interview.

### ***3.5.1.3 Conducting the interviews***

The semi-structured interview, built upon Bryman’s (2004) interview frameworks, was adopted for collecting primary data for this research. This was argued to be able to provide an opportunity for the researcher and interviewees to interact with each other. In the practice of this study, to avoid misunderstandings caused by language barriers, all interviews were conducted in Chinese instead of English. The use of the interviewee’s mother tongue is also seen to be effective in constructing a culturally intimate atmosphere during the interview (Johnson, 2001).

In order to avoid any potentially political pressure, the overall order of the interviews was organised deliberately, that is, in each city, the interview started first with non-government officials and ended with the Secretary General of the Mayor’s Office. All interviews took place either in tea houses or in hotel rooms to avoid interruption. With permission, all interviews were tape-recorded.

The process for conducting each interview was designed to follow a procedure involving three main steps: 1) pre-interview, 2) interview and, 3) post interview. This is illustrated in Figure 3.2.



**Figure 3-2 The illustration of interview procedure**

Following this procedure, each interview began slowly with a small talk for “icebreaking”. To get the ball rolling efficiently, extra attention was paid to not moving the conversation too quickly. Built upon the warm up conversation, the researcher deliberately began to introduce the purpose of the research. This was followed by the confidential declaration. At the end of each interview, the researcher asked the interviewee’s permission to have follow-up contact if there were any problems in relation to the interview. Moreover, the researcher also invited the informant to make contact



with the researcher by either telephone or e-mail if there were any points they would like to add after the interview.

With the concern of the elite interview in mind, the researcher started with carefully preparing the interviews by taking the suggestions given by Dexter (2006), Darren (2003), David (1996), and Leech (2002). Firstly, the chosen strategy of approaching the targeted participants ensured the researcher access to the participants in a way in which they realised this was purely academic support requested by a friend. Secondly, the Chinese culture of “guanxi” relationship played a very important role during the interview process. Thirdly, before conducting each interview, the researcher prepared well, aiming to know as much as possible about the interviewee. This helped very much for the warm up conversation and shortened the distance between the researcher and the interviewee. Fourthly, the knowledge about the subject and the questions asked provoked the interest of the interviewee who was therefore willing to answer the questions truthfully. Finally, the arrangement of the places for conducting interviews helped to make an atmosphere which made the interview much like a conversation between friends. Through this deliberate organization, the common issues associated with elite interview did not trouble the process of primary data collection.

What is more is that through the friendship developed during the interview, the researcher easily gained copies of documents that were not available elsewhere, some of which were highly confidential.

However, it is important to note that one of the case studies – Chengdu – unfortunately experienced an earthquake on 12th May 2008. The proposed schedule had to be put back to July, even though when the researcher made his visit to Chengdu, most key informants still could not make the interview, but promised to speak via the telephone later on. As a result, the interview data of Chengdu were collected in the following months.

#### ***3.5.1.4 Data transcription***

In the academic research, interview data is useful only if it has been transcribed. As mentioned above, transcribing tape-recorded interviews is one of the important tasks after each interview. In so doing, after each interview, while the memory was still fresh, the author listened to the recorded tape immediately. The main purpose of doing this was

to check if the interview data was properly recorded. Otherwise, the author would contact the interviewee to make another appointment as early as possible. After the data was confirmed, the recording was transcribed as soon as possible in Chinese at first.

It should be noted that the transcription of interview data is not just a simple technical task of writing down the words onto a piece of paper. Rather, it is a creative process. As Wengraf (2001) put it, while the researcher is transcribing the taped interview, “a flood of memories and thoughts will be provoked; these memories and thoughts are available only once” (p. 209). Accordingly, memo notes were made when ideas developed while transcribing the recorded data of each interview. These memo notes were put into a specially designed table shown in Table 3.4.

**Table 3-4 Illustration of memo notes of interview**

Ref:		
Interviewee		
Notes on interviewee	Notes on interviewer	Relation to the research
Mentioned something new	Did not catch it while interviewing	New theme
.....	.....	
Did not answer the question directly	Misunderstood the question	Change the manner of question next time
.....	.....	.....

The memo notes together with the transcribed interview data of each interview were labelled and filed after a double check ensuring there are no mistakes. This enabled the interview data and memo notes to be easily retrieved in the later stages of the study.

It should be noted that when transcribing interview data for Chengdu, the researcher realised that due to the poor quality of the recording, some answers could not be heard clearly. In order to ensure the reliability of the data, the researcher sent each transcribed

interview record to the interviewee via email. Unfortunately, some of them have never been sent back to the researcher.

**3.5.2 Direct observation**

There are a number of ways to carry out observation. Burgess (1990) and Bailey (1996) distinguish Direct, Non-participant, and Simple observation. Direct observation is “unobtrusive” or “non-reactive”, carried out by means that “do not involve direct elicitation of information from the research subjects (Lee, R. M., 2000, p.1). The use of direct observation in this research is to complement other two data collection techniques in collecting case study evidence. The aim of observation here is to record public events that involve knowledge activities related to KBUD and knowledge facilities that support knowledge activities.

**3.5.2.1 Observing public events**

Information about public events was gathered from local media, local authorities’ websites, personal contact, and gatekeepers. Events that were labelled as being related to knowledge activities were observed if possible during the visit to the city. Such knowledge related events include big public events at the city level and district level and small events at the residential community level. In order to maintain a chain of records, each event that was observed was reported in the following format (see, for example in Table 3.5 in next page).

At the end of the events, the researcher can usually have a chat with participants. Topics may vary and are kept highly informal. After each event, while the memory was still fresh, the researcher wrote the report as soon as he returned to the hotel room. When writing the report, for ethical reasons, the attendants who made their comments about the event were anonymised. Instead, each was assigned an alphabet A, B, or C, and so on. A total of seven events (listed in Table 3.6 in next page) taking place in the three case study cities were observed. Discussion and analysis will be presented in chapter seven.

Table 3-5 The illustration of direct observation record

Event	Residential community workshop on family learning		Ref: Knowledge event 02, Wuhan, Saturday, 7th June 2008
Time	9.30-11.30 am	Location	Common Room in Huaqiao Residential Community Office
Attendants	27 families	Participants' occupations	Mainly professionals
Programme	Presentations about reading (three presentations last 45 minutes) Story telling by children (15 minutes) Group work and discussion (40 minutes) Vote on the best book for the month and best story teller (20 minutes)		
Attendants' comments	Attendant A: this is good not only for learning, but also for harmonious community building.		
	Attendant B: good for children to play together which was not the case before.		
	Attendant C: I now know well our neighbours, ...but I hope we can decide the topics each time.		
	.....		
Research notes	Strong government led activity involving Chinese political and cultural tradition...		

Table 3-6 Observed events

Hangzhou	Hangzhou Science and Technology Expo	30 June 08	One day event
	Hangzhou and Zhejiang University workshop on developing exemplary harmonious urban district	07 July 08	Half day event
	West Lake District Learning Community Activity	02 July 08	Night college
Wuhan	Wuhan Urban Agglomeration Workshop on Resources Saving and Environmental Friendly Society	03 June 08	Onedays event
	Wuhan Huaqiao Residential Community Family Learning Workshop	07 June 08	Half day event
	Wuhan University High-Tech Exhibition	16 June 08	Two day event
Chengdu	Chengdu Learning Family Public Lecture	12 July 08	Half day event

### 3.5.2.2 *Visiting knowledge facilities*

City libraries, internet cafés, museums and other cultural settings are the main knowledge resources that facilitate citizens' learning. For this reason, these public spaces may provide valuable evidence for the current study. In order to collect such evidence, the researcher tested city libraries, internet cafés and other public spaces such as “foreign language corners”, and tea houses in each case study city. The reconnaissance and initial assessment of these places were carried out by visiting or using these facilities as a normal user, noting:

- the location, how easy people can get there,
- the service procedure, how easy people can use it,
- the availability, to what extent the facilities can satisfy various demand,
- during the visit, the researcher usually had a brief chat with staff and users aiming to gather more information, such as:
  - the range of users: age groups, gender, social class, ethnic identity etc
  - the frequency of use: how many users, the high and low periods
  - the vibrancy of the facilities: public events or activities

It should be noted that although this is often referred to as a survey technique, here the intention is made more of the preliminary mode, not the detailed one using a range of instruments for measurement (Walliman, 2005). The information gathered was recorded using written notes and/or diagrams.

What is more, observation also served as a prelude to the interviews, by guiding “us to some of the important questions we want to ask respondents” (Whyte and Whyte, 1984, p. 129). To this end, the interview questions were revised to accord with what was actually taking place and not with what was expected.

## **3.6 Presenting main case study**

### **3.6.1 The choice of data analysis strategy**

Analysing case study evidence has always been difficult because the strategies and techniques have not been well defined. Yin (2003) describes three general analytical strategies for analysing case study data: relying on the theoretical propositions that lead to the study, thinking about rival explanations, and developing a case description.

According to Yin, using theoretical propositions are the most common strategy to analyse case study evidence. This strategy is adopted when a case study is based on a theoretical proposition. It provides a guideline for recognizing certain data which is most relevant to the purpose of the study, while ignoring other data which is not. This strategy is especially relevant to propositions about causal relations fell into answering “how” and “why” research questions.

Thinking about rival explanations is useful in doing case study evaluations where the original propositions may be proved as if there is no, or at least tend to be so, rival explanations from the evidence.

Developing a case description is adopted when the case study does not fit in with the other two analytical strategies where there is a need to develop a descriptive framework for organizing and presenting case study evidence. In research practice, the first two strategies are highly related, whereas the third one is less preferable than the use of the first two.

Regarding the current study, the literature review in Chapter two has revealed that theories about KBUD have not been systematically developed. The intention of the study was not made to test a theoretical hypothesis, nor to evaluate a causal relationship of any specific urban development policy. Rather, it is to describe how Chinese cities respond to the global trend. In this respect, developing a descriptive framework is argued to be necessary for analysing case study evidences in this case.

### 3.6.2 The choice of analysis technique

Under the three general strategies, Yin (2003) distinguishes five specific techniques for analysing case study data: pattern matching, explanation building, time series analysis, logic models, and cross-case synthesis. These five techniques are applicable to all three general analysis strategies. The pattern-matching logic is to compare an empirically based pattern with a predicted one (that is, from theories) to see if the patterns coincide. This technique is most desirable for explanatory case study. Explanation building analyses the case data through building an explanation about the case. It is in fact the special type of pattern matching that is mainly relevant to explanatory study in the process of hypothesis-generating. The goal of explanation building is not to conclude a study but to develop ideas for further study. Time-series analysis for case study is similar to the time-series analysis conducted in experiments and quasi-experiments. It is also a means of pattern-matching between trends of data points compared to a theoretically significant trend specified before the onset of the study. This technique is specifically relevant to experimental and clinical psychology with single cases. The logic model, as Yin (2003, p. 127) citing Peterson and Brickman and Rog and Huebner, “deliberately stipulates a complex chain of events over time. The events are staged in repeated cause-effect-cause-effect patterns, whereby a dependent variable (event) at an earlier stage becomes the independent variable (causal event) for the next stage”. The use of the logic model is to match empirically observed events to theoretically predicted events. Finally, the cross-case synthesis technique is based on a series of single case studies where over four techniques are applied. In this respect, the technique can be seen as the same as other research syntheses, which aggregate findings across a series of individual studies.

These five techniques form the basis for analysing case study evidence. Nevertheless, for displaying a case study, Miles and Huberman (1994) suggest that the key of presenting a case study is “analytic progression”. To this end, Rein and Schon (1977) put that the natural progression is from telling the “story” about a specific situation saying what happened to constructing a “map” (formulising key elements of the story) and to building a theory or a model (how these elements connected and influenced each other). At the core of displaying case study data lays the combination of description and explanation (Miles and Huberman, 1994, p. 37). While description can make “complicated things understandable by reducing them to their component parts”, explanation denotes making

complicated things understandable by showing how their component parts fit together according to some rules – theories (Bernard, 1988). In fact, as Miles and Huberman argue, there is no clear boundary between the two. In this sense, the current study adopts both a describing and explaining approach.

### **3.6.3 Developing case profile: description**

Bearing in mind that multiple methodological techniques were employed to collect data from multiple sources in multiple cities, data was selectively collected, which means only potentially useful materials were gathered (Ezzy, 2002, Miles and Huberman, 1994, Yin, 2003), through a means of carefully designed triangulation. Even though, the data that was collected is still much larger than that from single sources in a single case. In this regard, in order to make sense from the huge amount of raw data, writing up fieldwork reports was adopted to process initially these raw data (Lofland, 2006, Rossman and Rallis, 2003).

The fieldwork reports are appropriately detailed presentations of the facts that were recorded in the field with no intention to interpret the meaning (Wolcott, 2001). A substantial part was given to the description of the events, activities, interactions, as well as the physical characteristics of settings. The descriptive reporting is essential work for data reduction, which would later be proved helpful to put the investigation in context. Furthermore, as Punch (2000) advised, a careful and thorough description is “... a very valuable step towards explanation, as it will be necessary to draw a picture of what happened, of how things are proceeding, of what the situation is like and of how things relate to each other” (p. 56). What is more, the process of writing up fieldwork reports yield a systematic understanding of the case, which also makes sense to the research context, laying a foundation for interpretation (Creswell, 2003).

### **3.6.4 Developing a framework for explanation**

A case study report would be pointless if it were not arranged in a logical way (Yin, 2003). This is especially the case when conducting a multiple case study (Stake, 2006). In order to display case study information in a comprehensive manner, a carefully defined framework is needed. Drawing upon the review of literature in chapter two, four themes and some subordinate themes have been identified to be central to the KBUD.



These themes formed an initial analytical framework for analysing the international KBUD initiatives. However, during the course of the analysis, some sub-themes were uncovered. By adding these sub-themes to the initial framework, the operational analytical framework was refined as below:

- understanding knowledge for development
- development dimensions in practice
- knowledge environment
  - quality of place
    - physical and social environment
    - cultural environment
    - economic base
    - urban innovation engines
  - knowledge base
  - knowledge culture
- knowledge synergy
  - institutional mechanism
  - policy framework

### 3.6.5 Drawing conclusions

Drawing conclusions is a main stream of data analysis activities. Many qualitative researchers “have considerable difficulties in drawing conclusions” (Miles and Huberman, 1994, p. 120). This is particularly the case when conducting social research involving cultural traditions. Whyte (1984, p. 260) advises that “when we observe in another cultural and social processes that appears similar to those with which we are familiar, we should not jump to the conclusion that we know what is going on. Even in our own society, we should interpret what we observe with caution”. Lofland (2006, p. 97) suggests in this respect to “look for patterns in activities, meanings, forms of participation, relationships and settings”. The search for meaning, as put it by Stake (1995), is often a search for patterns, which is to select categories or dimensions to look for within-group similarities coupled with inter-group differences. The continuous

revision of the analytical framework in the current study is an effort made to corresponding to this challenge.

Moreover, in order to draw a reliable conclusion, a mixture of analysis techniques should be used strategically (Miles and Huberman, 1994). The researcher in this study adopted different approaches to interpret the evidence. Before any formal conclusions were drawn, the researcher looked through all forms of documents which were already conducted in the previous stages of the study, such as field notes, fieldwork reports, research summary reports, and so on. If differences were identified, the places where these new insights emerged in the original evidence were traced and re-read. This was followed by revisiting the research aims and objectives. By doing this, the researcher tried to build up a full picture and attempted to draw conclusions systematically and sequentially.

### **3.7 Methodological limitations of the research**

Despite the rigorous design of the process of the research, there are still some perceived limitations that need to be highlighted. Firstly, it would be helpful if the researcher were able to interview more informants from different social groups since urban development involves all members of the community, though it was certain that it would be never possible to conduct a census for a PhD research. Secondly, the participants of the interviews are limited to those who have direct links with KBUD activities, whereas those who only have indirect links with KBUD have been excluded, which might miss out some important insights. Nevertheless, this chance may be hopefully reduced by the adoption of direct observation and documentary analysis. Thirdly, being a case study research, especially when the unit of analysis is the city, the generality of the research findings may be constrained by the data which specifically reflects the case city's uniqueness and contexts.

### **3.8 Chapter summary**

This chapter has explained why the case study has been chosen as the research strategy and why a qualitative approach is the most appropriate methodology for this research. Drawing on methodological literature, it discussed why a multiple case study design can better assist the researcher to achieve his research objectives. Building upon the qualitative methodology assumption in conducting a case study, it described why and

how multiple data collection methods fit well with the research questions of this study. Details of data collection and data analysis were presented transparently in order to provide readers with a clear picture of how this research was actually carried out. Furthermore, the discussion of data collection and analysis is concerned with the awareness of Chinese cultural traditions, which otherwise might be a big issue for international researchers in conducting Chinese policy related urban studies. Toward the end of this chapter, limitations both related to academic and personal weaknesses as a new researcher in conducting a complicated research project have been addressed. This will help the researcher improving his personal skills for the future research. In general, the discussion presented in this chapter will guide the researcher to conduct case studies in the following stages of the research.

## **4 A Review of KBUD Initiatives Worldwide**

### **4.1 Introduction**

In chapter two, the comprehensive literature review has noticed that there is a lack of empirical studies examining the general trend of KBUD movement on a global scale. Chapter three discussed the necessity of conducting a review of international KBUD initiatives. According to the research design, this chapter will explore the selected KBUD initiatives to fulfil this purpose, as well as to further develop understanding of KBUD.

Eleven cities were selected deliberately including eight well developed cities and three emerging industrial cities. These include Manchester and Newcastle upon Tyne in the United Kingdom (UK), Austin in the United States (US), Munich in Germany, Barcelona in Spain, Delft in the Netherlands, Melbourne in Australia, Singapore, Hsinchu in Taiwan, Dubai in the United Arab Emirates (UAE), and Cyberjaya in Malaysia. It should be noted that in order to simplify the depiction, the term “emerging industrial cities” is used to describe Hsinchu, Dubai, and Cyberjaya, whereas “well developed cities” indicates the remaining eight cities. Where a particular situation applies to a specific city, it will be specified.

The analysis is conducted based on the secondary data derived from desk-based research (except Newcastle, where direct observation was conducted). The initial framework generated from the literature review was employed as a guideline for the search of relevant information. Nevertheless, when analysis was undertaken, some coordinating themes have occurred. Such themes are used as subheadings under the main themes.

The rest of this chapter is organised as follows: section 4.2 introduces briefly each city’s profile and initiatives toward KBUD. The analysis is then moved on to knowledge definitions, which is followed by the discussion of development dimensions in practice. In sections 4.5 and 4.6, the knowledge environment and synergising knowledge for KBUD are discussed. The chapter will end with a summary in section 4.7.

4.2 Profiles of the selected cases

4.2.1 Manchester

Manchester is known internationally as one of the birthplaces of the Industrial Revolution and the first industrial city in the world (Work Foundation, 2002). However, from the 1970s, Manchester suffered particularly badly as a result of the economic recessions. More than 60 percent of its traditional industrial employees lost their jobs between 1975 and 1985. As a result of the long recessions, poverty, crime and the fear of crime, poor health, poor working skills, low educational levels and a lack of facilities became synonymous with the city (Manchester City Council, 2004).

In the following decades, Manchester has made substantial attempts to rejuvenate itself. Figure 4.1 illustrates the trajectory of its efforts. Manchester: Knowledge Capital (MKC) is established as an Executive Agency reporting to Manchester City Council and working with the other Greater Manchester authorities, universities, the strategic health authority, other key public agencies and leading businesses. It acts as a dynamic force for innovation and economic transformation.

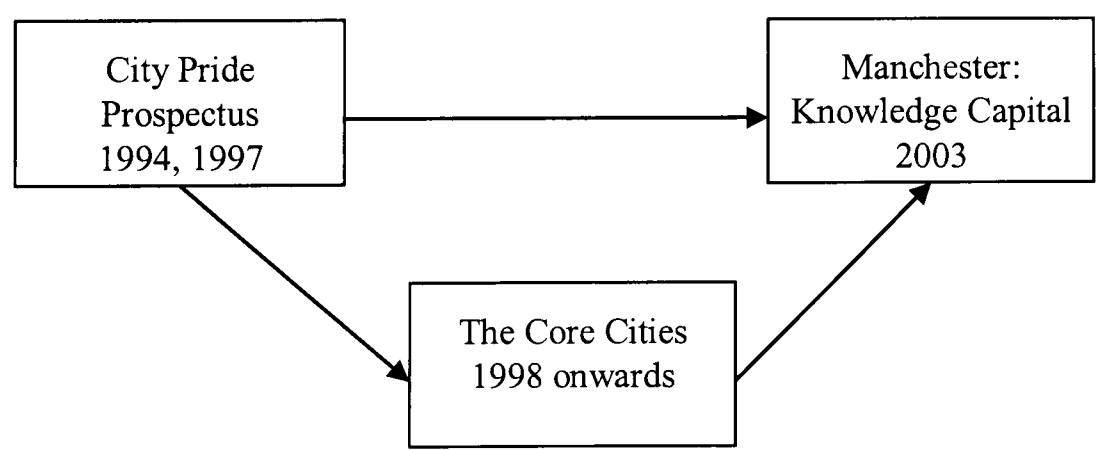


Figure 4-1 The development process of KBD approach in Manchester

Source: Adapted from van den Berg *et al* (2005, p. 162)

Furthermore, the MKC has brought the two cities of Manchester and Salford and the neighbouring boroughs of Bolton, Bury, Oldham, Rochdale, Stockport, Tameside, Trafford, and Wigan together to reorganise the city region, now known as Greater Manchester with a population of over two and a half million people, making it the second (both in size and importance) English city region after London (Garcia, 2004).

Since the establishment of MKC, Manchester has invested heavily in its physical infrastructure, transformed its city centre, and has been working closely with its universities to create new knowledge businesses and has an increasingly distinctive knowledge city offer (Work Foundation, 2006a). This provides a good case study for the current research.

#### **4.2.2 Barcelona**

Barcelona has been internationally recognised for its exemplary urban regeneration policy since the Olympic Games of 1992 (Clua and Albet, 2008). Taking the great advantages of hosting the Olympic Games, Barcelona has successfully integrated cultural elements into urban development. This allowed the city to focus its work not only on the improvement of the physical environment, but also on strengthening social cohesion and the sense of belonging to the city (Marshall, 2004), which has been granted as the “Barcelona Model” by leading authors (e.g. Clua and Albet, 2008). At the end of the 1990s, when the aftereffect of the Olympic period had subsided, Barcelona began to adapt a new strategy – the “Barcelona, city of knowledge”(1999) plan, which is now well known as one of the earliest efforts made to KBUD (Clua and Albet, 2008). In the literature on knowledge city, Barcelona has been the most cited story in the last decade.

#### **4.2.3 Austin, Texas**

Austin is the capital of Texas, with a population of 700,000, the state’s fourth-largest city and the 37<sup>th</sup> largest city in the United States. It ranks third among all the US cities in college attainment (percentage of people with college degrees), fourth for patents generated by the city, third in venture capital investment and first in Wi-Fi connections per capita. Austin is one of the first US cities to recognise both the emerging economic importance of knowledge work and the possibilities of attracting the ‘footloose’ industry. With almost half a century of experience in attracting and retaining creative industries

and knowledge workers, Austin is now home to more than 2,200 creative industry firms, employing approximately 160,000 knowledge workers (Powers, 2006), putting it in the top tier of global indices of knowledge development. The city ranks second on Florida's (2002) creativity index and sixth on its innovation index. In a study of World Knowledge Competitiveness involving 300 cities around the world in 2002, it ranks the third in the index (Michaud, 2003).

In the 1990s the city was hailed as a "technopolis"; at the turn of the new millennium it was known as a "knowledge city", exhibiting all the characteristics of it, from advanced infrastructure to public-private partnerships stemming from university, government, and business cooperation which supported research and development, technology transfer, an educated workforce, and a high quality of life.

#### **4.2.4 Melbourne**

The City of Melbourne is the seat of the Victorian government and Victoria's national and international gateway. There are 62,000 people living in the city of Melbourne and 3.6 million in metropolitan Melbourne (ABS, 2006). Melbourne has been developed as a hub of business, international trade, arts, entertainment, and sporting activities (Yigitcanlar, 2007). It homes the headquarters of many Victorian, national and international companies. It is also known internationally as one of the great multicultural cities with more than 30 percent of all residents speaking a language other than English. People from more than 140 countries call the city "home" (ABS, 2006). The city has also won awards for 'liveability', green building design and business innovations (MVCF, 2007). In the last decade, by consolidating its distinct economic and cultural foundations, world class learning, and research institutes, Melbourne has positioned itself successfully to grow as a leading international knowledge city (Shaw, 2003).

#### **4.2.5 Delft**

Delft is a Dutch city located in the province of south Holland. It is the part of the large urban agglomeration of Rotterdam and Den Haag, situated halfway between these urban centres, with a population around 95,000. It has a beautiful historical city centre, which is protected as part of the national heritage. The city is home to the 160 year-old Delft

University of Technology, the largest technical university in the country, as well as important research institutes.

Delft is one of the earliest cities to make a clear strategy to develop based on its strengths of knowledge thanks to the study titled “Delft, the knowledge city” conducted by the Instituut Voor Ruimtelijke Organisatie (TNO-INRO) in 1990 (Knight, 1995). The city is now known internationally as a city of knowledge, a breeding ground for knowledge development, knowledge application, and fundamental research. The unique combination of organisations such as research institutes, the university, knowledge intensive businesses and intermediary organisations give Delft a solid foundation for growing into a knowledge city (Fernandez-Maldonado and Romein, 2008).

#### **4.2.6 Munich**

Munich, in south-east Germany, is the capital of Bavaria. Munich's 1.3 million inhabitants make it the Germany's third largest city, after Berlin and Hamburg. The city is the centre of an urban region with a population of 2.4 million. The city's special features are an impressive historical background and a particularly dynamic economic sector. Over the years, Munich has shown a real capacity to create a synergy between its historical roots, a spirit of receptivity and building the future. In the past, the city was known as an artistic, cultural, and architectural centre. Now, with this reputation continuing to be held, it is first and foremost an economic centre, accounting for Germany's second largest labour pool and currently expanding sectors include the media and information technology, computer science, tourism, and financial services. Unlike other cities, Munich does not have an explicit strategy for KBUD. This is because, as van den Berg *et al* (2005) stated, Munich is already a highly knowledge-intensive city.

#### **4.2.7 Newcastle upon Tyne**

As the core city of the North East of England, Newcastle was developed as the administrative and cultural centre. In the past, the city was regarded as a “powerhouse of innovation for the Industrial Revolution”, one of the birthplaces of railways, the base for advances in shipbuilding technology, and so forth, all of which fuelled the growth of industry in the city. In the last few decades of the twentieth century, however, the city has suffered serious economic decline. Many of the traditional industries such as



shipbuilding and heavy industries had largely or completely disappeared from the city by the end of 1990s (CURDS, 2005). As a result of the long term decline, much managerial and technical expertise and skills were lost through outward migration or a lack of utilisation. In the recent wave of shifting into a knowledge society across the West, the city was somewhat “lagging behind” to struggle with the challenges of post industrialism (OECD, 2006). Efforts have nevertheless been made in recent years through working closely with regional development agency, universities, regional partners, and business enterprises. In the city’s Core Strategy of Local Development Framework, the city’s goal was set “to create a vibrant, inclusive, safe, sustainable, and modern European city” through building a “better infrastructure to exploit universities’ knowledge into jobs and companies” (p. 1).

#### 4.2.8 Singapore

In the 1960s, Singapore was a city relying on its port industry. However, in less than 30 years time, it became one of the most dynamic economies in the world. Particularly, in 2002, Singapore was ranked by the World Economic Forum as the number one in global competitiveness and the second-best place in the world after the US to do business (Wong *et al.*, 2006).

In its relatively short history, Singapore has made a constant change of economic strategies, taking the city-state from an industrialisation strategy in the 1970s to a higher, sophisticated manufacturing one. The 1980s saw another strategic shift toward the technology-intensive sectors, and from the early 1990s it was one focused on high knowledge intensive companies. By the end of the twentieth century, Singapore was fully aware that knowledge would become a strategic asset for the future development (Sim *et al.*, 2003).

Singapore makes for an interesting case for KBUD because of its successful transition to a knowledge economy (Wong, 2008) and substantial efforts made at the development of sciences parks over the last three decades (Koh *et al.*, 2005), which have been proved a success not only in economic terms, but also in leading to a paradigm shift from a city-state with an image of conservative ideology and strict censorship toward a free-spirited dynamic creative hub in the making.

#### 4.2.9 Hsinchu, Taiwan

Hsinchu is internationally known not because of the city but because of the science park. The Hsinchu Science Park, which was founded in 1980, has developed a total 632 hectares at the Hsinchu site and 141 hectares at the Chunan site with expansions continuing to the Tungluo, Longtan, and Ilan sites, as well as the Hsinchu Biomedical Park (Hsinchu Science Park web site).

The development of the Hsinchu Science Park was the epitome of development of Taiwan's high-tech industries modelled on the Stanford Industrial Park in Palo Alto, California. With several adequate incentives including an abundant supply of technology and skilled engineers, tax credits, excellent infrastructure, and convenient official services, Hsinchu Science Park has grown rapidly in terms of the number of firms, annual sales, and the number of employees. Six industrial sectors, including integrated circuits, computers and peripherals, telecommunications, optoelectronics, precision machinery, and biotechnology, have become the key players in the world's high-tech manufacturing. Hsinchu Science Park is now one of the world's most significant areas for semiconductor manufacturing (Chen *et al.*, 2006, Lai and Shyu, 2005).

Hsinchu Science Park is a meaningful case for this study because of its growth mechanism which provides a typical example of science parks in eastern and south eastern Asia (Koh *et al.*, 2005).

#### 4.2.10 Dubai

Dubai is the second most important emirate in the UAE in terms of its geographical size, population, and contribution to the national economy. In practical terms it can be considered as a city-state with 97 percent of its 1,000,000 population residing in the city of Dubai. The city is built along the edge of a narrow 10-kilometre long winding creek, which divides the southern section of Bur Dubai from the northern area of Deira. Bur Dubai is the city's traditional heart where the ruler's office, Port Rashid, the Dubai World Trade Centre, customs, broadcasting stations, and the postal authority, as well as many head offices of major companies are situated. Deira is a thriving commercial centre containing a huge range of retail outlets, markets, hotels, and Dubai International Airport.

Oil used to be the emirate's decisive economic pillar. However, its oil reserves have shrunk over the past decade and are now expected to be exhausted within 20 years (Keivani *et al.*, 2003). Given the depleted natural resources, Dubai has diversified its strategy for development with added emphasis on providing a service base for financial services, tourism, sporting events, and transit trade in its bid to become the financial, business, and high-tech centre for the region.

Following the strategic change, the government opened the doors of opportunity for private-sector investments in small- and medium-sized manufacturing industries in 1985. Two free trade zones were established, which are now seen as the largest free-trade zone in the Middle East region. After some fifteen years, the effort has proved successful as evidenced by its contribution to the UAE's national GDP. By the year 2000, Dubai accounted for 34.8 percent of UAE's no-oil GDP, 47.2 percent of UAE's GDP from trade, 44.1 percent of its transport, and 41.7 percent of its finance and insurance GDP (Keivani *et al.*, 2003). This was also confirmed by its connection with the outside world. As Graham (2000, p. 117) put it, "Dubai was not on the global map in 1992 but by 2000 was linked by 78 airlines directly with 125 other cities and handling 12m passengers/year".

Based on the success of free trade zones, the Dubai government launched a pioneering initiative—Dubai Technology, Electronic Commerce, and Media Free-Trade Zone (TECOM) at the beginning of the new millennium. The initiative was accompanied by a worldwide promotion of Dubai as an ideal tourist destination and a thriving commercial centre. Three interrelated mega-projects were established: Dubai Internet City, Dubai Knowledge Village, and Dubai Media City. The two "cities" and the "village" are located near each other on a beautiful site, about 20 kilometres south of the city and linked to the UAE's Capital city, Abu Dhabi, by a highway. Many of Dubai's most prestigious hotels and residences are situated between the highway and the coastline in this part of the city. Dubai provides another meaningful example which is in the transition not from a well developed post-industrial city but a rich natural resources city to a knowledge intensive one.

#### 4.2.11 Cyberjaya, Malaysia

Cyberjaya is the first intelligent city in Malaysia developed as part of the national project “Multimedia Super Corridor”, which was launched according to the country’s “Vision 2020” to help affirm Malaysia's status as a country of Knowledge-Based Economy. The ambition of Cyberjaya was to become the regional and global ICT hub to rival the best in the world (Schreiner, 1999). The giant project was to develop a total land area of 7,000 acres for world-class IT infrastructure, low-density urban enterprise, as well as state-of-art commercial, residential, enterprise and institutional facilities, including hotels, boutique malls, recreation centres, community clubhouse and more (Ramasamy *et al.*, 2004). The city is expected to see a large boom in population growth over the next 10 to 15 years, with residential developments expected to reach a population of 210,000, business developments providing for up to 120,000 employees and institutional establishments providing for 30,000 students (Cyberjaya website).

In order to ensure that the Vision 2020 will be achieved, the Malaysian government adopted a set of policies providing compelling factors for multinational companies, investors. These include:

- Comprehensive package for investors
- Strong socio-economic fundamentals
- Firm commitment from the Malaysian Government
- Accelerated human resource training and development
- Competitive costs of doing business
- Ready access to the Asia-Pacific markets
- Widespread usage of English
- Superlative quality of life

Lured by such an offer, many multinational companies such as Shell, EDS, Ericsson, BMW, HSBC, DHL, and domestic companies, the nation's top international schools and

institutions such as Limkokwing University College of Creative Technology, Multimedia University, and Cyberjaya University College of Medical Sciences have chosen their location in Cyberjaya (Cyberjaya website).

Cyberjaya is a typical example of uneven development in a developing country. The government has endeavoured to invest national income into a designated area to create an environment which is purposefully for knowledge elites or multinational companies, while paying no attention to social equity and regional disparity (Bunnell, 2002).

### **4.3 Knowledge defined for development**

Different concepts of knowledge and the ways in which they are valued has an influence on policies of development (Hornidge, 2007). It is noticed that although knowledge, with no exception, is receiving increasing attention, it is defined differently across the 11 cities, which at the core lies the particular understanding of knowledge in each city. Generally, in well developed cities, knowledge is understood as a determining factor of the city's future where the concept of knowledge is defined to including all types of knowledge. Meanwhile, in emerging industrial cities, knowledge is valued as a shortcut for closing the economic gaps where knowledge is often limited to technological knowledge or simply industrial know-how.

Specifically, Munich has developed its understanding of knowledge as social and cultural resources and the prime mover of industrial development (Figure 4.2 next page). For Munich, knowledge can be acquired by the city's population through education and life-long learning. On the other hand, knowledge can generate opportunities for participating in social life and is a precondition of skilled employment. Technological and scientific knowledge gives Munich a leading edge in knowledge to be successful in the competition among cities and regions.

Meanwhile, other post-industrial cities have also defined knowledge in this way. Manchester, for example, has launched a series of programmes under the strategy of "Manchester: Knowledge Capital" (MKC, 2003), such as Innovation Partnership, Real World Science, Innovation Ecosystem, and Manchester Is My Planet. All of these programmes were intended to exploit social and/or Model 2 knowledge. Similarly, Barcelona, Austin, and Melbourne have made culture and human capital the "motor" of

their development. As a city-state, Singapore is one of the most successful cities that integrate exogenous and indigenous knowledge for its development.

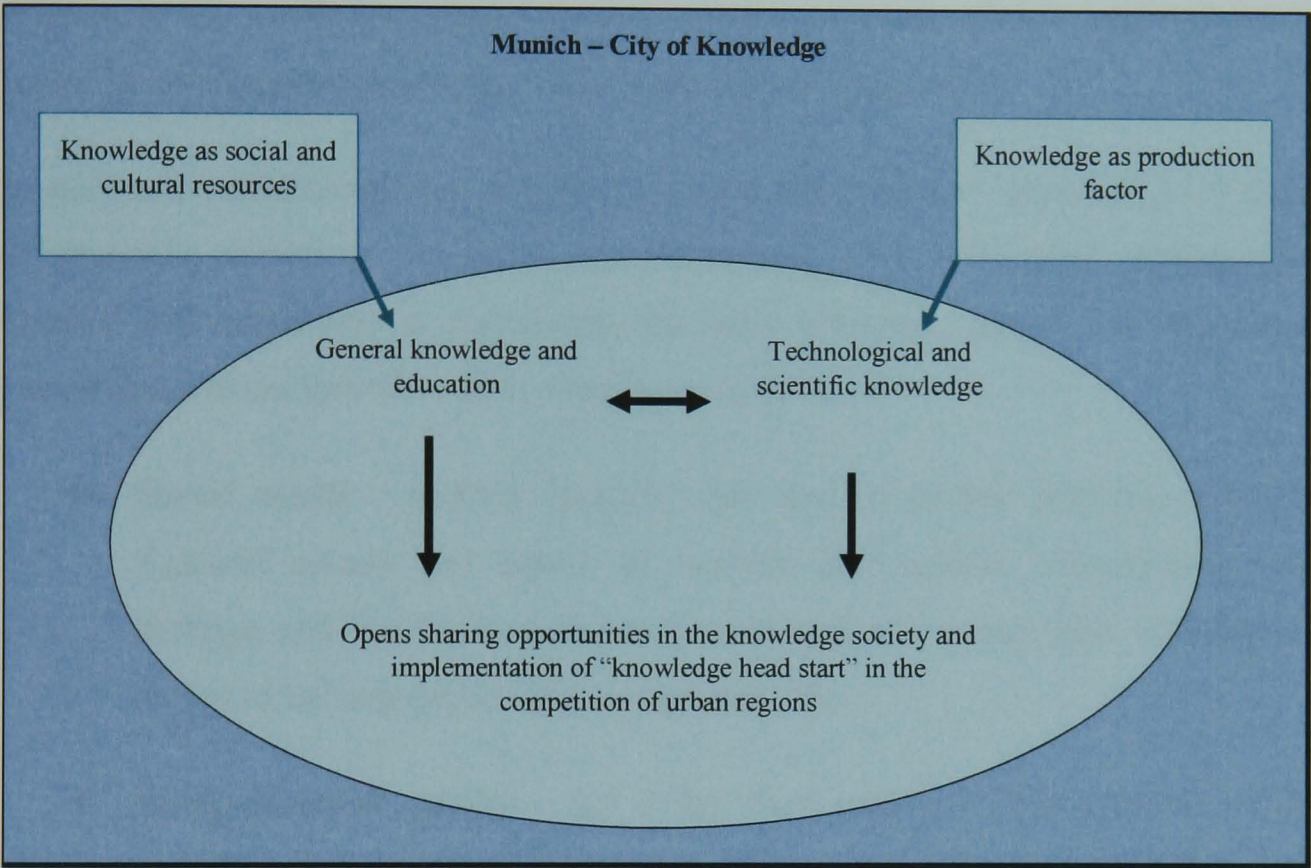


Figure 4-2 Knowledge definition in Munich

Source: Adapted from City of Munich (2005, p. 6)

In contrast to these well developed cities, only technological knowledge and/or industrial know-how are valued in Hsinchu, Dubai, and Cyberjaya. As the government-led high-tech industrial park, Hsinchu is focusing on the industrial know-how, which developed a successful technological transfer network with Silicon Valley, while the Emirate of Dubai and Malaysia Government are trying to attract external knowledge resources without linking its indigenous knowledge capacity.

At the core of the difference of the knowledge defined for development between the well developed cities and the emerging industrial cities lies the different understanding of the meaning of development, that is, development for people or people for development.



#### 4.4 Development dimensions in practice

The review of the selected cases noticed that development policy and activities stem from the understanding of knowledge and how it is valued by each city. In most cases of the post-industrial cities, although the knowledge economy in its “narrow sense” (van Winden *et al.*, 2007) has gained greater attention, social, cultural, and environmental issues are also addressed as being vital to the futures of the cities.

In particular, Melbourne has adopted a “triple bottom line” approach to balance its development initiatives. As set in the Melbourne City Plan 2010, Melbourne City Council was committed to monitoring the city's economic, social, and environmental performance to see how the city is working toward:

- **Social equity** - making decisions that lead to greater physical, cultural, and financial access and equity in services and justice; strengthening cultural heritage and the bonds between people and increasing their willingness and ability to become involved in community life.
- **Environmental quality** - not using more resources than required to deliver activities and services. Improving the overall amenity (including physical amenity) of a city while reducing the effect on natural capital. Practical steps include using energy from renewable resources, maximising resource and infrastructure use and minimising pollution and waste.
- **Economic prosperity** - promoting development of jobs, business prosperity and market growth in a sustainable manner.

To ensure this can be done coherently, Melbourne prioritised four themes of development activities: connection and accessibility, innovation and business vitality, inclusiveness and engagement, and environmental responsibility. This was coordinated by the new vision of “putting people at the centre”, under which any development activity was being made to be conducive to (a) substantially improving support and services to citizens; (b) providing better community engagement and more effective democracy; (c) using innovation in finding new opportunities; and (d) creating a framework for governance (Shaw, 2003).

Similarly, when Barcelona was defining its “new model of city” (Clua and Albet, 2008), innovation in urban refurbishment, economic, and social re-conceptualisation were highlighted. Reflected in the 22@Barcelona project, urban physical renewal has been managed to incentivise the development of interventions of diverse scope, and buildings of many different kinds, to meet the needs of the different end users in terms of quality, functionality, and representativeness. Differing from the traditional planning approach, the 22@ Barcelona plan does not establish the detailed, precise ordering of the territory but provides an extraordinarily flexible system of transformation whereby the individual project is able to adapt to its urban, economic and social environment. Coexistence, hybrid, and compact characterise the innovative features of the planning. Moreover, constructions of the urban refurbishment of all of the streets are regulated to contribute to generating new green spaces and public facilities.

From an economic perspective, 22@Barcelona defined as a pillar of its future economy, where the “@activities” was prioritised, such as digital services, ICT industries, cultural industries and R&Ds (Clua, 2005, Duarte, 2007). Meanwhile, social innovation as defined by the 22@Barcelona was to foster a diversified, high quality urban environment through government founded projects, such as 22@education, 22@digital district, multimedia classrooms, virtual memory, family online, and public campaigns such as computer recycling and so on.

Apart from Melbourne and Barcelona, Austin and Manchester are too emphasising the vital importance of culture for their future development. Both are trying to enhance their city’s cultural traditions as a means of city identity.

Meanwhile, in the cases of Hsinchu, Dubai, and Cyberjaya, development efforts are exclusively made to economic growth, where intensive public funds are invested into creating a physical and policy environment for attracting multinational companies and retaining knowledge elites.



## 4.5 Knowledge environment

### 4.5.1 Quality of place

#### 4.5.1.1 *Physical and social environment*

Regardless of the well developed cities and the emerging industrial cities, the physical environment of all 11 cities is attractive. Generally, in the old industrial cities, the old industrial areas have been or are being redeveloped based on the new understanding of 21<sup>st</sup> century global trends. For instance, in Manchester, the old industrial areas have been replaced by shopping centres, university campuses, restaurants, sports centres, banks, and museums (Work Foundation, 2002). Similarly, in central Melbourne, the Central Activities District and Docklands are giving way to high-order commercial development and the retail and entertainment core of the metropolitan area, whilst housing development is taking advantage of this area's unmatched accessibility to jobs, facilities, recreational and cultural opportunities, adding to the after-hours vibrancy of the inner areas (Victorian Government, 2002, 2002a). The same case can be found also in Newcastle upon Tyne, where the old Grainger town and industrial areas are being rebuilt as commercial and science parks, and Delft, which has converted most of its historical industrial sites into museums.

Other well developed cities like Barcelona have successfully redeveloped their physical infrastructure taking the opportunities of hosting the Olympic Games and Cultural Forum (Clua and Albet, 2008). Austin has embraced the new concept of creating a particular "people climate" in the provision of stylish built environment(s), extensive city parklands, conservation of natural surroundings, a rich variety of cultural institutions, quality affordable housing, quality hospitals, quality schools and universities, and an efficient traffic system. Meanwhile, the natural beauty and leisure facilities, cleanliness and elegance make Munich one of the most attractive places in the country (van den Berg *et al.*, 2005). However, to compare with Austin, the presence of hardly any affordable housing has become a major concern in Delft and Munich (Fernandez-Maldonado and Romein, 2008, van Winden *et al.*, 2007).

Meanwhile, in the case of emerging industrial cities, the creation of new urban areas has been taking advantage of knowledge and technology for both planning and construction,

particularly in Dubai and Cyberjaya, where the super-standards built environment are being constructed.

However, when the social environment is considered, it has been found to be problematic. Within the well developed cities, Munich, Austin, and Singapore performed better than others, though all well developed cities have made efforts to solve social problems such as inequality, digital divide, and are economically active. In contrast, the emerging industrial cities are following a policy that is exacerbating such issues.

#### **4.5.1.2 Cultural environment**

The importance of having a vibrant cultural environment for the future of the city is recognised by all cities. Whereas historical cities are endeavouring to maintain and enhance their cultural traditions, other industrial cities and newly developed cities are trying to foster a kind of culture which is attractive to knowledge workers. For example, Melbourne is known as one of the most attractive tourism destinations in the world. Cultural and international sporting activities are among the major tourist attractions of Melbourne. While having a large and vibrant sports scene, Melbourne is perhaps best known as “the art and culture capital” of Australia as it is the home of a large number of art and cultural activities (Yigitcanlar, 2007).

The same case is found in Munich, a city with a wide variety of culture and leisure facilities. Indeed, Munich is among the European “star” for short breaks and cultural visits (City of Munich, 2005). As van den Berg *et al* (2005) noted, Munich’s strength as a tourist city is mainly due to its traditional cultural-tourist market, enjoying an enviable palette of cultural institutions and intangible elements related to its celebrated atmosphere and countless festivals and events such as “Oktoberfest”.

Similarly, Barcelona has marked its name as the “culture capital” of Europe (Barcelona, 2004). Through hosting successfully the World Culture Forum in 2004 (which was organised under the three themes of cultural diversity, sustainable development, and conditions for peace, with the presence of 186 member states), Barcelona made another leap forward towards the “Barcelona: the City of Knowledge” (Dvir and Pasher, 2004).

Fostering a unique culture as an identity of the city has been adopted by some cities as a means of attracting and retaining talent. This is the case of Austin, where the most prominent initiative that the city has energetically promoted over the last few decades is renewing the music scene that emerged in the 1960s. In 1991 Austin capped this aspect of its lifestyle promotion with the adoption of an official slogan: “Live Music Capital of the World”. The slogan was readily accepted in the U.S. thanks largely to the television series “Austin City Limits”. Meanwhile, taking advantage of the quality of the School for Radio, Television, and Film in the University of Texas at Austin, the city has been the location for many motion pictures and annually hosts the Austin Film Festival. This together with the high proportion of university students from all over the world provides Austin with a reputation as being a young and active cultural haven (city of Austin web site).

Meanwhile, by launching the programme “Culture Vibe” under the MKC strategy, Manchester is trying to create a “24 hours city” so that people can find everything they are seeking, from world class sports and leisure events to superb nightlife and the café culture (MKC, 2003). According to MKC, the “Culture Vibe” also aims to foster a cultural environment for innovation in order to embrace the economic performance, attractiveness, and competitiveness of the Manchester region.

To compare with the well developed cities, Hsinchu, Dubai and Cyberjaya are creating an environment to facilitate a knowledge elite culture.

#### ***4.5.1.3 Economic base***

Economic growth has always gained priority within the development agenda across the 11 case studies. However, each city may adopt different approaches to compete in the emerging global knowledge economy. The following paragraphs discuss briefly each city’s economic situation.

#### **Manchester**

Until the 1960s, Manchester’s economy was dominated by the manufacturing sector, particularly by textile industries, which were globally competitive. However, in the 1970s and throughout the following decades, Manchester’s economy has undergone

fundamental changes, which has left a diverse and dynamic commercial base (van den Berg *et al.*, 2005). Currently, Manchester's economy relies largely on the universities, financial and professional services, and airport. Knowledge intensive industries emerged to be faster growing sectors than any other sectors (Work Foundation, 2002). Between 1998 and 2004, Manchester saw a 13 percent growth in the proportion of businesses that were knowledge-based. By 2006, 38 percent of the workforce are employed in knowledge occupations and 37 percent of businesses are knowledge based (Work Foundation, 2006a).

### **Barcelona**

Barcelona is the most industrialised metropolitan region in Spain. Like many other industrial cities, Barcelona's economic rejuvenation started in the late 1970s. However, unlike other cities, Barcelona's employment levels did not decrease during the process of this transformation. On the contrary, employment grew enormously because of the fact that the two processes took place simultaneously during the economic restructuring. That is, while manufacturing industries were declining and so lost employment, services industries (especially advanced services) were empowering their presence in the economic structure (Duarte, 2007). At the end of 1990s, Barcelona adopted the now well known "city of knowledge" strategy to promote the new economy and cultural industries (Gdaniec, 2001). This has led to the cultural and ICT industries, digital services, and knowledge centres becoming dominant sectors in the economic structure, employing 66 percent of working population (Duarte, 2007).

### **Austin**

Austin has a thriving economy that is rich in technology. Indeed, beginning in the 1980s, Austin often made headlines in the New York Times, the Wall Street Journal, and the world press as the next great "Silicon Valley", being nicknamed "Silicon Prairie," "Silicon Gulch," and "Silicon Hills" (city of Austin web site). The presence of large international companies such as Dell, IBM, Freescale Semiconductor, Apple Inc., Hewlett-Packard, Vignette, AMD, Sun Microsystems, Samsung, and Intel, and the presence of the University of Texas signified the city as already being at the forefront of the knowledge economy. Additionally, Austin is also rich in small businesses and is

served by a strong network of independent, locally-owned firms and organizations such as the Austin Independent Business Alliance (King and Keating, 2005).

### **Melbourne**

During the 20<sup>th</sup> century the city was shaped mainly by manufacturing activities. The city was therefore characterised as having well developed industrial areas, a 24-hour working port, a high quality railway infrastructure and premium sporting facilities, with access to a curfew-free international airport, high quality residential and retail environments, and an extensive park system. However, from the beginning of the new millennium, Melbourne has been shaped by the rise of 21<sup>st</sup> century occupations (Brain, 1999), including business analysts, computing professionals, legal professionals, finance managers, media producers, ICT managers, and policy and planning managers (Dodson and Berry, 2004). Moreover, universities have become vital contributors to the city's economy, with combined revenues totalling more than \$4 billion and export earnings in excess of \$2 billion, over employing 22,500 knowledge workers and enrolling more than 260,000 students (MVCF, 2007).

### **Delft**

Delft has a long tradition in industrial activity in sectors like the metal industry, chemical industry, construction, food, and drinks. Particularly, the city is famous for its pottery. During the second half of the 1970s and throughout the 1980s, Delft experienced long economic decline because of the difficulties that the industrial companies faced, which resulted in a significant drop in employment in the industrial sector. Unemployment became a problem for local authorities as well as for the national government (Knight, 1995). The implementation of the strategy, "Delft, the knowledge city", since the early 1990s has been proved a success by the increase in the percentage of knowledge intensive jobs, which increased by around 10 percent from 30 percent at the beginning of the 1990s to 40 percent at the end (Fernandez-Maldonado and Romein, 2008).

### **Munich**

Munich's growth as a key economic engine in Germany is relatively recent (van den Berg *et al.*, 2005). In fact, it was not until the 1960s that Munich's economy started

taking off. Since then, Munich has for decades actively promoted the development of the city into a knowledge economy. Substantial investments have been made systematically into its knowledge infrastructure, including the establishments of universities, knowledge intensive institutions, and centres of excellence. Meanwhile, public funded venture capital for supporting research and development and start-ups were also created. After half a century's continuous effort, Munich's economy is now characterized as highly diversified and knowledge intensive. A variety of knowledge clusters have been growing with the seat of headquarters and research bases of key companies such as Siemens and BMW. Apart from this, the banking and insurance sector has also grown impressively since the 1990s (City of Munich, 2005). Consequently, the city has grown to become the second most important economic region after Frankfurt in Germany (van Winden *et al.*, 2007).

### **Newcastle**

Newcastle's economy was once reliant on coal mining and heavy industries (OECD, 2006). In the recent wave of transformation to a knowledge economy, Newcastle scores well on knowledge intensive occupations and industries. According to the Work Foundation (2006b), although in absolute terms, the GVA of Newcastle (city region) is relatively small, the proportion of knowledge-based industries stands the fourth out of the UK cities (lower than Bristol, Edinburgh, and Manchester). In the period from 1998 to 2004, Newcastle's knowledge based businesses were growing at a rate of 11 percent, above the UK average, which has resulted in the knowledge intensive sector such as universities, advanced services, and research and development becoming the driving force of Newcastle's economy (NERIP, 2006).

### **Singapore**

From the late 1990s, the Singapore government has forged an environment that is conducive to the growth of knowledge-based economy (Wong, 2008). Both physical and policy environments were developed to facilitate innovation, new discoveries, the creation of new knowledge, harnessing the intangible such as ideas, knowledge, and expertise to add value and create new value in the light of economy. By the end of 20<sup>th</sup> century, the World Bank listed Singapore as one of the most ICT specialised economies in the world (World Bank, 1998). Notwithstanding, the government of Singapore has

started to promote the creative industries aimed to nurture Singapore as a creative centre so as to enable it to compete in the global knowledge economy (ERC, 2002). This has been proved successful by the strong growth of the cultural industry in recent years (Wong, 2008).

### **Hsinchu, Dubai, and Cyberjaya**

Across these three cities, the economic bases are specialised in single or few high-tech industries. Hsinchu concentrates on high-tech manufacturing, which was growing from local private run enterprises with incentive ties with the Silicon Valley, while Dubai and Cyberjaya have forged an environment for attracting multinational companies to operate in their cities. As noted in the literature, this might be risky as the city's economy concentrated too greatly on a single industry sector.

In summary, cities like Manchester, Barcelona, Melbourne, Delft, and Newcastle upon Tyne, as well as Singapore have diverse economies that can be characterised as knowledge intensive and creative, while Austin and Munich both have developed their economic base which includes not only knowledge intensive and creative industries but also the world leading high-tech production industries. This may enable their economy to be less vulnerable in the globalised economic competition. In contrast to these well developed cities, in the case of Hsinchu, high-tech manufacturing has already been challenged by its counterpart from mainland China, where the availability of much cheaper labour has taken the competitive advantage. Meanwhile, the knowledge intensive economy which radically emerged in Dubai and Cyberjaya in the last decade does not appear to be rooted in the city, nor has a strong link with local industries. This has put the cities' economies in a vulnerable position.

#### ***4.5.1.4 Urban innovation engines***

The ability to turn ordinary organisations and public spaces to innovative use have been highlighted by all 11 cases. Public spaces, cultural and sports events have also been used as a means of creating and disseminating knowledge in the well developed cities. For example, libraries (including city and university libraries), have been the favourable sector in receiving public funds across the eight well developed cities. This is especially true in Newcastle which has invested heavily in rebuilding the city library and museums

over the last few years. Moreover, theatres, museums, cinemas, and cafes are seen as one of the indispensable elements of life in historical cities such as Delft, Munich, Newcastle, Barcelona, and Manchester. In some cases, sports are being treated as the blood of the city. This is the case in Manchester, Newcastle, and Munich, where football is not only a sport, but is also of vital importance in cultural and economic terms.

In addition, some cities like Barcelona, Austin, Melbourne, Munich, and Singapore are using open air public spaces and cultural events to make meeting knowledge easy. The “Science in the Street” programme in Barcelona has allowed the public to learn more about scientific knowledge, while the “World Cultural Forum” has provided a platform for the exchange of knowledge on cultural diversity, development sustainability, and so forth. This is the case in Austin where the live music shows bring together people from different backgrounds. This is what Dvir (2006) would refer to as the “knowledge moment”, similar to Melbourne and Singapore’s cultural activities and Munich’s cultural market.

Nevertheless, in Dubai and Cyberjaya, much attention has been paid to facilitate meetings between knowledge elites, whereas public involvement has not been taken into consideration. Furthermore, being an industrial park rather than a fully functioning urban area, Hsinchu’s innovation capacity has benefited from being proximate to quality universities and research institutions (Lai and Shyu, 2005), but lacks informal facilities for knowledge creation and dissemination.

**4.5.2 Knowledge base**

The presence of quality and quantity of knowledge institutions such as universities, polytechnics, public and private fund R&D organisations are argued by many authors as determinant factors in positioning and developing a city to become a knowledge city (van den Berg *et al.*, 2005). Not surprisingly, this has been realised by all of the 11 case study cities. Table 4.1 lists the number of universities and the percentage of students compared to the population in the city or city region.



**Table 4-1 Number of universities, students and academic disciplines (2007/8)**

City	Number of universities	Students/population	Academic disciplines
Austin	7	--	Whole disciplines
Manchester	4	21%	Whole disciplines
Munich	8	7%	Whole disciplines
Melbourne	8	38%	Whole disciplines
Delft	2	17%	Science and technology
Barcelona	5	12.5%	Whole disciplines
Newcastle	2	17.3%	Whole disciplines
Singapore	6	--	Whole disciplines
Hsinchu	2 (nearby)	--	Whole disciplines
Dubai	27 (university campuses)	--	Science and technology
Cyberjaya	3 (one under construction)	81%	technology

**Sources** Statistic information derived from each case study city’s official web site

As is shown in the table, each case study city has at least two universities, of which some are the world’s leading universities (for example, University of Texas at Austin, Ludwig-Maximilians-University at Munich, Manchester University, and Newcastle University). In the extreme case, Dubai is developing the “Dubai International Academic City” under the project of “Dubai Knowledge Village (DKV)”, which aims to create an exclusive cluster for institutions of higher education. Twenty-seven prominent international universities from Australia, India, Pakistan, Iran, Russia, Belgium, UK, Ireland and Canada, have been attracted to establish campuses in the DKV, offering programmes in fields such as Computing, Technology, Business Management, Life Science, Fashion, Media and so forth.

In the mean time, the percentage of students compared to the whole population indicates that Melbourne can be seen as a university city with Manchester, Newcastle, and Delft are not far from there. In the context of Cyberjaya, the newly developed town has a day population roughly 37,000 of which 30,000 are students and only 10,000 residents

(Cyberjaya web site). Moreover, whereas relevant information about numbers of students cannot be found for Hsinchu, Singapore, and Dubai, Austin has been ranked as the first U.S. city in regional student concentration – full-time students per 1,000 residents (Pennsylvania Economy League, 2000).

From this qualitative perspective, it is noticed that while in most case study cities the universities teach a wide range of academic disciplines, they are focused on science and technological fields in Delft and Dubai, with Cyberjaya concentrating on multimedia technology. Moreover, except Dubai and Cyberjaya, whose universities are solely teaching institutions, the rest are research universities with some of them emerging to be entrepreneurial ones such as the University of Texas at Austin, universities in Munich and around Hsinchu.

One common feature across the case studies is that quality university(ies) are playing increasingly important roles. In some cases like Melbourne, Manchester, Newcastle, Delft, and Austin, universities are the largest employers in their local context. Some universities are the largest economic entities in their city (for example, Melbourne). Furthermore, quality universities in some cities (for example, University of Texas at Austin) are not only a “magnet for people”, but are also “a magnet” for the knowledge intensive industries, since multinational high-tech giant companies are lured to operate approximately to universities (for example, Austin), not to mention the growing amount of university spin-offs, which have become major economic players (for example, Dell in Austin).

Alongside the universities, the presence of non-university research establishments in the cities is commonly found in the seven well developed cities as well as in Singapore and Hsinchu. Such research institutions exist either independently or owned by large companies. Compared with university based research, their research activities concentrate more on innovations in the product and processes sectors of technology intensive industries.

Overall, with no exception, universities in these 11 case study cities are receiving extensive support from the government and for those research and/or entrepreneurial universities. Their success may be largely attributed to the research milieu that has formed around them. Indeed in most cases, universities, numerous professional

academies and vocational training schools, plus an assortment of private-sector training and development institutes combine to generate knowledge, promote innovation, and provide a steady stream of highly qualified personnel for the local labour market.

#### 4.5.3 Knowledge culture

An open approach to knowledge as a resource and an inspiring climate provide conditions that are attractive to people and make them feel loyal to the city. Such an environment promotes the culture of meeting knowledge and makes people want to know more. Within the case study cities, some of them are already internationally known as having a sensational knowledge culture (such as Austin and Munich), while others are making efforts to foster this kind of culture.

In Munich, apart from the well established school systems and universities and colleges, a wide variety of renowned institutions for training, further education and adult education formed a comprehensive life-long learning system. The Adult Education Centre (MVHS in German<sup>3</sup>) alone trains over a quarter of a million people in relation to their jobs, the largest European adult education establishment in public responsibility (City of Munich, 2005). Additionally, the private sector, such as information technology and media companies, language schools and further education establishments, also provide specialised and widely diversified ranges of training courses. This makes an important contribution to Munich's lifelong-learning culture. What is more, the life-long education facilities provide not only occupational learning but also social integration of individuals disadvantaged in the general labour market.

In the case of Austin, the city was accorded the title of "human capital" (Powers, 2006) because of the concentration of high skilled workers, including skilled in-migration and high quality of university graduates (King, 2006), where more than one-third (36.4 percent) of its workforce is employed in knowledge-based industry (Florida, 2002). The

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<sup>3</sup> MVHS – Münchner Volkshochschule GmbH, whose history can be dated back to more than a century ago. Now it organizes life-accompanying learning in the fields of languages, health, culture, politics, labour and occupation, frequently in cooperation with other Munich-based cultural and educational institutions, universities, societies, associations and initiatives. Moreover, the MVHS provides accepted second-chance education and nationally and internationally accredited examinations in vocational training, and issues language diplomas. Courses, which can be attended by people from all walks of life and of any age, are run at 27 sites throughout the city and at 95 schools in Munich (City of Munich, 2005).

gathering of such knowledge workers has spontaneously generated an atmosphere of learning, which has been deliberately fostered by the government under the “People Climate”<sup>4</sup> program (Michaud, 2003). Such an environment makes the city a magnet for young, talented, and innovative people and businesses alike, which in return consolidate that kind of culture (Baum *et al.*, 2007).

Meanwhile, in other cities such as Melbourne and Newcastle, extensive efforts have been made to create a knowledge culture. Newcastle, for instance, launched a “City Learning” program ten years ago, under which a set of infrastructure, the City Learning Centre, has been created, and learning activities such as Learning Partnership, Family Learning, Learning First, and Learning Disability Team action have been in favour of local policy agenda (Newcastle City Council websites). The availability of infrastructure and diversified activities would undoubtedly release the potential of learning.

Similarly, making knowledge accessible for all has been prioritised by Melbourne city council and the Victoria State Government. Through implementing the “e-government” policy, the government has invested heavily into building ICT skills in the community, providing access, and on outreach such as helping the development of community and business websites to bridge the digital divide (Blumhardt, 2004, Griffiths, 2002). This policy has proved successful by the fact that some 50,000 people have taken part in various training programmes and most of whom have found new jobs (Multimedia Victoria, 2002).

#### **4.6 Knowledge synergy**

In the literature review, it has been found that the ability to synergise knowledge resources for development is an indispensable feature of KBUD. The review of the 11 international cases noticed that both institutional mechanism and policy frameworks have

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<sup>4</sup> A program under which Austin has been developed to provide Stylish built environment(s); Extensive city parklands; Conservation of natural surroundings; A rich variety of cultural institutions; Quality affordable housing; Quality hospitals; Quality schools and universities; An efficient traffic system, and to offer a wide range of outdoor recreation opportunities; a diverse range of ethnic and cultural settings; a vibrant nightlife; and a thriving live music scene (Florida, 2005).

been adopted for effectively using knowledge. This section presents the findings from the case studies.

#### **4.6.1 Institutional mechanism**

Establishing institutions for facilitating knowledge governance has been greatly discussed in the literature, as well as being in favour of the development activities toward KBUD. In the practice of the case study cities, developing technopoles (science parks, industrial complexes, technopolises, and science cities) and the like are adopted as a way of transforming knowledge and technology into productivity. This is particularly the case in the emerging industrial cities. Meanwhile, creating and fostering knowledge clusters and networks based on the city's knowledge and technology strengths are seen as being common in well developed cities.

##### ***4.6.1.1 Developing technopoles***

As discussed in the literature, technopoles have been adopted enthusiastically by many cities as a means of transferring knowledge into productivity, though their effectiveness is still open for debate. Nevertheless, in the current case studies, it is noticed that science parks and the like which are comparatively well equipped with infrastructure and aimed at attracting foreign direct investments (purposefully multinational large companies) and domestic high-tech industries are found commonly in Hsinchu, Dubai, and Cyberjaya, as well as the earlier three science parks in Singapore. Meanwhile, in Newcastle and Barcelona this has been used for the transmission of knowledge for socioeconomic purposes.

##### **The three science parks in Singapore**

Starting from the early 1980s and throughout the following two decades, Singapore has developed three science parks within a total 54 ha land area. each of which was designed to target a specific industrial sector, namely with Science Park I for attracting and facilitating multinational high-tech manufacturing; Science Park II in the 1990s for ICT industry and Science Park III started in the early 21<sup>st</sup> century, targeting the life sciences industry (Singapore Science Park web site). The development process of these three science parks was associated with the substantial efforts that were made to define the role

of science parks in the national development strategy over the years, from the provision of infrastructure and services for multinational companies to fostering indigenous knowledge entrepreneurship. Nevertheless, Singapore's science park strategy has until recently been focused on economic growth and has been driven largely by the government. Private sector participation was limited (Koh *et al.*, 2005).

### **Hsinchu Science and Industrial Park**

The Hsinchu Science and Industrial Park was developed to provide high-quality infrastructure to support technology start-ups and help develop capabilities of high-tech manufacturing. It made no intention to develop the cutting edge technology, but rather to transfer industrial know-how to the production sector (Saxenian and Hsu, 2001). From an economic perspective, Hsinchu Science and Industrial Park is successful because it influenced strongly the development and geographical transformation of the surrounding area, where knowledge networks (R&D, incubation, and production) have emerged. Such networks stimulated the growth of knowledge-intensive service businesses, which, in return, provide a crucial interface between the supportive environment and technological infrastructure (Hu *et al.*, 2006). Moreover, the success of the Hsinchu Science and Industrial Park is also attributed to the strong links with Silicon Valley, to which it has become a part of the global network (Saxenian and Hsu, 2001). This helped Hsinchu to extend to cross-border investment flows, key manufacturing partnerships between Taiwanese and U.S. firms, and the transfer of entrepreneurial talent and management practices from the Silicon Valley to Taiwan (Koh *et al.*, 2005).

### **Dubai Internet City, Media City, and Knowledge Village**

The three named cities are actually free developed zones. As indicated by the name, Dubai Internet City is a free economic zone targeted at information technology industries; Media City is a tax free media outlet, and Knowledge Village is developed as a universities park (Dubai Investment and Development Authority, 2002). All of these giant projects are designed to provide modern, full-service infrastructure with cutting-edge technologies that cater to the specific needs of knowledge intensive companies from across the world. They also allow companies to avail themselves of a number of ownership, taxation and custom related benefits which are guaranteed by law for a period of 50 years (TECOM website) of operation and includes 100 percent foreign ownership.

Nevertheless, as the policies that are in effect in the special zones have been made in favour of attracting foreigners, domestic players have found it hard to become involved. Consequently, there are actually no direct connections between local and foreign investors so far (Bagaeen, 2007).

It is important to note that among the above three cases, Hsinchu and Singapore science parks were both established in the 1980s when many cities in developed countries were doing so, whereas Dubai decided to develop its “three cities” very recently. In addition, similar to Dubai Media city, Cyberjaya was too an initiative taking place at the beginning of 21<sup>st</sup> century with the aim of facilitating multimedia and ICT industrial development (respectfully attract multinational large companies to operate in the city). However, regardless of time, they are economically centred. To compare with these three cases, the former industrial cities are paying more attention to synergise knowledge for socioeconomic development. This is the case in Singapore, Newcastle, and Barcelona.

### **The One-North in Singapore**

The One-North is a new knowledge precinct initiated at the beginning of the 21<sup>st</sup> century, which would integrate the existing three science parks and other research centres with a whole range of high quality places that are favourable to knowledge workers, by extending the scale to 200 hectares. The project was launched based on a detailed study of the movement of technopoles worldwide and the global trend of the knowledge society (Baum *et al.*, 2007). The conceptual objective of the One-North was accordingly set to create “an idea what we are and what we can be – with space to live our lives in harmony, with energy, time for thought and time for being – to realise the potential of what we do and can achieve in our work and play, in what we will learn and how we live” (one-north website: [www.one-north.com](http://www.one-north.com)). Following this concept, land use policy was reset to allow the integration of residential (includes leisure, cultural, service and so on.) and work.

The concept of a “knowledge community” and “learning region” (Florida, 2000) were adopted for conceptual planning, upon which eight interrelated elements – living, connectivity, growing around centres of excellence, transport, housing, education, conservation, and ICT – were soundly taken into account. Each element was defined by particular parameters of form and function but in all One-North strives to create an

ambiance of technological sophistication and a futurist, compact, mixed use, pedestrian-centric urban form for easing face-to-face interactions, which is argued to be important for sustaining the innovation ecology of the knowledge economy (Wong *et al.*, 2006). The earlier stage of the One-North has been proved a success by the increasing concentration of domestic and foreign talent (Baum *et al.*, 2007).

### **The Newcastle Science City**

The Newcastle Science City can be seen both as a national program and a giant project initiated by local partners. As the former it was designated in 2004 by the central government to develop an internationally recognised vibrant knowledge centre. As the latter it was to develop a new university campus that will “integrate science, business, education, and economic development so as to create an environment where technology, business, and society develop together on a scale competitive with anything in the world and underpinned by the highest ethical and moral standards of integrity” (Newcastle Science City websites). In the local context of partnership, Newcastle’s Science City employed the Triple Helix theory by involving Newcastle University, Newcastle City Council, and One NorthEast, which have been argued as being the principal partners for regional development (Etzkowitz and Klofsten, 2005).

Despite the fact that the project is still under construction, actions toward its objectives have started, among which “Professors of Practice” and “Public Engagement” were meaningful for synergising knowledge. The action of “Professors of Practice” is to point scientist entrepreneurs with strong academic credentials and research interests to bridge between the university and the industrial world giving access to talents for companies and placement opportunities for students. “Professors of Practice” are employed part-time, allowing them to maintain dual careers in business and academia. As agents of change, the Professors of Practice will foster new industrial networks, develop translational research programmes, identify commercialisation opportunities, and act as a role model for staff and students. Moreover, those Professors of Practice also play a role for integrating business and academic roles and collapsing the university-industry divide, turning a conflict of interest into a confluence of interest.

Meanwhile, Public Engagement activities encourage citizens including currently excluded groups, especially young people, and school pupils to raise their confidence,



ambitions and abilities, so that they are more scientifically aware and able to understand better the benefits that science brings to their lives. What is more, through interacting with experts, research questions have been generated. This brings a change to institutions by creating a sense of shared ownership, of two-way learning, and a process of continuous reflection and improvement for a model of public engagement and social innovation.

### **The 22@ Barcelona**

The 22@Barcelona is an ambitious project that aims at transforming 200 hectares of old industrial land in Poblenou into an innovative district to provide modern spaces for the strategic concentration of intensive knowledge-based activities. The project also aims to develop a “new model of city”, where the most innovative companies co-exist with research, training and technology transfer centres, new residential areas, facilities, and green areas to offer a high quality of environment for working, living and learning (Barcelona, 2005).

As the “new model of city”, the development of 22@Barcelona highlights innovations in the process of urban refurbishment, economic, and social re-conceptualisation. In order to ease the knowledge process, the 22@ Barcelona incentivises the development of interventions of diverse scope, and buildings of many different kinds, to meet the needs of the different end users in terms of quality, functionality, and representativeness. Meanwhile, following the conceptualisation of “@activities” (Clua, 2005, Duarte, 2007), 22@centres of knowledge, 22@space, 22@network, 22@breakfast, 22@UGAP (management unit of project aids), 22@landing (Clos, 2004), 22@Education project, 22@Digital District Project, 22@Multimedia classrooms, 22@Virtual Memory, 22@Family online (22@Barcelona web site), and so forth have been launched to facilitate knowledge creation, dissemination, and utilisation. This reflects the core feature of the “new model of city” (Duarte, 2007).

In summary of synergising knowledge through developing a physical space (technopoles) discussed above, the emerging industrial cities tend to designate a special area, invest public money into physical infrastructure, apply substantially preferential policies to the area for the transfer of technological knowledge or industrial know-how into productivity. Meanwhile, the well developed cities have started to embrace a much wider knowledge

concept and paid great attention to developing coherent frameworks for regulating knowledge transmission.

#### ***4.6.1.2 Developing knowledge clusters and networks***

Knowledge clusters and networks have been argued as being efficient for the transmission of knowledge by the literature. Nevertheless, in practice, only a few of the case study cities formally take this approach. Typical examples are Munich and Newcastle, as discussed below.

A special feature of Munich's economy is the variety of knowledge clusters. These clusters, while attracting new high-technology businesses and industries, facilitate the actors in developing interlinked knowledge networks. Such networks usually involve actors from universities, research institutions and companies, which help constructing trust and developing urban innovation systems. These innovative environments are not mobile in space at random but embedded in the Munich city region as a result of deliberately fostering over the years. These clusters are the prime movers of the knowledge-intensive urban economy. They attract investment and provide high-skill jobs and define the future fields of growth of this city.

Unlike Munich whose industrialisation started to take place in the second half of the 20<sup>th</sup> century and therefore has been able to take the "later mover's advantage" to develop a variety of knowledge clusters, it was not until very recently that Newcastle started to establish knowledge networks – Centres of Excellence (CoE). Each CoE was launched in relation to the local research strengths and was jointly invested by local authorities, regional development agencies, universities, and business enterprises and operated as virtual organisations involving relevant knowledge networks across the world. The function of the CoEs was defined to:

- act as the link between the scientific knowledge and commercial applications;
- seek to secure additional funding for knowledge creation;
- equip and facilitate knowledge distribution and utilisation through establishing local and regional knowledge network and knowledge intensive business incubator (ONE, 2003).

Overall, both knowledge clusters in Munich and CoEs in Newcastle have been successful. Meanwhile, the informal knowledge networks developed through personal ties have also been shown to be efficient by Hsinchu's success in terms of linking with Silicon Valley over the last three decades.

#### **4.6.2 Policy frameworks**

In a broad sense, all the case study cities have put in force a set of policies to facilitate the creation of a cohesive environment for knowledge transmission. However, only Manchester, Melbourne, and Barcelona established the functional organisations for serving exclusively this purpose.

##### ***4.6.2.1 The Manchester: Knowledge Capital (MKC)***

The MKC was jointly established by local partners as a governance structure for better transmission of knowledge. It involves all ten Greater Manchester authorities; four universities; Greater Manchester Learning and Skills Council, Manchester Enterprises, and many other profit and non-profit making agencies and leading businesses. The vision of MKC was set to secure substantial and sustainable growth to benefit all the people of Greater Manchester and to make a major contribution to the Northwest, the North of England and the UK's future prosperity, through innovation and the best use of its knowledge assets (MKC, 2003). MKC is committed to strengthen the links between higher education, businesses, and local communities. Four predominant areas have been identified to work in for the fulfilment of its vision:

- Stimulating and supporting increased business innovation from research, science and knowledge;
- Engaging with the people of Manchester in securing this future through dialogue, debate, education and employment;
- Supporting the growth of a city-region environment which facilitates business success, provides an outstanding quality of life and is open to all;
- Championing and trying new ideas and new ways of living and working.

Drawing upon this policy framework, MKC has set out seven essential themes:

- A dynamic environment for leisure, living, learning and working;

- Connectivity matters for making the city connectable and accessible regionally, nationally and internationally;
- Better for business for nurturing industrial clusters and business start-up;
- Academic acceleration for supporting world-class, blue sky research and cutting-edge science and for the transformation of such knowledge into productivity;
- Genius generation for fostering and retaining knowledge entrepreneurs; empowering brilliant, pioneering individuals to embrace better ways of managing knowledge, new ways of working, innovative use of creative technology and ever stronger communications;
- Cultural vibe for making Manchester a “24hours city”;
- Community and opportunity for all (MKC website).

Under these themes, programs and public campaigns were launched such as Innovation Partnerships, Real World Science, Innovation Ecosystem, Manchester Innovation Fund, and Manchester is My Planet. From 2004 onward, such programs have been integrated into Manchester’s Science City.

As it shows, the selection of the four predominant areas share one common feature – fostering and utilising knowledge, while the seven essential themes cover a wide range of development dimensions and the project, programs, and public campaigns are conducive to its overall knowledge vision. However, due to the fact that the MKC was a cross administrative boundary partnership, it does not have the power to synergise knowledge efficiently because there is a lack of corresponding structure in each partner authority. Instead, MKC followed an approach that relies on programs and public campaigns which may be less sustainable.

#### ***4.6.2.2 Melbourne’s Office of Knowledge Capital (MOKC)***

As stated previously, Melbourne is indeed a university city, which means universities are sitting at the centre stage of the city’s urban life. The formation of the “Melbourne Vice Chancellor’s Forum”, which is chaired by the Lord Mayor of the city of Melbourne and involves all eight universities that have seats there, indicates that universities have become the leading force of the city. Launching the “Melbourne: Australia’s Knowledge

Capital” as Melbourne’s urban strategy to compete in the global knowledge society was the first initiative of the forum (MVCF, 2007).

Based upon the new urban strategy, in order to pave the way for effective transmission of knowledge, the MOKC was established jointly by Melbourne City Council, universities and partner organisations in Melbourne. The mission of MOKC was set to collaborate with the partners and other groups to enhance Melbourne’s status and performance as a city that creates, shares, and utilises its knowledge attributes to meet its overall economic, social and environmental needs. Accordingly, the MOKC was given to act in facilitating collaboration between the governments, universities, businesses, and other communities, and forming links with similar “knowledge cities” worldwide to enable mutually beneficial interactions (city of Melbourne web site). The MOKC has for the first time, brought together the city council, business, think tanks, and the city’s eight metropolitan universities in a combined effort to legitimately pave the way for knowledge creation, dissemination, and utilisation.

#### **4.6.2.3 *Barcelona Activa***

In order to make sure the implementation of “Barcelona, City of knowledge” is directed in a coherent way, Barcelona has created a new framework for managing development activities (Revuelta, 2004). Within the government body, a new councillor was added to the city’s political structure, who works in parallel with the city administrative departments, to ensure the integration of this strategy into all urban development policies, and to upgrade public and private partnership and public involvement in knowledge creation, distribution, and application (Ergazakis *et al.*, 2006a). Meanwhile, a local development agency, Barcelona Activa which was fully sponsored by the Barcelona City Council, was formed to execute the Barcelona City of Knowledge policies. Barcelona Activa was designed to be responsible for bringing knowledge closer to enterprises, professionals, students and all others to improve their skills and in turn, to apply these skills to their company, professional activities, careers, and lives. “Science in the Street” is one of the knowledge activities that involve the public which is organised by Barcelona Activa (Marshall, 2004).

Changing the local political structure and setting-up development agencies helped in promoting “Barcelona, City of Knowledge”. The agencies involved in different kinds of

activities such as designing and implementing projects, conducting research, strengthening scientific co-operation and knowledge sharing, attracting and retaining knowledge workers, sustaining economic development, marketing the strategic plan, and so on. Overall, by doing so, Barcelona has generated a new model of managing the process of knowledge.

In summary, by establishing the MKC, Manchester has taken the Greater Manchester city region into consideration in synergising knowledge for its urban development, though the efficiency is left open for debate as a result of the lack of corresponding structures in partner authorities. On the contrary, Melbourne and Barcelona have both restructured their government bodies to coordinate the overall strategy of synergising knowledge effectively for urban development. In addition, it is noticed that in contrast to the cases discussed above, the emerging industrial cities are using government power to mechanically facilitate knowledge processes, where there is a lack of legitimate governance structures.

#### **4.7 Chapter Summary**

This chapter has done a cross-case analysis by synthesising the 11 carefully selected cases worldwide. Drawing upon the above analysis, some key points are summarised as follows. Generally, it found that although all 11 case study cities, city regions, and newly developed towns, have made KBUD their development strategy, they are following significantly different approaches, but nevertheless, assuming a general trend.

Firstly, the well developed cities embrace a broader definition of knowledge than the emerging industrial cities. As evidenced in their urban development strategies, local development programs, public campaigns, and policies, efforts have been made to mobilise all knowledge resources for serving and ruling development behaviour in the well developed cities, such as Munich, Austin, Melbourne, Manchester, and Barcelona. In particular, Singapore successfully harvested the advantages of integrating indigenous and exogenous knowledge in sustaining the city-state's fast growth. To compare with these well developed cities, Cyberjaya and Dubai are paying more attention to external knowledge, while Hsinchu has been successful in localising technological knowledge for its high-tech industrial growth. Meanwhile, the well developed cities are making knowledge accessible to all by generating equal opportunities both for personal

development and social equity and inclusion, whereas in the emerging industrial cities, it is understood as exclusive advantages for elites.

Secondly, the well developed cities are doing better than the emerging industrial cities in terms of increasing urban sustainability. While the well developed cities are paying equal attention to social, economic, cultural, and environmental issues when making development decisions, the emerging industrial cities tend to bias development towards economic growth. Furthermore, the significant difference between the well developed cities and emerging industrial cities is that the former has made it clear that development is for all, whereas it is tended to be turned the other way around by the emerging industrial cities. In addition, the review also noticed that, however, within the well developed cities, the knowledge economy is understood differently - Austin and Munich define it in a broad sense whilst others define it in a narrow sense. The same case is found within the emerging industrial cities.

Thirdly, the well developed cities have developed a more cohesive knowledge environment than the emerging industrial cities. Regardless of the well developed cities or the emerging industrial cities, much attention has been paid to create a physically attractive environment. While the former invest extensively in regenerating old urban centres and industrial areas, the latter takes advantage of advanced technology to develop the new urban proper. To some extent, the latter even invests relatively more of its income into the built environment than the former. However, despite the well developed infrastructure, compared with Austin, the high price of housing in Delft and Munich are problematic.

Socially, although most of the well developed cities are endeavouring to build social inclusion and equity, in some cities (like Manchester, Delft, and Newcastle) the record is still poor. Not to mention the emerging industrial cities, which are making policy in favour of the knowledge elite few. This may strengthen the social inequality.

Culturally, the well developed cities are having or attempting to foster a cultural identity for the city (for example, Austin, Manchester, Barcelona, and Melbourne), at the same time, the emerging industrial cities are developing a physical condition for knowledge elites, where local cultural identity has been generally missing.

In terms of economic base, Austin and Munich both integrated their knowledge strengths into production and action, whereas other well developed cities are pursuing a narrow sense of the knowledge economy, with emerging industrial cities competing for growing high-tech manufacturing.

In all of the case study cities, attention has been paid to turn public spaces into innovation engines, but the well developed cities make it for the general public whilst the emerging industrial cities for knowledge elites. Meanwhile, knowledge base as measured by the presence of quality universities and research institutions is positively correlated with the knowledge culture as measured by the availability of a lifelong education system and the learners' enrolment, which are found to be better in the well developed cities than the emerging industrial cities.

Fourthly, both institutional mechanisms (for example, technopoles, knowledge clusters, knowledge networks, and so on) and policy frameworks (for example, MKC, MOKC, and so on) are used by some of the well developed cities as a means of effectively synergising knowledge for regulating knowledge transmission and ruling development behaviour in order to increase social, economic, cultural, and environmental sustainability. Meanwhile, the emerging industrial cities tend to establish institutional mechanisms for economic growth. Moreover, from the policy perspective, some well developed cities have legitimate political structures and approaches for coordinating knowledge processes, whereas emerging industrial cities tend to use government power to do so.

Putting these findings together, a conclusion can be drawn as that the well developed cities tend to embrace a broader concept of knowledge than the emerging industrial cities to serve and rule their development behaviour. They therefore follow better approaches of KBUD than the latter. Regarding the aim of the current study, this gives rise to the question of whether this finding is applicable to Chinese cities or not. Bearing this in mind, the next three chapters will discuss the Chinese cases.



## **5 KBUD in China: Historical and Policy Perspective**

### **5.1 Introduction**

The review of the current literature related to KBUD in chapter two identified that there exist research gaps in the English literature regarding how Chinese cities interpret and take action toward KBUD. The review of international KBUD initiatives in chapter four identified the general trend of KBUD movements worldwide. Starting from this chapter, the researcher will move discussion to the Chinese case. This chapter in particular is set out to review China's urban development from historical and policy perspectives. It starts with a discussion of the national concept of knowledge and its evolution, and then it looks at the impact of this change on the practice of urban development. This is followed by the discussion of recent initiatives toward KBUD and the Chinese literature in this domain.

### **5.2 Conceptual evolution of knowledge**

#### **5.2.1 Traditional Chinese philosophy of knowledge**

As discussed in chapter two, development behaviour is determined by the understanding of knowledge and how it is defined for development. Differing from the western concept of knowledge, the Chinese concept of knowledge was deeply rooted in the Chinese traditional culture, which was developed from the combination of Confucianism, Buddhism, and Taoism (Zhou and Liu, 1999). This section discusses the three philosophical elements of the Chinese concept of knowledge.

##### **5.2.1.1 *Confucianism***

Approximately 2,500 years ago, the Chinese philosopher Confucius advised that “know what we know and what we do not know is knowing”. This observation is somewhat similar to what Laszlo (2002) called “wisdom”. According to Confucius, the way in which “knowing” could be gained is learning. In terms of learning, Confucius advised

that: “learn from people to know gains and losses; learn from past (history) to know rise and fall; learn from nature to act toward harmony”. On how to learn from people, he cautioned that “among three passersby, one must know something better than me and therefore can be my instructor in this respect”. On how to learn from past, he said “reviewing defects from history to avoid the same mistake”. Confucius also emphasised the importance of learning from nature as evidenced by his edification: “observing the change of nature to adjust actions” (Analects of Confucius). The Sage’s adage of knowledge and attitude of learning became a norm that influenced the Chinese national concept of knowledge throughout the subsequent feudal history of China.

Based on this norm, respecting instructors, masters, teachers, knowledgeable people, elders, history and nature, has been regarded as the same as respecting knowledge, which in other words, is learning from people (experience). A typical example of this is the inculcation through the establishment of master and apprentice relationships in every field of society. This norm constituted the core of the Chinese culture of learning and moral standards (Yu, 2006), which helped the accumulation of knowledge on the one hand and may discourage challenging against authorities on the other. Moreover, this also helped to build a commonly accepted moral standard in respecting power, which profoundly influenced the Chinese thinking of social order and development (Ma and Li, 2006).

#### **5.2.1.2 Taoism**

Taoism (Dao Jiao) was originated in China. In Chinese, it is neither a thorough philosophy, nor a religion, but in reality a part of philosophy and religion (Tang, 2001). Taoism contains a variety of themes such as naturalness, vitality, peace, “non-action” (wu wei), emptiness (refinement), humanism, detachment, the strength of softness (or flexibility) (in the Lao Zi Dao De Jing), and receptiveness, spontaneity, the relativism of human ways of life, ways of speaking and guiding behaviour (in the Zhuang zi Nan Hua Jing) (see also in Sharot, 2001, Slingerland, 2003). At the core lies the central concept: Dao (Tao) and De (Te).

Dao is understood as the natural law of the universe, the flow of the universe, or the force behind the natural order (Ding, 1996). It is believed to be the influence that keeps the universe balanced and ordered. Dao exists everywhere and consists of everything in the universe. It believes that everything in the universe is interrelated. In the meantime, De is the active expression of Dao, which can be roughly understood as “inherent character, inner power, integrity” (Li, 1996, p. 77). While Dao is considered a “way”, De is the active living, or cultivation, of that “way” (Cane, 2002, Maspero, 1981)

The dichotomy of the universe as “Yin” and “Yang” is the symbolic doctrine of Taoism (Nan, 1994). According to Taoism, the universe (includes every thing) consists of and is self-balanced between Yin and Yang. If the balance were broken, problems would occur, such as earthquakes, illness and so on. In this respect, Taoism suggests “Wu Wei”. The literal meaning of Wu Wei is “without action”. It is often expressed by the paradox Wei Wu Wei, meaning “action without action” or “affectless doing”, to respect Dao (Lao Zi Dao De Jing). From this perspective, Taoism proposes that the universe works harmoniously according to its own ways. If someone exerts his will against the world, he disrupts that harmony. Nevertheless, Taoism does not identify man's will as the root of the problem. Rather, it asserts that man must place his will in harmony with the natural universe.

### **5.2.1.3 Buddhism**

Buddhism was introduced to China during the Han Dynasty around the first century (Zhao, 1986). However, the interpretation of the Buddhism involved Confucianism, Taoism and other indigenous philosophical thoughts so that what was initially a foreign religion came to be a natural part of Chinese civilisation albeit with its own unique character, which is known as “Chinese Buddhism” (Lin, 2006). The key point of Chinese Buddhism is that it emphasises “behaving better” by “knowing humans themselves” (Zhao, 1986). In other words, Chinese Buddhism believes that the human society is not a “reality” but a “temporary existence”, whereas the “spiritual world” is an “everlasting reality”, when only people know what and how to behave and help each other, can they help themselves and make human society better (Liang, 2002). Buddhism has become

one of the most influential factors of Chinese culture, playing an enormous role in shaping the mindset of the Chinese people, particularly in aesthetics, architecture, literature, politics, philosophy, and medicine (Zhao, 1986).

The combined influence of Confucianism, Taoism, and Buddhism laid a concrete foundation for the Chinese concept of knowledge (Zhou and Liu, 1999). This foundation was so well developed and deeply rooted that it rarely changed for more than 2,000 years until the Opium War (Bian, 2001), which forced the self-sufficient feudal China to open its door to the outside world. Since then, the western culture and development of knowledge – industrialisation – started to influence the Chinese tradition, though the foundation of Chinese traditional culture has never been shaken off (Li, 2000).

### **5.2.2 The impact of Marxism on the Chinese knowledge concept**

The feudal norm of knowledge for development was by and large abandoned after the birth of socialist China in 1949 (CAS, 2005, Wang, 2002). Under the centralised planning system that was built upon the Chinese interpretation of Marxism's political economy (Marxism with Chinese characteristics), public ownership was understood as the representative character of socialist society, where the State was the representative of the public (Zhu, 1999). The State's interests were exclusively prioritised. To this end, development was limited to satisfy the State's needs, which were often defined under the ideology of the Communist Party of China (CPC). Ironically, although the CPC calls itself a "hundred percent" Marxist, it has not been free of influence of China's traditional culture. Rather, the power hierarchy and management mechanism that established for the socialist society was somewhat similar to the traditional Chinese model (Shaun, 2007). Not surprisingly, the adoration of power continued to play the central role in the "political state" of China. This has resulted in a situation where the socialist construction was actually determined by the highly centralised power, which was in fact depending on its leaders' personal knowledge about development (Hsu, 1996).

During the first three decades of the People's Republic of China (1949-1978), especially the period of "cultural revolution" (1966-1976), Mao Zedong was worshipped as a god and the Mao Zedong Thought (the Maoist ideology), was full of cautions about "class

contending” between proletariat and bourgeois, and was regarded as the “universal truth” in leading the development. Socioeconomic activities were often seen as a means to serve the demands of “class contending” (Liu and Dong, 1999). Under this ideology, knowledge was distinguished between “proletarian knowledge” and “bourgeois knowledge”, upon which the latter was regarded as reactionary authority to be rejected (Yan and Gao, 1986). Academia was thus divided into two opposing groups based on their family background and personal performance (non-academic related) in the past. The “bourgeois academia” was forced to leave their expertise fields to work as labourers in farms and/or factories. Universities were ordered to recruit farm workers, factory workers, and soldiers based on assessments of their political performance. The legacy of the Maoist ideology was the creation of Chinese “metaphysics” and “idealism” (Hu, 1977, p.2).

After the death of Mao Zedong, Deng Xiaoping called for studies and debates about “truth”, aiming to find a realist principle to replace the Maoist “class contending” theory. Drawing on the debates, Deng concluded that “practice is the unique criterion in verifying truth”. Drawing on this conclusion, he instructed that “economic construction is the central commitment of CPC” (Deng, 1997, p. 178). In the opening speech to the “National Science Conference” (1978), Deng affirmed that “knowledge is power”; “science and technology are the primary productive forces”. This discourse turned around the Chinese tradition of respecting knowledge. Nevertheless, the concept of knowledge was somehow narrowed down to science and technology for the purpose of economic growth. This interpretation of knowledge guided China’s development policy in the following two decades where development was biased to economic growth. As a result, China’s economy has experienced unprecedented growth over the last three decades. However, this has been criticised by many researchers (e.g. Dahlman and Aubert, 2001, Wei, 2000, Ying, 1999) as too costly in social, cultural, and environmental terms.

### **5.2.3 The “scientific development concept”**

Ever since the current Chinese president Hu Jintao became the leader in 2002, development policy has been gradually re-oriented towards being people-centred and the so-called “scientific development concept” was introduced. According to Hu, the goal of development is to build a “harmonious society”. The “Communiqué of the Communist Party of China’s 17th Party Congress” (2007) constitutes the “scientific development concept” as the successor and extension of China’s socialism ideology. In tackling the country’s increasingly serious social problems and general instability, Hu Jintao launched a new ideological campaign to shift focus of official agenda from “economic growth” to “social harmony”.

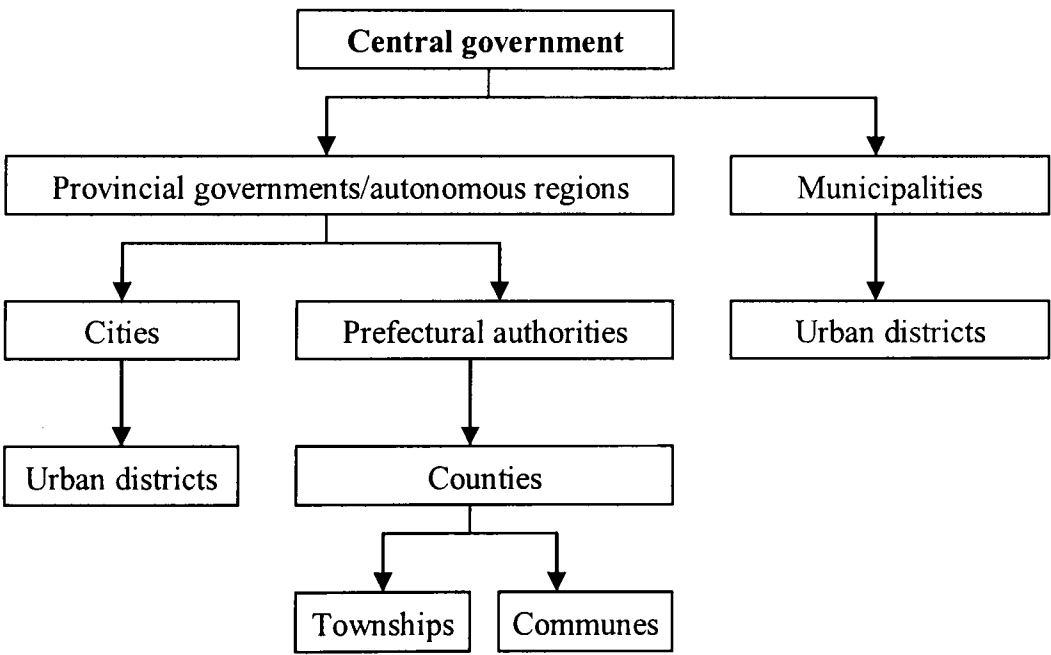
In the speech to the 5<sup>th</sup> Plenary Session of the 16<sup>th</sup> CPC Central Committee, Hu (2006) summed up the “scientific development concept” as development in a manner of “properly balancing among regions, between urban and rural areas, between economic growth and social development, between man and nature, and between domestic development and opening to the outside world, and democracy, the rule of law, justice, sincerity, amity and vitality as well as a better relationship between the people and the government” (author’s translation from Chinese). This interpretation has once again turned around somewhat the traditional Chinese concept of knowledge for development (Ma and Li, 2006).

## **5.3 Chinese urban development: A historical overview**

### **5.3.1 Evolution of Chinese definition of city**

The original meaning of “city” in Chinese meant the “walled settlements with market places” (Yu and Ma, 1996). While the “wall” was used for defense, “market places” were designed to provide services to its inhabitants (Chou, 1999). The city was the inside “wall” area, meaning urban proper, where the boundary between the urban and rural area was the “wall” (Yu and Ma, 1996). This definition and associated urban spatial structure, administrative, social and economic organizations had rarely been changed until the CPC came into power in 1949 (Xu, 2000).

During the first three decades of socialist China, although in most cities, the “wall” was demolished, the definition of the city remained largely unchanged. The city still meant the urban proper, where the boundary between the urban and rural area was replaced by the “red line of urban planning control (RLUPC)” (MCC, 1990). In both cases, cities were isolated from its hinterland both in socioeconomic and administrative terms (CAS, 2005). This can be understood from administrative system settings in the first 35 years as illustrated in Figure 5.1. Cities and prefectural authorities were set as two different systems. Under this setting, cities comprised only urban districts, whereas prefectural authorities were in charge of managing rural areas including counties, rural townships, and communes. There is no direct link between cities and prefectural authorities and their hinterland. This is what is now known as the “dual track system”<sup>5</sup> (Lau *et al.*, 2000).



**Figure 5-1 Administrative system settings 1949-1985**

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<sup>5</sup> Ever since the Communist Party of China came into power, national policies for development have made a clear boundary between rural and urban area, under which urban area have been always in favour of policy. See for details in (Lau *et al.*, 2000).

In 1985, the central government announced plans to restructure administrative settings, in which the prefectural authorities were to be abolished instead of prefectural level cities. In the meantime, urban districts were given authority to manage their adjacent rural areas, though the “dual track system” was still in effect. From that time onward, links between cities and their administrative hinterland started to develop and the spatial boundary between them became gradually unclear. Cities have therefore actually been transformed into city-regions from an administrative point of view (Ma, 2005).

Associated with the evolution of the definition, cities in China have played different roles in the country’s general development process and have taken significantly different forms. In order to gain a whole picture of the distinctiveness, the following sections take a look at the trajectory of the evolution of Chinese urban development.

### **5.3.2 Chinese tradition of urban development**

From its origin, the Chinese city was not a corporate entity of its own but a government seat of the region under its administration (Xu, 2000). In other words, an ancient Chinese city was not spontaneously developed for economic reasons. Rather, it was deliberately established for corresponding to administrative needs (Yi, 2005). For this reason, ancient Chinese cities followed a distinctive form of development, which was influenced by three important factors: “Construction Code (Zhou Dynasty, 2800 BC)”, “Guan Zi Doctrine”, and “Feng Shui Theory” (He, 1996).

The Construction Code was the official theoretical basis and standard for developing a designated city, which was later advocated by Confucius. The key point of this was that the city had to be built in squares and divided into inner and outer cities with walls between them. The inner city was exclusively for the emperor or regional/local governor, while the outer city was divided into left (west) and right (east) parts. The western part was designated for official use, whereas the east was for markets. The whole city was often constructed in accordance with an integrated layout (Chou, 1999), in which the function of each neighbourhood was clearly defined according to origin relationships between residents and/or occupational specialisations. The entire street network and all major architecture were aligned with the cardinal directions to conform to Chinese



geomancy (Xu, 2000). Massive crenellated walls demarcated both the city from the countryside and internal status divisions. The height and extent of ornamentation of buildings were dictated thoroughly according to the occupiers' position within a complex social hierarchy which should not be mistaken (Gaubatz, 1999).

The second factor was the Guan Zi Doctrine. Guan Zi was another influential philosopher in the same period of Confucius, known as one of the pioneers of Taoism. His famous doctrine was "letting the nature take the course" (Zhou and Liu, 1999). The idea was to respect the natural and physical geography, which in other words was to manage development behaviour to be harmonious with the surrounding nature. According to Guan Zi, the whole city (except the most monumental structures), should be built low to the ground in one or two-storey structures using rammed earth, brick and wood. Otherwise, the balance of nature would be broken (He, 1996).

For non-Chinese people, Fengshui is perhaps well known as Chinese superstition. However, this was a misinterpretation of its original meaning. In Chinese, "Feng" means "wind", while "Shui" is "water" meaning "river", "lake", or "sea". The Feng Shui theory was commonly used for the choice of location for cities, towns, buildings, and graveyards. The application of Feng Shui was to examine the natural and physical geography to "avoid facing wind while taking the advantages of using water" (Guan Zi on Construction). Feng Shui theory was a main branch of Taoism, which referred in this respect to Dao, meaning respecting natural law. In practice, because the general location (climate), topography, existing building, and so on, can all affect the direction of "wind", it was therefore important to take all potentially influential factors into consideration (Wang and Liu, 2006). So does "water" since the direction of the flow and flooding may be a destroyer to the city and its buildings (Nan, 1994).

Overall, these three factors were not contradictory but complementary to each other. Feng Shui theory is useful in choosing the location; Guan Zi doctrine provides advice to keep development activities taking place in a harmonious manner. Meanwhile, the Construction Code served as the principles to build the city in the order of social hierarchy. In fact, any ancient Chinese city was an outcome of the application of these

three theories. Zhou and Liu (1999) argue that the traditional form of Chinese urban development was a sustainable means of development.

However, it should be noted that in its long history, urban development activities in China made no necessary connection with economic growth on the basis of the concentration of massive manufacturing industries (Yi, 2005). Instead, the economic base of the feudal China relied on its fairly well developed agriculture since the Qin Dynasty (in approximately 200 BC). Meanwhile, the city was deemed only important in terms of administration and culture. This structure lasted at least 2,000 years until the Opium War (1840-1842), from which industrial concentration began to occur in Chinese cities (Yi, 2005).

### **5.3.3 Urban development in Maoist era (1949 – 1978)**

Ever since the CPC established the new Chinese government in 1949, city has been modelled as a form of socialist organisation (Hsu, 1996). Urban development was shaped by the socialist ideological commitments, political convictions, managerial considerations, and institutional as well as administrative settings (Lin, 2002). Politically, any city had to be officially designated and fiscally committed to by the central government. Once it became a designated city, it was automatically included in the state budgetary allocation, and thus received the privilege to enjoy state capital investment in the urban economy and resources allocated by the central government for urban development (Lin, 2002).

Economically, cities were narrowly viewed as potential sites of industrial plants, which serve the political convictions. Because the central government dominated economic decision-making, the development of a city's pillar industries was determined by the national development plan (CAS, 2005). Under this system, the State Planning Commission set output targets on an annual basis for each industry, and allocated a specified portion of the output to the respective provinces, then to the cities. Inputs needed to achieve these outputs were calculated and the deliveries of the inputs to the state-owned enterprises were scheduled. The more a city was assigned large state-owned enterprises, the faster the development of the city.

Spatially, Maoist ideology adopted a “redistributive” urban policy under which investments were diverted from more developed coastal areas to the poorer interior in order to “correct” the inherent uneven development, and to tap inland raw materials and resources (Yang, 2004). The underlying motivation behind Maoist redistributive policy was the concern of national defence (Yang, 1990). Moreover, in this period, urban planning and architecture was modelled based on the former Soviet Union’s approach. City walls were demolished to give way to the urban expansion (CAS, 2005).

One of the primary goals of Chinese urban development in this period was to create a self-sufficient urban form. Differing from the traditional Chinese cities, the newly developed or renewed districts were structured around large, walled work unit<sup>6</sup> compounds, within whose walls people worked, lived and played within a small community centred on the workplace (Xu, 2000). Work units were encouraged to become self-sufficient communities within the city, providing not only work and housing, but also health care, food distribution and other basic social services such as nurseries and schools. Urban development was accomplished largely through the creation of these small, independent cells. Neighbourhoods and districts of the city were therefore relatively undifferentiated by function. The ideology of this form of urban development was based on an assumption that, as Gaubatz (1999) put it, the ideal work-unit-based city would have virtually eliminated the need for specialised districts, because most urban residents would rarely have any need to travel beyond the walls of their work-and living unit.

Maoist urban policy sustained low levels of urbanisation and a brief episode of anti-urbanism accompanied by centralized planning and city-based industrialisation (Ma, 2002). Under this ideology, urban development was to add new walled work units. Although this generalised urban structure has never been fully realised, it became common in the newly constructed or renewed districts which now constitute most of the urban space in Chinese cities. Moreover, Maoist ideology on urban policy had far-

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<sup>6</sup> A common Chinese term means place of employment, or *danwei*, including government departments, government agencies, enterprises, social organises, and all other employers.

reaching ramifications for the reorganisation of urban social life and the very form of the Chinese cities (CAS, 2005). In contrast to its tradition, Chinese cities have become radically industrial centres adding economic importance to the cities.

#### **5.3.4 Uneven development in the post-reform era (1979-1991)**

Starting from the early 1980s, under the reform strategy, China's central government has endeavoured to promote an open-door policy and a so-called "socialist market economy". The ideological view of the city during the Maoist era has been largely abandoned. New thinking about social organisation and urban lifestyles, together with the demands of a changing economy, has led to the change of cities, which function very differently from the Maoist vision. As a result, the effects of early government directives have become less important. Instead, other factors which are also critical to urban development elsewhere in the world have become important to urban development in China.

Nevertheless, unlike the former Soviet Union and other central and eastern European socialist countries, where the transition into a Western capitalist system took place in a short phase, China was following a gradualism strategy of change (Zhu, J., 2004). In the first round of economic reform (1978-1992) urban policies were formulated under the internal constraints of a socialist system (Wu, 2001). In this period, while Maoist ideology still dominated urban policy in most inland cities, Deng Xiaoping's "uneven development" ideology started to affect the coastal regions (Yang, 1990). One distinctive feature was the designation of four coastal cities as Special Economic Zones (SEZ) and 14 Economic and Technological Development Zones (ETDZ) in other coastal cities (CAS, 2005). The SEZ and ETDZ were defined by the State Council (State Council, 1984) as a designated city and/or area (usually in suburb) within selected cities to develop a high standard of urban infrastructure and high quality of investment environment for attracting inward industrial investment. SEZ and ETDZ were given certain autonomy and a set of preferential policies such as tax release, free use of land, privilege of resources allocation, and receiving more state investment on fixed assets than others. Meanwhile, other cities and urban districts remained unchanged following Maoist policy (Fan and Scott, 2003).

Not surprisingly, Deng's uneven urban policy has resulted in a situation where a mass of talent floated to these SEZs and ETDZs. This in conjunction with state investment and resource allocation by the central government, which were in favour of the SEZs and ETDZs, has led to the inland cities becoming marginalised. Thus on the one hand, the coastal cities were enjoying fast growth, inland cities suffered decline on the other. This, as Wei and Ma (1996) put it, characterised China's urban development in the 1980s. As a result, regional disparity between coastal and inland cities, as well as inequality between ETDZ and other urban districts within a city has emerged to become a major concern, which has led to another radical change in urban policy in the 1990s.

### **5.3.5 The emergence of technopoles in China**

Despite the problems associated with the ETDZ, the 1990s witnessed a national "fever" of development zones (Chien, 2008, Demurger *et al.*, 2002). Firstly, the ETDZs policy was expanded to be applied to all cities in 1992. Although to compare with the first fourteen ETDZs, the central government provided less investment and resources allocation, local governments responded swiftly to this policy, which caused immediate regional competition on the development of ETDZs throughout the country. Almost every city and town established their ETDZs. Numerous ETDZs at both provincial level and prefecture level and even at county level were sprung out without any consideration of feasibility. By 2002, in addition to the 54 state level ETDZs, there were more than 5,000 ETDZs across the country (Chien, 2008). Not surprisingly, the majority of them failed to meet what they were expected to be, but proved to be a waste of land and natural resources as well as the cause of environmental damage (Chen, 2004).

Secondly, a new type of development zone – High- and New-Technology Industry Development Zones (HNTIDZ) – started to take the shape in 1991 (Wang *et al.*, 1998). The main objective of HNTIDZ was set to "develop high- and new-technology products, establish technology-oriented enterprises, and pave the way for the commercialization of innovations that will come out of major national science and technology programs (the

863 plan<sup>7</sup>)” (Yuan and Gao, 1992). In only two years, the Ministry of Science and Technology (MOST) approved 52 state level HNTIDZs. Meanwhile, numerous provincial and prefectural level HNTIDZs quickly sprang up across the whole country (Hu, 2007).

Spatially, except the few NHTIDZs located in built-up urban areas, the majority of them are either located close to the edge of the city or in suburban counties. In the early stages, there were no NHTIDZ located adjacent to universities except Zhongguancun HNTIDZ in Beijing. Planning and architecture in these newly developed areas are taking advantage of advanced technologies which produced a genuine environment for companies.

However, despite its original purpose, in the first ten years the preferential policies available to firms in the park areas were related closely to production incentives. Policies for encouraging research and nurturing innovation system reform, such as encouraging relationships between academic and research institutions and business have been noticeably missing (Sutherland, 2005). This has led to HNTIDZs becoming merely manufacturing centres. Moreover, contrary to the early claims that the HNTIDZs were established to help nurture capabilities of domestic corporations, foreign direct investment, especially those from multinational companies, has actually become the key to their growth (Sutherland, 2005).

It should be also noted that it was not until the end of 20<sup>th</sup> century, HNTIDZs were making efforts to encourage universities and other research institutions’ involvement. Changes have nevertheless taken place since 2000 when the MOST and the Ministry of Education jointly launched the national program of “National University Science and Technology Park” and a national subsidising plan on new campus development within HNTIDZs (MOST, 2000). This has resulted in the Chinese HNTIDZs becoming similar to technopoles elsewhere, but larger in land area and growing faster (MOST, 2007).

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<sup>7</sup> The abbreviation of China’s strategic plan for science and technology originated in March 1986, upon which the “High-Tech Research and Development Program of China” (the Torch Program) was launched in 1988. Establishing HNTIDZ was adopted as a way of implementing this program (Hu, 2007, Walcott, 2003)

Meanwhile, science and technology innovation centres, high-tech incubators, and foreign educated returnees' start-ups centres were established successively. All of these are part of the national science and technology plan, which offer substantial subsidies for such projects (MOST, 2006).

Thirdly, starting from the middle 1990s, national programs of the Free Trade Development Zones and Export Processing Development Zones led by the Foreign Trade Commission, and the Tourism and Holiday Making Development Zones led by the National Bureau of Tourism, as well as other types of development zones, have also been launched (CADZ, 2004). However, these types of development zones were tightly controlled by the central government and limited to a few cities with special preferential policies applied.

In general, national policy on the various types of development zones was exclusively economic centred following Deng Xiaoping's "uneven development" paradigm in the 1980s and 1990s. However, changes started to occur at the beginning of the 21<sup>st</sup> century, as evidenced by the redirection of national policy on land use in ETDZ and HNTIDZ areas to allow mixed use (Fang and Xie, 2008). This made it possible for ETDZ and HNTIDZs to provide residential areas, schools, hospitals, shopping, leisure, and all other services and facilities to their workers (MOST, 2002, 2006). This in conjunction with other related policies has led to the Chinese HNTIDZs beginning to transform from technopoles toward knowledge intensive urban districts or new towns. Moreover, the location-based national preferential policies for development zones have been replaced by industrial sector based preferential policies applicable to the territory since 2007 (State Council, 2007c), indicating the efforts made to redirecting national development strategy from "uneven development" to "scientific development".

#### **5.4 Knowledge city in the Chinese context**

At the beginning of the 21<sup>st</sup> century, in response to the global trend of transforming to a knowledge society, the CPC government set the goal of developing a "harmonious society" through the implementation of a "scientific development concept" (Hu, 2004).

Since then, a set of policies has been put in force and national programs have been launched, as discussed below.

#### 5.4.1 Policy measures

As mentioned above, one of the distinctive characteristics of the development in socialist China is the adoption of the “dual track system” (Lau *et al.*, 2000). Under this system, China has adopted a discriminatory policy called “Household Registration (*Hukou*)”<sup>8</sup> to distinguish rural and urban residents since the late 1950s (Shen *et al.*, 2005, State Council, 1958). All policies thereafter were produced on the basis of this dichotomy, which has resulted in the occurrence of the so called “Temporary Migrants”<sup>9</sup> in the post-reform era when the government loosened the control of the rural-urban migration but with the Household Registration policy still in effect (Knight and Song, 1999, 2005). Before 2003, national policy related to the Temporary Migrants was generally negative. This has been criticised by many authors as a major factor threatening social and political stability and, thus, the sustainability of development in China (Chen, 2002, Chen *et al.*, 2004, Fang *et al.*, 2002).

However, changes started to occur at the beginning of the new century when the “scientific development concept” was introduced. Although there is still a lack of a systematically designed national policy framework toward the development of the “harmonious society”, some policy measures have been well received. Apart from the

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<sup>8</sup> The Household Registration policy has been the typical character of the political economy in China (Wang, 2004). It helped effectively to control the rural to urban migration in the pre-reform period (before the 1980s) and still has a strong impact in the post-reform period (Chen *et al.*, 2004). The differences between rural and urban Household Registration status can be huge ranging from subsidised housing, health care, pension schemes, unemployment benefit, compulsory education, priority on university students recruitments and job recruitments, to government subsidies on company formation and so on. While urban residents enjoy all of these benefits, rural residents have not been included (Shen *et al.*, 2005).

<sup>9</sup> This is a term seen original in Chinese as Liu Dong Ren Kou to mean those who have lived in the city for more than six months working on a temporary job, without having full urban Household Registration status and normally do not own permanent dwellings (NBSC, 2000). In local practice, the temporary migrants comprise both rural workers (the main body) who working in labour intensive sectors and people from other cities (often smaller) working in various sectors. In the English literature, it has also been translated by some authors as “floating population” (Chen, 2002, Chen *et al.*, 2004, Liang and Ma, 2004). According to the Census in 2000, roughly 40% (200 million) of rural work force has entered urban area to work in the labour intensive sector receiving very low pay for their work (Zhang *et al.*, 2002).



abovementioned changes in economic policies, a number of social policies, such as increasing investment in education, science, and technology, establishing a lifelong education system, and giving support to “Temporary Migrants”, have been put in place.

The first significant change in national policy was the radical increase in investment in education, science, and technology. During the period between 1985 and 2000, the number of higher education institutions only increased by 25 and in the period between 1994 and 1998, the number was decreased by 19. However, it jumped from 1041 in 2000 to 1908 in 2007 (Figure 5.2), which has overtaken America to become the largest higher education providers in the world in 2004. Within the same period, the number of higher educational students’ enrolment has more than trebled (Figure 5.3 next page). Moreover, investments in higher education and science and technology have doubled within seven years from 2000 to 2007. Meanwhile, national subsidies on the Torch Program have also been radically increased since 2000 (MOST, 2007).

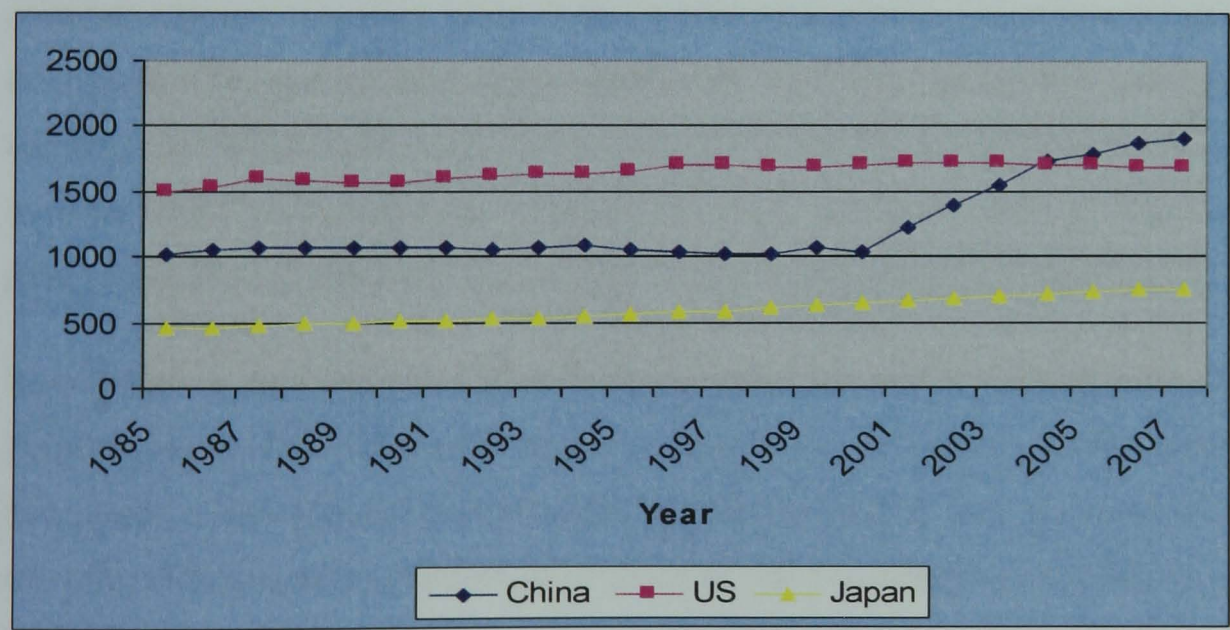
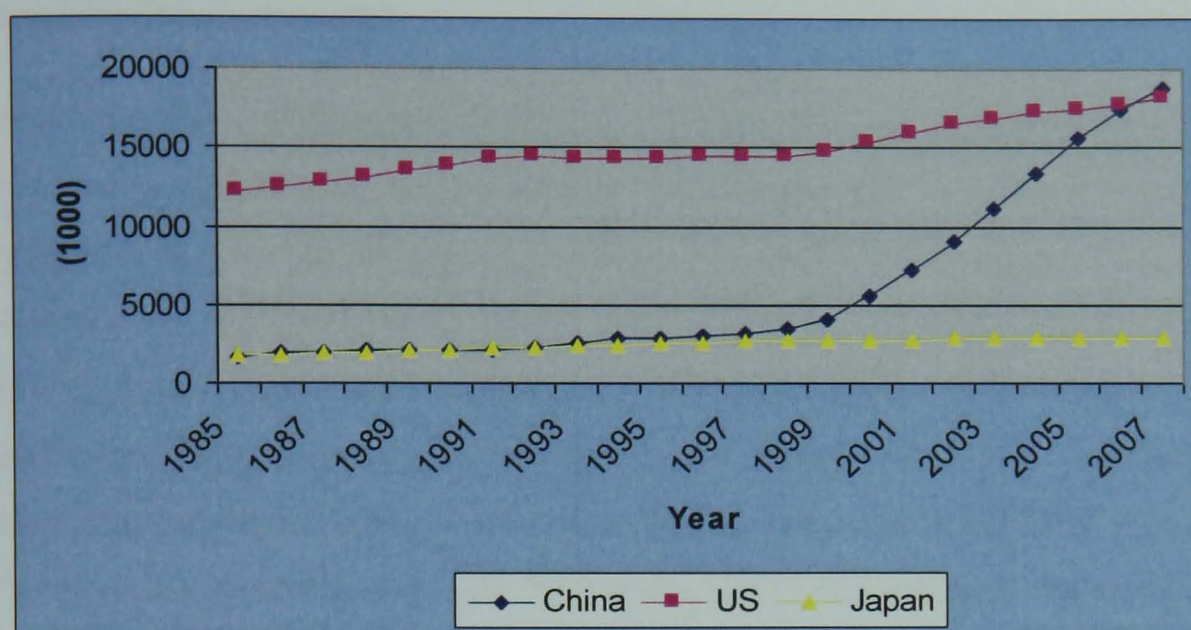


Figure 5-2 Number of higher education institutions

Sources: Developed from NBSC (2008), RIHE (2009), and USNCES (2009)





**Figure 5-3 Enrolment in higher education institutions**

Sources: Developed from NBSC (2008), RIHE (2009), and USNCES (2009)

In the meantime, developing a lifelong education system has been officially adopted to promote citizens' learning since 2003. Under this policy, local community schools throughout the country have been established as a part of national program of the learning city. What made this policy meaningful is that for the first time in the history of socialist China, rural temporary migrants are given an equal chance to benefit from the policy by including them into the national citizen learning policy (State Council, 2003).

In addition to the national citizen learning policy, a call for abandoning Household Registration, giving Temporary Migrants more help, and other related policy reforms have come to the national policymaking agenda. In the last few years, policies such as allowing rural migration children to go to urban schools without extra charges, providing health care insurance and pension schemes to rural migrants, and so on, have been put into force (State Council, 2004, 2006). Although these policies are fragmented and still differentiate between permanent urban residents and rural temporary migrants and their children, it at least indicates that efforts are being made in this direction.

### **5.4.2 National programs**

Following the new development ideology of “scientific development concept”, numerous national programs have been launched over the last few years. In relation to the city, programs such as the National Civilising City, the National Sanitary City, the National Garden City, and the National Model City of Environment Protection, are well known as the “nationally-titled cities”. Meanwhile, “resources saving and environmentally friendly city”, “intellectual property demonstrating city”, “digital city”, and “eco and livable city”, have also been introduced, which are undertaken experiments by some cities and regions. Furthermore, “learning city” and “innovative city” are commonly adopted as a means of achieving the above national titled cities.

#### ***5.4.2.1 National Civilising City***

The National Civilising City as the national program was launched in the 1980s, but remained purely a political slogan in the first 20 years. However, it became meaningful in 2004 when the National Civilisation Commission adopted the “civilisation index”. The index consists of seven elements which cover civil services environment, legal environment, business environment, humanity environment, living environment, eco environment, and efforts made to improve the quality of the six environments. There are 37 indicators containing 119 detailed factors. Assessment is made through documentary analysis, surveys, and direct observation. A prize will be granted to the winning city and will be broadcasted by the national media. The program has now become a major measure used to assess the achievements of urban development in the country. So far, there are ten cities and three urban districts won the title of “National Civilising Cities” (National Civilisation Commission websites).

#### ***5.4.2.2 National Sanitary City***

Like the National Civilising City, the National Sanitary City program was launched in the early 1990s, but it was not until 1999 that the National Sanitary Commission released ten criteria for assessing sanitary city. These ten criteria are: management organisations, public health education, urban sanitary facilities and waste management, environment

protection, quality of public spaces, food safety, infectious disease control, pest control, sanitary quality in residential neighbourhoods, and public satisfaction. Under each criterion are detailed indicators. By 2008, 86 cities had been awarded the title as a National Sanitary City. Compared with the National Civilising City, this program focuses on public health and environment protection and reserved budgetary investment funds (National Sanitary Commission web sites).

#### ***5.4.2.3 National Garden City***

The program of the National Garden City was launched in 2006 and aimed to improve urban afforestation to tackle the deforestation in urban areas caused by the economic centred urban development. Differing from the above two programs, the National Garden City program is backed by the National Regulations of Urban Afforestation (State Council, 2005). The National Afforesting and Greening Commission issued an index covering seven indicators: management, design, urban landscape protection, increase of forest and grass lands, distribution of urban parks and quality, local eco-systems, and municipal infrastructure (National Afforesting and Greening Commission). This program is in fact a reorientation of urban land use policy, which was guided to give priority to commercial development in the 1980s and 1990s.

#### ***5.4.2.4 National Model City of Environment Protection***

This program was launched by the National Bureau of Environment Protection (NBEP) in 1997 and modified in 2003. Assessment is made based on three indices: intensity of investment in environment protection, environment education, and the state of creating the National Sanitary City (NBEP, 2003). However, the 25 indicators under the three indices are poorly designed and politically oriented. To compare with the other three programs, this program is more compulsory and meaningless.

In addition to the above four national titled programs, the experimentation programs of “digital city” in 2005, “intellectual property demonstrating city” in 2004, “eco and livable city” in 2006, are in the process of evaluation drawing on the experiments in some designated cities. Meanwhile, the experiment of the “resources saving and

environmentally friendly city” was launched in 2007 to explore the way in which manufacturing-based economic growth can be sustained in a balanced manner (State Council, 2007b).

Indeed, regardless of the variety of titles, these programs indicate the great attention given to the environmental issues resulting from urban development. While the National Sanitary City, National Garden City, and National Model City of Environment Protection, each stress the importance of a specific aspect, the National Civilising City program is making effort to bridge China’s traditional knowledge concept with contemporary practice of urban development.

What is more, under the national strategy to develop as an innovation society, developing a “learning city” and “innovative city” has been adopted by many Chinese cities as a means to compete in the era of the knowledge society. Not surprisingly, Chinese scholars have also paid great attention to this field of study. Therefore, the next section will briefly review the Chinese literature on learning and innovative cities.

## **5.5 Chinese literature on learning and innovative cities**

### **5.5.1 Learning city**

The term “learning city” was not an academic invention but originated from practice. Starting in Shanghai in 1999, “learning city” was quickly followed by many other cities across the country (Huang, 2002). However, in the first few years, the concept was adopted by many cities without properly defining it. While in many cases, the term was defined as the application of learning organisation to city level, others have portrayed a paradoxical approach, which fell into Chinese socio-political externalism.

Nevertheless, the learning city gained its legitimacy in 2002 when the 16<sup>th</sup> Congress of CPC announced its plans to develop a “learning society”. Since then, Chinese scholars have thus been attracted to study this field. The review of the Chinese literature found that the studies thus far are fragmented, though the following themes have been identified as being central for Chinese cities to become a learning city:

- comprehensive lifelong education system: in addition to the expansion of compulsory education and higher education, vocational education and continuing education are being made available to all (Zhang and Fan, 2002, Zhuang, 2002);
- available community education facilities: an informal learning opportunity, which links to family learning, encouraging citizens' participation (Li, 2003, Wu, 2002);
- promoting learning organisations in both public and private sectors (Pan, 2003);
- developing and using IT facilities to support various types of teaching and learning on the basis of accessible to all (Zhang and Fan, 2002);
- accessible city library system available at every community and open for free to all (Bai, 2008, He, 2006);
- encouraging environment and learning culture (Jiang, 2001, Wu, 2005).

### 5.5.2 Innovative city

Compared with the learning city, studies into the innovative city in Chinese are controversial. While some authors take the western theories for grant (Li, 2002), others are following China's political paradigm to duplicate the leader's speech as doctrine (Chien, 2008, Wang, X. K., 2006). A few exceptions however, are making attempts to identify the pre-conditions to become an innovative city. Yang *et al* (2006), for example, present that the following factors are vital for an innovative city:

- Capacity of innovation: ability of innovation in all disciplines;
- Adequate innovative resources: includes talent, information, knowledge, and finance;
- Presence of innovative organisations: includes enterprises, higher education, research institutes, NGOs, and governments;

- Efficient innovative mechanisms: motivation, competition, evaluation, institution, and governance;
- Innovative environment: the basis of innovation includes innovative policies, regulations, culture, ICT infrastructure, science and technology bases, and international collaboration and competition.

Drawing on these studies, the Chinese efforts made to develop the learning city and the innovative city may be regarded as the Chinese version of knowledge city. In addition, developing a “digital city” has also boasted to be the “fashion” in the last few years. However, as Yao (2006) noted, to a large extent, the concept of a “digital city” was confused with e-government and e-business. Some studies are even biased digital city to haing a website (Pang, 2006).

## 5.6 Chapter summary

This chapter briefly reviewed China’s national concept of knowledge for development and the ideological impact on the change of urban development policy. It found that Confucianism, Taoism, and Buddhism jointly formed a concrete foundation, which has deeply influenced the Chinese way of thinking and understanding of the natural world, as well as shaping Chinese urban development throughout history. Although the establishment of the socialist society has abandoned to some extent the traditional norm, it did not shake the foundation. In fact, one can easily find that its deeply rooted influence still exists everywhere in today’s Chinese life, from political structure, power hierarchy, and adoration of power. To this end, its leader’s interpretation can often dominate the national concept of knowledge, which, in turn, determines the way in which urban development policy is made.

Indeed, under Mao Zedong’s leadership, “class contending” was regarded as the “universal truth” applied to the making of development policy. As national defence was the major concern of “Mao Zedong Thought”, “redistributive policy” was accordingly chosen to correspond to this purpose. Ideologically, the Maoist perspective saw the city as a productive centre, which could be located anywhere as long as it could be easily



defended. Spatially, cities were formed by functionally undifferentiated neighbourhoods – the walled work units, and urban expansion was to add more such units. Moreover, under the Maoist ideology, while an anti-urbanisation policy was applied, urban social and cultural life was limited.

The result of “Deng Xiaoping’s Theory” was the radical transformation from a Maoist “redistributive ideology” to an economically centred “uneven development paradigm”, under which numerous SEZ and ETDZ were established and have been explosively growing, and were underpinned by multiple preferential policies. This has led to unprecedented urban economic growth and the significant upgrading of the urban built environment. Despite the increase in social inequality, cultural deviation from Chinese tradition, and environmental degradation, the 1990s saw the emergence of technopoles as evidenced by the developing of HNTIDZs, though they actually fell into another ETDZs in their first ten years.

The so called “scientific development concept” initiated by the current leader Hu Jintao has nevertheless comprehended the national concept of knowledge for development. Upon this ideological change, national development policy has been amended accordingly. Firstly, policy on HNTIDZ and ETDZ was redirected from economically centred to socioeconomically, culturally, and environmentally balanced. Secondly, the goal of national development was set clearly to build a “harmonious society”, which may be interpreted as the Chinese version of knowledge society. In relation to urban development, a series of national programs were launched to coordinate developing the “harmonious city”. Nevertheless, the presence of the discriminatory policy based on the “dual track system” may be the big barrier for Chinese cities to become “harmonious”.

Overall, the review of Chinese urban development policy seems to suggest an emerging development geography, which may challenge the orthodoxy of Western ones derived from those based on EU-American practices. Nevertheless, the Chinese literature cannot contribute to this because they were unsystematic and lacking empirical evidence. This was one of the motivations in conducting the current research. Accordingly, the following chapters will present findings from selected case studies. However, as a



methodological concern, before conducting the main case studies, there is a need to testify the chosen techniques for data collection and analysis. The next chapter will therefore discuss the findings of the pilot study.

## **6 KBUD in Zhengzhou: A Pilot Case Study**

### **6.1 Introduction**

In chapter three, the researcher discussed the necessity of conducting a pilot study before the main case studies from a theoretical perspective to a) identify reliable sources of data and key informants; b) assess the reliability of selected data collection techniques; c) assess the appropriateness of the selected data analysis techniques; and d) further develop understanding on the subject in its real context. The city of Zhengzhou has been chosen to do so. This chapter provides the findings of this pilot study to fulfil this purpose. It will start with a discussion of the applicability of undertaking a pilot study concerning the current research. This is followed by a brief introduction to Zhengzhou and its activities related to KBUD. Then under each theme of the analytical framework, it provides possible data sources, assessment of their reliability, and the method of collecting the desired data. The proposed data analysis methods are testified.

### **6.2 Rationale from a practical perspective**

Despite the theoretical rationality and necessity of doing a pilot case study, it may be of concern to some of its applicability to a study whose unit of analysis is a whole city or city region. Indeed, given the complexity and uniqueness of each city, findings from the pilot study may not be applicable to main case study cities. This may be the case in the context of cities in western developed countries. However in China, since the strong centralised political and planning systems are still dominating development behaviour, local governments are keeping a similar pace with the central government. Therefore, the majority of cities across the country are behaving similarly following the central government policy.

Meanwhile, the top four levels (central, provincial, prefectural, and county) of governments have the same structure (except defence and foreign affairs in the central government). Accordingly, city level governments, regardless of their political hierarchies and the state of development (except a few special economic development zones), are having almost the same functional departments, which are playing the same or similar role of responsibilities. Moreover, since January 2007, the State Council (2007a) has put in force a regulation for opening government information to public. This has actually made the same kind of information simultaneously available in different cities. Based upon these reasons, it is argued that the findings from pilot case study should be applicable to the main case studies.

Additionally, undertaking a pilot case study is also a technical consideration for this research. Firstly, as discussed in chapters two and four, the study covers a very broad area, which means a great deal of data needs to be collected. In this sense, a pilot study would be helpful in defining data and data resources so as to increase the effectiveness of the main study fieldwork. Secondly, being a first time researcher, a rehearsal may help to build up confidence both in asking questions and leading the process of interviews. Most importantly, since the potential key informants for this research are senior government officials who from a Chinese point of view may be regarded as “elite”, the way in which the questions are asked is vitally important to gain a truthful answer. In this sense, a pilot is needed.

### **6.3 The city profile of Zhengzhou**

Zhengzhou is the provincial capital of Henan, whose territory covers 7,447 square kilometres, comprising six urban districts, five county-level cities, and one county, with a population 7.35 million, of which about two million are fully registered as urban residents. It is an ancient city, with a history of more than 3,600 years, located in the middle reaches of the Yellow River, an area of both the cradle of the Chinese people and the heart of Chinese culture. The famous Shaolin Temple, the birthplace of Chinese Kungfu, is located in the city region.

Despite its long history, Zhengzhou was merely a small town before the 1950s (Zhengzhou Chorography Editorial Group, 1990). Its urban growth occurred after the city became the provincial capital when the Chinese Communist Party came to power in 1949. Since then, the city has been developed as an important transportation and logistics hub, with many of the national transportation trunk lines – highway, railway, and aviation network – meeting there, with the largest railway switching station in Asia and the largest bulk cargo railway station in China.

The city's industrial base once relied upon textiles, machinery, building materials, refractory materials, raw and supplementary materials, and coal mining. However, during the post-reform period, the majority of these industries shrank or completely disappeared. Instead, aluminium oxide, automobiles, food processing, and knowledge intensive small and medium enterprises started to take shape. In 2007, the city's gross domestic product reached 242 billion RMB, ranking the 17th among China's large and medium-sized cities and ninth among the provincial capitals (ZZSB, 2008).

Science and technology has received increasing attention over the last two decades. In order to strengthen the role of science and technology in economic growth, the Zhengzhou Municipal Government called its five departments – the Science and Technology Bureau, the Development and Reform Commission, the Education Bureau, the Small and Medium Enterprises Services Bureau, and the Bureau of Commerce – together with large state-owned companies, universities, and development zones (such as Zhengzhou HNTIDZ and ETDZ) to form a core innovation network. All of these involved departments and organisations are asked to support each other to contribute to create a cohesive environment for fostering a knowledge intensive city (ZZMG, 2003).

Higher education became increasingly important in the city's socioeconomic life. By 2007, there were 39 higher education institutions, one of which has qualified as the "211 University". Full time students enrolment reached 550,000 studying in all academic disciplines. The number of students accounted for a quarter of its total permanent population (ZZSB, 2008). Moreover, following the national policy, Zhengzhou has

established numerous professional training and adult learning institutions to facilitate lifelong learning (documents collected from Education Bureau).

Zhengzhou has established two state level development zones, Zhengzhou ETDZ and HNTIDZ. There was actually no difference between the two zones before the end of the 1990s, given that both were manufacturing centres. At the beginning of the 21<sup>st</sup> century however, the relocation of four universities into HNTIDZ and the establishment of the National University Science Park made the HNTIDZ meaningful in becoming a knowledge intensive centre (documents collected from HNTIDZ Administrative Commission).

In 2001, supported by the Henan Provincial Government, Zhengzhou launched an ambitious project, Zhengdong New District (ZDND), aiming to develop an innovative urban district within 10 years, which would double its city size by adding a 150 square kilometre built up area to home 1.5 million new citizens. The planning adopted the concepts of “symbiosis” and “metabolism”, under which it is to develop a 300 hectares forest park, convert numerous fish ponds and rice paddies into an eight square kilometre artificial lake, using retreated sewage as part of the water resources. Waste was planned to be used as fuel for power generation (ZZPC, 2002).

National development strategies have a profound influence on Zhengzhou’s urban development. It was one of the beneficiaries of the Maoist “redistributive” development strategy, under which the city became an important national transport and industrial base. The city has nevertheless “lagged behind” under the “uneven” development strategy. The implementation of the “scientific development concept” has resulted in the city resetting its goal to develop as an innovative city (ZZMG, 2006).

For the current study, Zhengzhou may not be taken as a main case study as discussed in chapter three. In fact, as Zhengzhou is a provincial capital city in the central region, it has nothing special compared to other provincial capital cities at the prefectural level. However, what makes it meaningful for conducting a pilot study is that it is the researcher’s home town where he has developed a good network (*guanxi*), which will

allow the pilot process to take place in a very informal manner so as to gain reliable feedback. The following sections present the findings from the pilot study.

#### **6.4 Local understanding of knowledge for development**

This theme is set to investigate how knowledge has been understood and defined by cities for local development. In chapter five, the discussion of the Chinese national concept of knowledge for development noticed that it is influenced by its traditional culture, national development ideology, and global development trends. Nevertheless, at the local level in China, the influential factors are local history and its cultural traditions and national development policy since in most cases global development trend is reflected in national policy.

In order to find relevant information of local history and cultural traditions, the following sources have been searched: a) government web sites (including departments' websites); b) local chronicles; c) local publications in this field. In so doing, very little information was found from government websites, while the city library has plenty of publications on local history and cultural traditions. Moreover, interview with key informants is also found to be especially useful in making the connection between the cultural traditions and development behaviour.

Meanwhile, information for the local interpretation of national development policy can be derived from local government documents, such as local "five-year development plan", local development programs, and so on. Nevertheless, this should be triangulated by asking related questions to key informants. In both cases, the key informants are those who work in the above mentioned core organisations that are part of the innovation network.

#### **6.5 Development dimensions in practice**

Under this theme the intention is to examine how the city makes efforts to direct their development behaviour in a balanced manner in social, economic, cultural, and environmental terms. Information that reflects such development behaviour is embedded in the local development activities. In the Chinese context, these activities are undertaken

in accordance with local development plan. In searching for this information, local development plans, statistics yearbooks, local development programs, public events, and local leaders' speeches are all relevant. This desired information and documentation is collected from government departments such as the Mayor's Office, the Development and Reform Commission, and the city library in Zhengzhou. This "must be the case in other cities since it is the standard set by the central government" (Secretary General of the Mayor's office, 08/05/2007).

## **6.6 Knowledge environment**

### **6.6.1 Quality of place**

#### ***6.6.1.1 Physical and social environment***

This is a very broad theme under which the aim is to investigate how the city offers attractive physical conditions and social equity and inclusion. As suggested by past research, the focus will be on housing, connectivity and accessibility, outdoor attractiveness, social services, justice, equity and inclusion. Accordingly, information about local housing schemes, housing markets, urban parks, outdoor sports and cultural facilities, ICT infrastructure, transportations, school and hospital systems, social justice schemes, and so on are needed. The experience gained from Zhengzhou indicated that much of the desired information on the physical environment can be found either from the local statistical yearbooks or from direct observation during the fieldwork.

Meanwhile, information about social justice, equity, and inclusion would have to be collected through focused interviews and documents from relevant government departments. As advised by the Director General of the Zhengzhou Academy of Social Science, specific attention when undertaking the interview needs to be given to the inclusiveness of temporary migrants since most government documents of this kind made no clear statement but to exclude temporary migrants by default.

### **6.6.1.2 Cultural environment**

The cultural environment aims to examine whether and how cultural elements play a role in making the city attractive. Information needed for this purpose includes the distinctive traditional culture, folk culture, public cultural events, and cultural facilities. In searching for this information, attention is paid to how these cultural elements have been used to coordinate the implementation of the development strategy. The experience gained from Zhengzhou indicates that such information can be found from local chronicles and publications as well as by “going to the city and talking to native people who live there” (Director General of Zhengzhou Cultural Bureau, 16/05/2007).

### **6.6.1.3 Economic base**

Under this theme, the intention is to investigate to what extent the city’s economy embraces the knowledge economy (both in a narrow sense and broad sense). In order to do so, information about the city’s economic structure, economic policy, and efforts made to restructure the economy are needed. In the case of Zhengzhou, the statistic yearbooks provided the most up to date information for the city’s economic structure, while the industrial development plan (created by the Economic Commission with the Industrial Association) and the high-tech industrial development plan (created by the Science and Technology Bureau) indicate the efforts being made to restructure the economy.

### **6.6.1.4 Urban innovation engines**

This theme is intended to investigate whether and how urban public spaces have been used for innovation places. As suggested by Dvir (2004), public spaces could be city libraries, museums, future centres, public squares, cafés, and community centres. In order to learn how such public spaces are used by the general public, the best way is to visit and use them as an ordinary user. In Zhengzhou, the City Library, the English Language



Corner<sup>10</sup>, the city museum, and internet café have been observed. Attention was paid to how easily these facilities can be used, how people use them, and for what purposes. Nevertheless, it should be noted that as each city has its specific cultural traditions; the most popular public spaces may differ from city to city. Therefore, when conducting the main case study fieldwork, there is a need to ask for advice from key informants.

### **6.6.2 Knowledge base**

With the theme of the knowledge base, the intention is to examine the city's knowledge capability. As suggested by the literature and findings from the review of international KBUD initiatives, this can be largely reflected by the presence of universities and students, research institutions, knowledge intensive and creative industries, and so on. In order to collect such information, education, science and technology statistics, and industrial statistical documents are needed. Thanks to the recent regulation, the information is available from the city's statistic yearbook. However, this statistical information must be triangulated with the interview data and related policy documents, since there were extraordinary changes found in the pilot study case, which had to be put in the context of policy changes.

### **6.6.3 Knowledge culture**

The theme of knowledge culture is to investigate how people are willing to learn, to share, and to apply their knowledge to their work and lives. Information about how the city promotes public learning and facilitates people meeting is desired. In Zhengzhou, the government has been working very hard to build a learning city over the last few years. This work involves education and cultural departments, the mayor's office, and local communities as well as enterprises and organisations to invest in the establishment of a lifelong education system for fostering a learning culture. Local community schools,

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<sup>10</sup> A spontaneous English language learning activities taking place at parks, universities squares, public squares, pubs, and so on. Amateurs, usually involve foreigners, English language teachers, professionals and other English fans, meet regularly to practice English (actually it has evolved to embrace other foreign languages such as French, German, Spanish, Japanese, and Russian). Over the last two decades, it has become a common phenomenon across China's cities.

vocational training centres, and the English language corner have been visited. Key informants from government departments and local community schools were interviewed. According to the Director General of the Education Bureau, developing a learning city has become a nationwide initiative. Every city has therefore made similar efforts to develop a learning city.

## **6.7 Knowledge synergy**

### **6.7.1 Institutional mechanism**

This theme aims to investigate how the city establishes institutions to effectively facilitate knowledge transmission. The information needed for this theme is that which institutions have established, for what purpose, how it works, and so on. The search for information in Zhengzhou found that development zones, the National University Science Park, and the new town development are typical in this kind. In order to collect the desired data, the Zhengzhou ETDZ, HNTIDZ, ZDND, and the National University Science Park websites have been accessed. Government working reports, development plans, statistical reports, leaders' speeches, and research publications are reviewed and were found to be useful. Meanwhile, information from the interview with the Secretary General, the Director General of each development zone, the Executive Director of the university science park, the Director General of Development and Reform Commission helped the integration of the information collected from web sites, research publications, and government documents into a whole picture.

### **6.7.2 Policy framework**

This theme intended to investigate how the city uses policy measures to encourage and facilitate knowledge transmission. In a general sense, it might be argued that this is a very broad theme, and policy that is related to this may be found from a wide range. However, from the review of international KBUD initiatives, the current research only looks at those which have been clearly defined for the purpose to encourage or facilitate the synergy of knowledge for KBUD. In this regard, the search for information in Zhengzhou found that policies for developing national titled cities and promoting

creative industries, the development of the learning city and the innovative city, and the formation of the Zhongyuan Urban Agglomeration, are highly relevant. Apart from the research publications which can be accessed at the city library, policy documents are collected from the Mayor's Office. While the interview with the Secretary General of the Mayor's Office gave an overview of these policy measures, the Director General of Zhengzhou Academy of Social Science provided meaningful insights.

Nevertheless, it noticed that there is no clear boundary made between the institutional mechanism and policy measures. Instead, they are often used in an integrated way in Zhengzhou. For instance, the Zhengzhou HNTIDZ is in a leading position in creating the learning and innovation city, while universities are enjoying preferential policies for developing the science park. For this reason, the main case studies will not distinguish these two themes.

## 6.8 Chapter summary

In this chapter, the discussion has been focused on the identification of desired data, the possible and reliable resources, the way in which such data can be collected effectively, and the applicability to the main case study cities. Drawing upon the experience derived from the pilot study conducted in Zhengzhou, it has helped the researcher to refine the data collection strategies and to develop the techniques of interviewing with the "elite". Specifically, the findings and experience from the pilot case study have helped the researcher to build confidence to conduct the main case studies in the following way. Firstly, as complex as the Chinese political systems are, and the often fragmented information sources, it would be hard to find out where the desired information for this particular study could be found if the pilot study was not conducted in the researcher's hometown where the Chinese *guanxi* culture has played a vital role in gaining help and advice in the identification of reliable sources of data and key informants.

Secondly, as already presented in chapter three, the majority of the key informants identified for the current study are senior government officials or politicians, therefore, the way in which the questions are asked is vitally important in receiving honest answers. Nevertheless, based upon *guanxi*, the researcher has been able to discuss this with the

key informants during the pilot. This has helped the researcher to refine the interview questions and the way in which they can be delivered.

Thirdly, through applying the analytical framework developed from the review of literature and the international KBUD initiatives to the pro-analysis of data collected from the pilot, the appropriateness of the data analysis methods has been testified.

Fourthly, the practice of the pilot study has certainly developed understanding on the subject in China's real life context. Moreover, as stated at the beginning of this chapter, under the current political systems in China, regardless of their autonomous scale, vice-provincial level and prefectural level, capital cities of provinces have similar settings of administrative structure and, perhaps even more importantly, the government officials at the same level share a similar culture. Accordingly, what has been learned from the pilot study will be applicable to the main study. Based on this, the next chapter will present the findings from the main case studies.

## **7 Chinese Case Studies: Hangzhou, Wuhan and Chengdu**

### **7.1 Introduction**

Chapter five discussed KBUD movement in the Chinese context from a policy perspective. Chapter six testified the proposed data collection instruments and possible data resources. These in conjunction with findings from chapter two have paved the way for the researcher to conduct the main case study. This chapter will present the findings from three Chinese case study cities: Hangzhou, Wuhan, and Chengdu (Figure 7.1 in next page). The choice of case study cities is deliberately national drawing upon the experiences from across four regions (where the same regional policy applied to both the Western and the Northeast Regions). The process of case selection and justification was discussed in chapter three.

The analysis of each case study is organised around four themes – understanding and defining knowledge for development, development dimensions in practice, knowledge environment, and knowledge synergy. It starts with the analysis of each case one by one and ends with a cross-case synthesis.

### **7.2 Hangzhou: transforming to a knowledge intensive city**

Hangzhou is the capital city of the Zhejiang Province, enjoying vice provincial level autonomous power. There are eight urban districts, three county-level cities and two counties under its jurisdiction, with a territorial area of 16,596 square kilometres and a total population of around 6.5 million (Hangzhou Statistics, 2008), of which roughly four million live in urban area. The history of Hangzhou can be traced back as far as 4,700 years ago when the Liangchu Civilisation was founded. It was designated as a county town in 216 BC in the Qin dynasty. During its 2,200 years of history (Hangzhou, 1995), Hangzhou was the capital of two dynasties of feudal China and thus became one of the seven ancient capitals of China.



**Figure 7-1 Division of Chinese regional policy**

**Source:** Author developed from Dunford (in press, p. 9)

Throughout its history, Hangzhou has been well known as a leisure and tourism city because of its attractive natural beauty and cultural environment. Apart from the service industry, handiwork-based silk work and relatively small scale textile and garment production were the pillar industries. This tradition remained largely unchanged until the early 1980s. Taking advantage of Deng Xiaoping's uneven development policy, Hangzhou has become a major destination of both domestic and foreign direct investment and therefore became an important manufacturing centre. However, the reorientation of national regional policy to promote the development of western and central regions (as well as the northeast) in conjunction with the availability of comparatively cheap labour and low land prices in central and western regions has pulled labour intensive manufacturing industry out of Hangzhou in recent years (Chen, Jin *et al.*, 2008), leaving Hangzhou to find a new way to sustain its economic growth and development. To develop a knowledge intensive industry and, in turn, an innovative city

that is sustainable in environmental, social, and cultural terms is the new strategic goal set in the Eleventh Five-year Plan by the government (HZCC, 2006).

### **7.2.1 Local understanding of knowledge for development**

Understanding knowledge for development in Hangzhou is influenced by three distinctive factors: contemporary national developmental ideology, the city's historical and cultural tradition, and global trend of urban development. The legacy of being the national capital in its history has brought Hangzhou rich resources of Chinese culture and talent (Hangzhou, 1995). As discussed in chapter five, the influence of Taoism and Confucianism on the capital city was far-reaching. As a result, the overall pattern of urban development was thoroughly determined by Confucius' doctrine of social hierarchy and the theory of Feng Shui, which at the core lies "harmonious thought" that directed development activities (Yi, 2007). This tradition had continued to influence development knowledge until the establishment of socialist China.

The impact of Maoist ideology on Hangzhou's urban development was not as profound as that of cities in central and western regions because Hangzhou was marginalised as a result of worrying about the national defence. What was made even worse was that the city's existing industries had been moved out to newly developed cities in central and western regions under the national development plan. As a consequence, the city largely retained its traditional landscape until economic reform began in the early 1980s.

Under Deng Xiaoping's economically centred ideology, as one of the beneficiary cities, Hangzhou's understanding of development was biased towards economic growth, where the need for knowledge for development was limited to technology or simply industrial "know-how". To this end, all people including government officials and government departments became the "machines of profit making" (Wei *et al.*, 2007). Not surprisingly, this has resulted in great social polarisation, water pollution in the West Lake, damage to natural beauty and loss of traditional culture.

The influence of the "scientific development concept" on the city's understanding of knowledge for sustaining harmonious development is becoming more and more apparent. This was reflected in its "Creating Learning City Plan (2005)", "Eleventh Five-year Plan (2006)", "Creating Innovative Hangzhou Plan (2006)", "Developing International



Leisure and Tourism City Plan (2006)”, and “Promoting Hangzhou’s Traditional Services Industries Plan (2008)”. The review of these plans found that the common features cross these plans were increasing investment in citizens, giving priority to develop knowledge intensive industries, paying attention to social justice, and making efforts to protect the environment and its traditional culture. As will be discussed below, although the way in which these initiatives are being delivered is debatable, it indicates a positive change towards a holistic understanding of knowledge for development.

### **7.2.2 Development dimensions in practice**

Understanding the meaning of development in Hangzhou followed a similar track as the understanding of knowledge for development. In the last two decades of 20<sup>th</sup> century, increasing GDP became the exclusive objective in the government agenda. The typical example was the creation of development zones. Within a three year period from 1991 to 1993, Hangzhou established four state-level development zones (Hangzhou Economic Development Zone, Hangzhou High-tech Development Zone, Hangzhou Xiaoshan Economic & Technology Development Zone, and Hangzhou Zhijiang National Tourist Holiday Resort), with a total planned area of more than 330 square kilometres. Regardless of what the zones were called, they were exclusively economically centred. This was exactly the case before the year 2000. Apart from the Hangzhou Zhijiang National Tourist Holiday Resort, which was planned to take advantage of natural beauty to develop high standard hotels, leisure and sports facilities to promote the service industry, the other three zones were not allowed to be used for residential, social services, leisure, sports, and cultural purposes but for factories and management facilities (Yi, 2007). One interviewee rationalised this as because:

... first we must follow the central government’s policy, which would otherwise make mistakes in political concern.... Second, in that period, there was actually no demand for such facilities because plants managers did not need to live in the zones, supervisors and technicians could live in accommodations provided by factories, and plant workers lived in rented rooms in the nearby villages (Director General of Hangzhou Development and Reform Commission, 18/07/2008).

Regardless of how this description can be interpreted in other ways, it at least implies that the exclusive purpose of development is for economic growth itself in Hangzhou. This can be evidenced partially by the economic structure as measured by the shares of primary, secondary and tertiary industry. Due to the lack of statistical information, the



earliest one available was in 2003, where the shares were 0.94:94.03:5.03 (HZBS, 2003). Manufacturing industry shared over 94 percent, indicating low consumption in the zones.

Meanwhile, in the existing urban areas, most old buildings (including many historical heritages) were demolished to make way for commercial property development. What is more, even schools were sold to property developers. A review of the city's statistical information shows that over the last 30 years, Hangzhou's urban population has increased by over three million from 1.04 million in 1978 to 4.19 million in 2007 and the urban built up area has been quintupled. However, in the same period, the number of primary schools dropped from 4959 in 1978 to 437 in 2007, leading to a radical concentration of schools. One interviewee of this study disclosed that:

even in the remaining schools, most of their frontage areas were sold and because the increasing number of pupils, the playgrounds were used to build class rooms.... Even though, number of pupils in one class still exceeds 50 and in some extreme cases the number is over 70.... Because of the concentration, one third pupils may have to travel more than three kilometres to their schools (Director General of Hangzhou Academy of Social Science, 25/06/2008).

The increasing gap between demand and supply has led to the charge of high illegal fees and major corruption,<sup>11</sup> thus, aggravating low income families' financial burden and public unhappiness. In terms of the impact of economic centred development, he commented that:

because majority of Hangzhou's industries were private owned manufacturing based small and medium enterprises, which pursue low technology and productivity, the environmental costs were extremely high. Not to mention the damage of moral standard, social polarisation, and lost of invaluable cultural heritage (Director General of Hangzhou Academy of Social Science, 25/06/2008).

However, positive changes have started to take place in recent years. As mentioned in the previous section, under the new guideline of the "scientific development concept", Hangzhou has refined its strategy to develop:

an eco and liveable city through increasing investment in people's livelihood and environmental protection; a learning city through encouraging citizens learning; innovative city by promoting knowledge intensive and creative industry; an

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<sup>11</sup> According to the law, primary and secondary school education are compulsory and free.

international tourism and holiday making city through resuming and maintaining its natural beauty and cultural heritages ... (Secretary General of the Mayor's Office, 05/07/2008).

Following in this direction, the Hangzhou Municipal Government committed itself to solve at least ten problems that resist the realisation of above strategy. Some related initiatives are integrated into the discussion of Hangzhou's knowledge environment and knowledge synergy in the following sections.

### **7.2.3 Knowledge environment**

#### ***7.2.3.1 Quality of place***

##### **Physical and social environment**

Hangzhou has been historically compared to the "heaven in the earth". This was attributed to its natural beauty and richness of both culture and creature comforts. Firstly, the city embraces a six square kilometre natural lake – the West Lake – which links a mountain where sits a famous Buddhism temple – Lingyin Temple. According to Feng Shui theory, this is an ideal place to live. Secondly, taking advantage of the good climate, rich water resources, and fertile land, Hangzhou region has long been an important base for growing rice, tea, silkworm, and fish (Hangzhou, 1995, Yi, 2007), making Hangzhou a rich, attractive place to visit. Thirdly, because of the above two reasons, Hangzhou became one of the prime place attracting talents. Numerous Chinese poets have written to glorify Hangzhou. This on the one hand enriched Hangzhou's cultural resources, and in return, promoted Hangzhou to the outside world on the other. The Italian traveller Marco Polo, in the 13th century, once applauded Hangzhou as "the most splendid and luxurious city in the world".

Contemporarily, despite the demolition of many historical heritages and environmental degradation, Hangzhou is still an attractive city for the Chinese. Being a core city of the Yangtze River Delta, the largest economic region in China, Hangzhou is 180 kilometres away from Shanghai. The ongoing project Shanghai-Hangzhou High Speed Railway will further reduce the travel time between the two cities to 40 minutes. Meanwhile, from Hangzhou Xiaoshan International Airport, one can fly to 58 domestic cities and more than ten overseas destinations, making Hangzhou well connected with major knowledge

centres in the world. In the meantime, Hangzhou's virtual connectivity has also been enhanced as measured by broadband connections. By 2007, broadband users reached 1.22 million, accounting for 57.56 percent of total households, and a steady increase of more than 10 percent every year in the last few years (Hangzhou Statistics, 2008).

Moreover, housing conditions have been largely improved in the last two decades. More than 70 percent of its housing stock was built after the 1990s and an average of more than 100,000 units of new flats has been or is being built every year from 2003 onward. However, housing supply still cannot meet the upsurge of demand, which resulted in the rapid increase of housing prices in the last few years. Statistical information revealed that more than 40 percent of housing was bought by non-Hangzhounese, indicating the explosive in-migration flow. This, on the other hand reflects Hangzhou's attractiveness.

In addition, despite the decreasing numbers of public schools, private run international schools have emerged rapidly, making them available for foreigners and high income families to have their children educated in a bilingual environment. The supply of leisure activities, such as golf, and many other outdoor sports facilities, is widely appreciated. However, for the vast majority of people (including the middle classes), such luxury schools and leisure activities are beyond their financial means.

The relatively expensive housing and high cost of living became a big barrier for attracting students and entry-level knowledge workers. However, this may not be easily solved, as local policy makers are taking a self-contradictory and somewhat speculative approach in dealing with the already overcrowded population and in-migration. As put it by an interviewee,

[w]e must enlarge our urban scale through a means of fastening urbanisation, but we would have to control the amount of low skilled rural labours,... to give rooms to high skilled and knowledge workers (Director General of Hangzhou Development and Reform Commission, 18/06/2008).

Different policies are therefore applied to different social groups, namely fully registered permanent urban residents and temporary migrants which consist of rural labourers and students, and entry-level high skilled and knowledge workers. While fully registered urban residents are the beneficiaries of urban development, rural labourers take nothing

away from it, with students and entry level high skilled and knowledge workers sitting somewhere in the middle.

As stated, over the last three decades, the amount of temporary migrants in Hangzhou increased steadily and reached 1.25 million in 2008, accounting for more than one third of its urban population. Majority of them were rural labourers, working in the manufacturing sector, with an increasing proportion of students and entry-level knowledge workers. Local policies related to those temporary migrants were generally negative before 2003. Although it was evidenced in the last few years that local policy makers began to make efforts to remove policy barriers in this respect,

...it is far from a systematically designed policy pack, ... even though, the new policies on temporary migrants themselves are usually contradictory and simply cannot be implemented (Director General of Hangzhou Academy of Social Science, 25/06/2008).

Thus without doubt, the location and natural beauty has brought comparative advantages to Hangzhou. However, an economically centred development strategy has weakened to a large extent this advantage rather than strengthening it. Despite the improvement of conditions in housing and urban infrastructure, many policies that are still in effect are enhancing social inequality rather than social inclusion and equity.

### **Cultural environment**

Being a National Historical and Cultural City, Hangzhou has never been lacking in culture in its urban life. These cultural elements include fine arts and performances, and local folk culture such as: Tea Culture, Silk Culture, and Hangzhou Style Catering. Historically, Hangzhou was one of the major genres of Chinese Landscape Painting and was well written about by the literati. The Yue Drama (originated in Hangzhou) is one of the ten most popular performance arts in China. These cultural traditions were inherited, taught and researched in the China Academy of Art (located in Hangzhou), one of the most influential fine arts universities in China, making Hangzhou one of the prime places for fine arts (Director General of Hangzhou Bureau of Culture, 22/06/2008).

In Hangzhou's tradition, tea and silk work are not only industries but also cultural identity. The tea culture is deeply rooted in Hangzhou's urban life, which integrated work

and business into leisure. Meeting with friends and business gatherings are usually held in tea houses, which are normally decorated with Hangzhou traditional fine arts and play light music. Some tea houses also provide performances including Yue Drama, comedy, and/or pop-music. Moreover, as one of the cradles of silk work, every native Hangzhounese can tell numerous stories about silkworms, filature, embroidery, and garments. Every year, silk related events, such as the International Forum of Silk, the Silk Expo, and the Silk Fashion Festival, have attracted millions of people from all over the world (Hangzhou Chorography Editorial Group, 2007).

In recent years, following the change of central government's policy, Hangzhou invests extensively in fostering a so called "socialism mainstream culture", which aims to rebuild moral standards. Government funded performances, TV programmes and public campaigns were launched. The Hangzhou Grand Theatre is one of the typical examples of the government led initiatives of this kind. The theatre is a multifunctional cultural place consisting of an Opera House with 1,600 seats, a Concert Hall with 600 seats, a Multifunction Hall, an Open Air Stage, and service facilities. The theatre constantly runs the "Weekend Concert and Opera", which offers low ticket prices to students and retired people, attracting more citizens to participate. This has been added to the attractive cultural traditions of Hangzhou.

In general, the attractive cultural tradition lured many cultural and arts professionals (creative class) who, in return, contributed to the creation of a more attractive cultural environment. Such a cultural environment has played the role of a magnet in attracting and retaining people.

### **Economic base**

Hangzhou became economically important during the 1980s with the explosive emergence of private ownership and foreign direct investment manufacturing. As noted, Hangzhou was not a favourable place in the national development strategy under Maoist development ideology. For this reason, there were not many state owned large enterprises located in Hangzhou during the first three decades of socialist China. Its economy therefore remained largely based on traditional light industry, such as silk, food processing, electronic products, garments, and textiles. However, taking advantage of national development strategy reorientation in the post-reform era, Hangzhou has been

developed as a major manufacturing centre. Now, the most important industries in Hangzhou city region are: machinery, electronic information, food processing, textiles and chemical fibres, garments, and medicines, which contribute more than 70 percent to the city's economy (Hangzhou Statistics, 2008).

From 2002 onward, following the central government's change of development strategy, Hangzhou has redefined its vision for future development, that is, as an innovative city, for international tourism and holiday making, and an advanced technological manufacturing centre (HZCC, 2006). In this direction, a number of special plans have been developed and extensive efforts have been made in recent years. This has led to the emergence and radical growth of a creative industry. Hangzhou is now the national software writing, integrated circuit design and manufacturing, and electronic industrial base. According to the statistical information (Hangzhou Statistics, 2003, 2007, 2008), from 2002 to 2007, within less than five years, the added value produced by the creative industry in Hangzhou increased from less than one billion to 56 billion RMB, among which, cartoons, network games, and software contributed over two thirds. John Howkins, the author of "Creative Economy", once admired Hangzhou as the "heaven of creative industry" (Chinanews.com, 23/06/2007).

More recently, in order to develop toward an international tourism and holiday making city, Hangzhou planned to promote ten traditional industries: Hangzhou style catering, tea houses, recuperating, performances, dressing, hygiene, garments, baby and children's products, leisure sports, arts and crafts (HZCC, 2007). These ten industries were all historically important to Hangzhou, but were somewhat overlooked in the last three decades. What is more, the plan was intended to not simply rehabilitate these industries but to use and valorise new technology and knowledge to upgrade them.

All in all, Hangzhou's economy is in transition from being labour intensive manufacturing centred to a knowledge-based economy, which involves not only producing more knowledge and technology products, but also the use and valorisation of knowledge in production.

## **Urban innovation engines**

Investing in urban public spaces and turning them into innovation engines have been overwhelmingly appreciated in Hangzhou. Over the last fifteen years, a number of big projects, including the New Hangzhou City Library, the Hangzhou Grand Theatre, the Hangzhou Silk Museum, and public squares have been built. During the fieldwork of this study, the researcher observed some of these public spaces.

Among the three observed public places, Hangzhou City Library has been built deliberately to serve as a formal place for facilitating citizens' learning. Indeed, Hangzhou City Library is among the first in China providing free services to its citizens<sup>12</sup>. In the last few years, a library network has been created and extended to cover the whole city region, including rural areas. Within the network, inter-library loan services were made available in 2007. On average, there are more than 8,000 visitors visiting the two main libraries every day. In addition to providing normal services based on advanced technology, in order to further encourage citizens' learning, Hangzhou City Library established a Citizen Reading Association and the Hangzhou Library Foundation. The Citizen Reading Association regularly holds reading activities and workshops, and encourages citizens to participate for free, while the Library Foundation provides funds for inviting leading scholars to give seminars and lectures that related to public interests. Both are well received. Moreover, the completion of the New Hangzhou City Library has lifted the library services up to among the highest level libraries in the country. As stated by the Customer Services Manager of the library, Hangzhou City Library has transformed from "a knowledge store to the knowledge catalyst" (visited on 09/07/2008).

However, the unequal rules of using the library, which distinguish between fully registered urban residents and temporary migrants, have prevented the latter to access knowledge. This reflects the deeply rooted discrimination to temporary migrants. Without doubt, this will further enlarge the gap between permanent urban residents and temporary migrants in terms of becoming knowledge citizens, which is running counter to the national strategy to develop the "harmonious society".

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<sup>12</sup> Only includes those who have fully urban Household Registration status. For those temporary migrants, they would have to pay annual fees for the services, that is, ¥100 RMB for borrowing publications and ¥1,000 RMB for using databases.

The Hangzhou Silk Museum is the largest one of its kind in the world. The museum exhibits the whole history of silk and the whole process of silk production, as well as a live show of silk garments. It also provides “try-out” facilities and souvenir shops. The Research Centre of the Museum is among the highest level of studies in this field. The centre also runs regular international seminars and workshops. In 2005, the Museum became a teaching and learning base both for pupils and students outside their campuses. Nevertheless, compared with its invaluable antiques, the way in which they are exhibited is poor. Furthermore, due to the poor location and public transport access, as well as a lack of its own website, the Hangzhou Silk Museum is less known compared with its well known history of being a “silk capital” (visited on 26/06/2008).

To compare with the above two examples, the English Language Corner is a spontaneously occurring phenomenon. There are numerous such corners in Hangzhou, taking place in parks, public squares, university campuses, libraries, and tea houses. Each Corner has its own fixed time (evening and/or weekend) and each event may last from two to five hours. The corners are totally disorganised and absolutely free for taking part in. Nevertheless, each corner has evolved to serve a particular group of learners. Generally, the indoor Corners such as those taking place in the tea house and café bar are among the highest level, whereas the outdoor corners such as parks and public squares are the favourite of youngsters and entry level learners. Dependent on the different types of corners, the number of attendees can range from tens to several hundreds, and normally with the participation of foreigners. In general, the increasing popularity of the English Language Corners indicates public willingness to turn ordinary places into knowledge processes, which not only helps to improve English language skills, but also facilitates tacit knowledge transfer.

In addition to the above observed three typical examples, many other public spaces have also been deliberately used to facilitate public learning, such as the local residential community and public square cultural events, and so on. Nevertheless, these are more or less ideologically concentrated, which actually received less public interest compared with the spontaneous public learning activities.



7.2.3.2 Knowledge base

The knowledge base, as measured by the number of university students and the presence of a creative class and knowledge intensive industries are encouraging, but are potentially problematic in Hangzhou. There are currently 36 universities teaching the whole range of academic disciplines and the number of students had reached 400,000 by 2007. Roughly one in two individuals has the chance to go to university. The total amount of citizens who have a university degree was about one million in 2007, accounting for 15 percent of its total population (Hangzhou Statistics, 2008). Nevertheless, as Figure 7.2 shows, the number of students has increased tenfold over the last two decades, whereas the number of academic staff has remained steady. This could result in a decrease in the quality of teaching and learning. Moreover, apart from Zhejiang University, a “211 university”, China Academy of Arts, Hangzhou Silk Institute, and Zhejiang Science and Technology University, are outstanding both in teaching and research, others are purely teaching universities, especially those that are newly established.

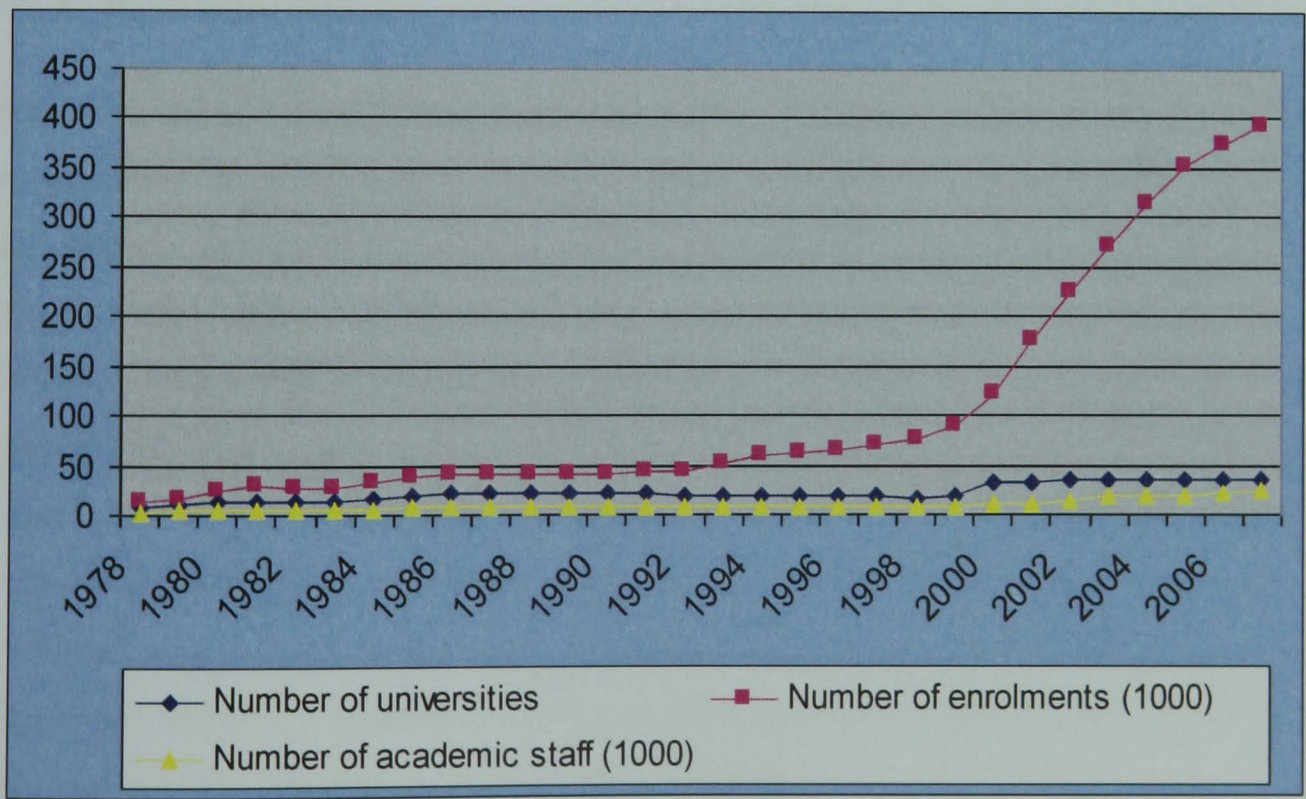


Figure 7-2 Numbers of universities, students and academic staff in Hangzhou

Source: Developed from Hangzhou Statistic Yearbook, 2008

What is more, as noted by an interviewee:

what we need is not only the amount of students, but more important their knowledge and skills. In this sense, I am afraid the universities may need to focus on the quality of teaching (Chair of the Association of Industry of Hangzhou, 19/06/2008)

Meanwhile, the radical increase in the supply of students and the relative small demand of knowledge workers has become an increasingly major concern within the government's work agenda (Director General of the Mayor's Office, 05/07/2008).

As stated, a creative industry has emerged explosively as an important pillar of Hangzhou's economy and has become internationally known as an emerging "cartoon and network games capital". By 2007, three clusters: art and design, cartoon and network games, and software, employed about 100,000 creative workers and the demand is continuously increasing, which, therefore, attracts more and more talented people from all over the country and even the world. The concentration of such talent will further catalyse this industry and vice versa.

#### **7.2.3.3 Knowledge culture**

Promoting citizens learning has been used as a means of developing a knowledge culture in Hangzhou since 2002. In so doing, a plan for building a learning city was created, according to which citizen colleges, local community learning centres, colleges for aging people (both virtual and physical), were established, and open to citizens<sup>13</sup> for free (HZMG, 2002). All of these learning facilities are fully equipped and offer regular courses, activities, and events, embracing politics, social ethics, general scientific knowledge, law and regulations, environmental protection, and knowledge of civilised behaviour. From 2004 onward, computing skills (using the internet), general English, and Mandarin became the compulsory courses, aiming to train 100,000 citizens every year. Moreover, university libraries are asked to open to citizens and to join the inter-library loan system. One interviewee commented on this as:

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<sup>13</sup> Again, this means the fully registered permanent residents of the Hangzhou city region. Temporary migrants are not included.

... all we have done over the last four years was to create a lifelong education system, which covers not only the urban area, but also rural area... to make Hangzhou a place where learning is taking place at any time everywhere and everybody wants to learn and can learn (Director General of Hangzhou Bureau of Education, 24/06/2008).

The efforts have been well received, according to the same interviewee:

ever since the [city's] library system was expanded in last year to the local community level and provide free services, the number of books on loan has increased explosively month by month. In June, there were over 600,000 books have been borrowed (Director General of Hangzhou Bureau of Culture, 22/06/2008).

In terms of organised learning activities, more than half a million people attended public lectures and seminars in 2007 (Hangzhou Statistics, 2007). The Secretary General of Mayor's Office described this as:

... different from previous government-led activities, with learning city strategy, all organisational work are voluntary, the government only offered a general guidelines. Courses and learning activities are decided by local communities... citizens' active involvement indicates we are doing the right thing (interviewed, 05/07/2008).

In one local community learning centre (observed 02/07/2008), 47 participants (most of which are managers and/or supervisors of small and medium enterprises from labour intensive service sectors), attended a night school course. The voluntary teacher, professor of business management in Zhejiang University comments that:

all participants are from private owned small business and most of them do not have university degree. This made their management of business getting hard and hard because the competition is becoming hot.... I can feel their enthusiasm to learn (02/07/2008).

One participant responds to this learning activity:

I would say it is brilliant, you know, we have no chance to go to university, but the market is changing so quick and the government asks us to upgrade our business, but it is hard for us to do so ... hm..., this course gives us the knowledge we need ... you know, we can do it better now ... (02/07/2008)

As stated in the previous section, public aspirations to learn in Hangzhou can be also evidenced by the English Language Corners, a spontaneously emerging learning phenomenon. Undoubtedly, knowledge gained through public learning will be applied to

their daily tasks, which will lead to development activities relying more and more on knowledge.

However, barriers set by the organisers or local authorities to exclude temporary migrants from the learning facilities and activities again are the major cause of “inharmonious” behaviour. Moreover, as noticed, even those permanent urban residents from low income families are not actively involved in the learning activities. This gives rise to the question of whether the approach that was employed by the authority to implement the citizens learning strategy is closing the gap or enlarging it.

#### **7.2.4 Knowledge synergy**

The way in which Hangzhou synergises its knowledge for urban development can be evidenced by the efforts made to the creation of development zones; the development of national university science parks and public campaigns for the development of an eco-liveable city, civilising city, sanitary city, innovative city, and so on. This section discusses the approaches that Hangzhou adopted for synergising knowledge.

##### **7.2.4.1 Development zones**

The establishment of development zones was the first step in synergising knowledge for urban development in the post-reform period. However, in the first ten years, three development zones (Hangzhou ETDZ, Xiaoshan ETDZ, and Hangzhou HNTIDZ) were actually developed as manufacturing centres. Knowledge here was limited to technology and development was biased towards economic growth. In this period, both foreign and private investors with a degree of production knowledge were attracted by the preferential policy and cheap or even free use of land to set up factory plants in the development zones, while labourers were attracted by employment opportunities. The knowledge environment was not deliberately developed for coinciding with local industry. As one interviewee stated:

... both foreign invested and private owned manufacturing were seldom to link with universities and research institutions located in the city because there was no need for them to invest in R & D but repeatedly produce technically mature products invented elsewhere ... Hangzhou citizens were generally not involved ... what they actually needs here in Hangzhou was the preferential policy (Chair of the Hangzhou Association of Private Enterprises, interviewed 04/07/2008).

From 2000 onward, in responding to the change in the national development strategy, Hangzhou has made extensive efforts to transform economic centred development zones into knowledge intensive urban districts. These include integrating high-tech development zones into urban districts; transforming the Economic Development Zone into a subsidiary centre of Hangzhou; and fostering knowledge intensive and creative industries.

### **Integrating Hangzhou HNTIDZ into an Urban District**

The integration of Hangzhou HNTIDZ into Binjiang Urban District in 2002 was a step forward to transform the industrial centre into a fully functional urban district. One interviewee described the advantages of the integration as:

With the change of development strategy, we need a high quality of urban environment to attract and retain creative and knowledge workers to set up their knowledge intensive business. However, the problem we are facing is that national preferential policy was applicable only in the development zone where was full of industrial facilities but lack of living, cultural and leisure facilities... on the other hand, we have an attractive urban environment in Binjiang District, but, where the national preferential policy was not applicable. ... in this case, the “one stone, two birds” way is to get the urban district to become development zone... (Director General of Hangzhou HNTIDZ, 03/07/2008).

In so doing, departments in the two governmental bodies were merged and preferential policies were extended to be applicable to the whole Binjiang Urban District. The development plan was revised and the goal was redefined to develop a “science and technology new town” (HHTZ, 2005). This change has received a positive response both in economic and social terms as evidenced by the emerging and fast growing creative industry and the in-migration of knowledge workers:

You will see how successful the integration is if you go to see the creative industrial clusters in the Binjiang area (Director General of Development and Reform Commission, 18/06/2008).

However, despite the success in the local context, Hangzhou has actually taken advantage of the loopholes in the national regulations. As mentioned in chapter five, it was five years later, the location based preferential tax policy was replaced by an industrial sector based policy (State Council, 2007c). Nevertheless, the integration has indeed given Hangzhou five years to take the competitive advantage.



### **Upgrading Economic Development Zone**

Despite the economic success of the Economic Development Zone in the last two decades of the 20<sup>th</sup> century, Hangzhou citizens were rarely involved. As shown above, the economic growth mainly relied on the expansion of labour intensive manufacturing, which was formed through the combination of foreign or outside Hangzhou investors with temporary rural migration workers. Moreover, more than half a million rural labourers concentrated in the development zone were seen as a potential risk to urban safety and social stability (Li and Yang, 2000). The departure of foreign direct investment and private owned labour intensive manufacturing, on the one hand, has put pressure on policy makers in Hangzhou to find another way to sustain its economic growth, but simultaneously took away low skilled rural labourers on the other, as well as making room for Hangzhou to develop a knowledge-based economy.

In 2004, the new development plan for the Hangzhou Economic Development Zone has reset its goal to develop as “a hi-tech manufacturing centre, a university town, and one subsidiary centre of Hangzhou” (HEDZ, 2004). In order to upgrade its economic structure, especially the four pillar industries: electronics and communication, biomedicine, machinery, and food processing, a set of policies was put in effect (Table 7.1). These policies were coordinated by the development of the university town, a planned area of 10.5 square kilometres, consisting of 15 technological universities with 150,000 students. Meanwhile, fully functional urban facilities were also planned and are being implemented.

### **Fostering creative and knowledge intensive industry**

Hangzhou has an attractive knowledge environment, but was somehow unused in the last few decades. Soon after the merging of the high-tech development zone into the Binjiang urban district, which allowed enterprises located in the Binjiang urban area to enjoy the preferential policy, a creative cluster has emerged spontaneously and has been growing explosively. This immediately drew the attention from the local authority, which resulted in the making of policy measures to promote the creative industry (HZMG, 2005). These policy measures include:

- Developing education and training centres to integrate and exploit the existing resources within the universities in Hangzhou, such as the China Academy of Arts, Zhejiang University, Zhejiang Gongshang (industry and commerce) University, Zhejiang Science & Technology University, Zhejiang University of Media & Communications, and so on.

**Table 7-1 List of mechanisms for knowledge synergy**

Name	Objectives	Function
Singapore Hangzhou Science Park	Transforming technology and knowledge from Singapore	1) software R&D; 2) biomedicine R&D and manufacturing; 3) industrial design
Teaching, researching and producing centre	Promoting and enhancing collaboration between industry and academia	1) joint R&D; 2) information and resources sharing (both virtual and actual); 3) human resource services
Biomedicine innovative service platform	Promoting and facilitating R&Ds	Online technology market
Hi-tech incubator	Fostering enterprises in software writing, hi-tech solutions related to biomedicine, machinery, and food processing	Office space, finance, legal, marketing, policy, human resource etc services
Foreign educated returnee business park	Same as hi-tech incubator	Office space, finance, legal, marketing, policy, human resource etc services
Human resource services centre	Making cohering policies to attract and retain talent	1) policy research; 2) professional training; 3) bridging universities and enterprises

**Sources:** Author developed from HEDZ (2004, 2005)

- Establishing research and development centres to develop an open platform for creative small and medium enterprises (SMEs);
- Building a creative industrial incubator to foster creative entrepreneurship;
- Building an exhibition centre and market to facilitate creative products marketing;

- Establishing an information and exchange centre to organise events and to facilitate attracting and retaining talent from all over the world;
- Developing industrial clusters and extending supply chains to strengthen the creative industry base.

These policy measures have been well received. There are more than 50,000 creative workers working in over 200 companies concentrated in two creative clusters in Binjiang District (Hangzhou Statistics, 2008). Moreover, the numbers of companies and creative workers have been doubled every year in the last five years, and are still growing rapidly. One interviewee in the Mayor's office of Hangzhou commented on this:

[w]e had been working very hard to attract investment from outside the city, but have generally overlooked our own invaluable assets – knowledge resources. As you know, our strengths to compare with other cities are natural beauty, richness of culture, and quality of universities, as well as mass of knowledgeable workers. We generally overlooked the importance these knowledge assets making no connections between them and economic growth in the last thirty years but relied on preferential policies to promote labour intensive manufacturing industries... but anyway, we got it right now. As you can see, Hangzhou citizens are actively involved and enjoy this ... (Secretary General of the Mayor's Office, 05/07/2008).

Indeed, Hangzhou is now known in China as a capital of creativity focusing on cartoon and network games production.

In addition, in order to create a cohesive environment for stimulating knowledge intensive industries, Hangzhou has resumed its annual international event – the West Lake Expo Hangzhou<sup>14</sup>, based on a number of events which are organised throughout the year. The Hangzhou Science and Technology Expo is one of them taking place during late June and early July every year. This event attracts many high quality universities, research institutions, domestic and multinational high-tech companies to come to Hangzhou. The event coordinator commented that:

[t]here are more than 1,000 companies attend the event and the number is still increasing, which attracting over 600,000 people visiting Hangzhou every year... This provides a very good chance for local high-tech companies and knowledge

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<sup>14</sup> The event was launched in 1929, but was interrupted because of the War and many other reasons. See for detailed information at: <http://www.xh-expo.com/en/index.html>



people to keep the pace with latest progression of high and new technology (opening speech to the Hangzhou Science and Technology Conference, 30/06/2008).

Without doubt, from an economic perspective, through the above three policy measures, Hangzhou has once again taken the “earlier movers’ advantage”.

7.2.4.2 *Developing National University Science Parks*

Establishing a national university science park is another institutional mechanism to facilitate knowledge synergy. Under the guideline of the “national plan of university science park” (MOST and ME, 2000), Hangzhou established two national university science parks: Zhejiang University National Science Park and Zhejiang Province National University Science Park. The former is located in the Hangzhou High-Tech Development Zone, while the latter is located in the Hangzhou Economic Development Zone. Table 7.2 shows the main features of the two national university science parks in Hangzhou.

Table 7-2 Main features of National Science Parks in Hangzhou

	Zhejiang University National Science Park	Zhejiang Province National University Science Park
Partners	Zhejiang Provincial Government, Hangzhou Municipality Government, Zhejiang University	Zhejiang Industrial University, Zhejiang University of Science and Technology, China Institute of Metrology, Hangzhou Jianggan Urban District Authority,
Managing body	Zhejiang University Science Park Ltd	Joint venture
Scale	113 ha	12 ha
Floor space of incubators	72,000 sq.m	18,000 sq.m
Number of companies	396	85
Number of employees	>8,000	1,500

Sources: Author compiled from documents provided by the two parks, 2008

Regardless of the differences between the two parks, they are government led initiatives, therefore, following similar approaches. Both parks are based on property development that enjoys subsidised land prices and substantially preferential policies. What makes them meaningful is that both parks are deliberately fostering knowledge intensive start-ups that serve Hangzhou's traditional industries. The Managing Director of Zhejiang University National Science Park responded to this as:

... The reason of why we were given so many preferential policies is that we were expected to exploit universities' knowledge resources to serve upgrading the traditional industries, as well as encouraging students to go for businesses ... (interviewed 06/07/2008).

It is important to note that due to the very short history, there is a lack of systematic information and the evaluation benchmark. Therefore, it might be too early to make a judgement on whether the national science parks in Hangzhou are functioning well or not.

#### ***7.2.4.3 Developing nationally-titled cities***

The efforts made in the development of economic and high-tech development zones as well as national university science parks are generally economic centred. Nevertheless, in corresponding to the change of development strategy, Hangzhou has been working extensively in recent years on facilitating the dissemination and maximum usage of knowledge, which includes not only technological knowledge but also social, cultural, and environmental knowledge for sustaining balanced development. This has resulted in the city boasting a number of national and international honours, such as the National Sanitary City, the National Demonstrative City of Intellectual Property Protection, the National Model City of Environmental Protection, the Nomination of the National Civilising City, the National Model City of Scientific and Technological Education, the Best Tourism City, the International Garden City, and the UN Human Habitat Award (2001). Furthermore, to become an innovative city has been set as a strategic goal in the city's Eleventh Five-year Plan (HZMG, 2006).

In order to achieve the above goals, building the learning city has been employed as a key approach. As stated, the activities of creating a learning city involve all citizens in Hangzhou, and a system for lifelong learning has been built. On the use of this system for citizens' education, one interview in the Mayor's office of Hangzhou said that:

[w]e divided our strategic goals into several sub-objectives and tasks, local communities are asked to inform families in their communities to make sure all citizens understand our goals in a certain period. ... Communities are also asked to organise learning activities and discussions related to these goals... this helps largely developing a great consensus on our development initiatives and support was received accordingly... what is encouraging, you know, is that citizens as well as organisations can usually make things better by using their knowledge (Secretary General of the Mayor's Office, 05/07/2006).

Meanwhile, establishing partnerships between Hangzhou's municipal government and universities, and between Hangzhou's municipal government and large companies to develop exemplary harmonious districts, is also seen as a means of synergising knowledge for urban development. One interviewee in Zhejiang University commented on this as:

The agreement of establishing the partnership [between the government and the university] gives social roles to university to contribute to the development of harmonious district not only in theoretical terms but in practice. ... this is important since Zhejiang University has become the largest organisation in the city, occupying 518 ha with over 40,000 students and roughly 8,500 staff, which, to a some extent, can be seen as an independent town. ... the concentration of the talented people can make the development of harmonious city easy if the talent is used effectively (Vice-President of Zhejiang University, 07/07/2008).

The Executive Chair of Association for Industry in Hangzhou insisted that:

Enterprises used to play substantially social roles in the pre-reform era, but were taken away in the last three decades. The partnership agreement lets the enterprises bear once again the social roles to look after social, cultural and environmental issues related to development activities (interviewed 19/06/2008).

Nevertheless, despite the success of winning the honour of various national titled cities, the approach that Hangzhou has been following is questionable. As stated in the previous sections, there were roughly 1.28 million temporary migrants in Hangzhou, most of them are working in the labour intensive sector receiving very low pay. While Hangzhou is enjoying these temporary migrants' economic contribution, the city offers nothing to them. In this context, Hangzhou may be of success in synergising knowledge for economic growth, but is poor from a social perspective.

### 7.3 Wuhan, from industrial city to innovative city

Wuhan is the largest city in central China, sitting at the middle reaches of the Yangtze River. The Wuhan metropolitan area comprises seven urban districts, six suburban districts, and three state level development zones, covering 8467.11 square kilometres, of which 1,557 square kilometres are developed urban proper. By 2007, the total population in the great Wuhan area reached 9.79 million; 6.60 million of them live in urban areas, ranking as the eighth largest city in China and the largest one in the central China region. Roughly one million people are educated to a higher level.

The history of Wuhan can be dated back to 3,500 years ago. It was developed gradually as the military, political, cultural, commercial, and trade centre because of its strategic location and advantages of rivers and roads transportation in ancient history. By the time of the Second Opium War (Lamour and Lamberti, 1974), Hankou (the core of Wuhan) had been developed as one of the four most developed commercial and trade centres in the country (Chen, 2005). The Second Opium War resulted in the Hankou Port becoming the trade port opening to foreign trade. Wuhan has consequently been transformed from an inland close town into an international city (Chesneaux *et al.*, 1976). The Xinhai Revolution (took place in 1911), which resulted in the death of the Qing Dynasty, was originated in Wuhan. Wuhan became the capital of Hubei Province after the establishment of the People's Republic of China and one of the 15 vice-provincial cities in the early 1990s.

Wuhan was one of the most favourable places receiving state investment during the Maoist era, which had led to the city ranking as the fourth largest economic entity after Shanghai, Beijing and Tianjin before the 1980s, and the third largest scientific and higher educational base in the country after Beijing and Shanghai. Its pillar industries such as steelmaking, automobiles and machinery, tobacco, and petrochemicals, were founded during this period (WHCSG, 2000). However, Wuhan gradually lost its position in the post-reform era because of the relatively slower economic growth compared with coastal cities. Nevertheless, the recent reorientation of national development strategy has allowed Wuhan to become once again the focus in leading the rise of the central region. This section discusses Wuhan's efforts towards KBUD.

### 7.3.1 Local understanding of knowledge for development

The impact of the traditional Chinese knowledge concept on Wuhan's urban development was weak. Instead, foreign concessions in Hankou since the Second Opium War brought the western concept of knowledge for development – developing modern industrial cities (Chen, 2005). The advantage of western development knowledge was recognised by the Hubei governor – Zhang Zhidong (in office from 1889-1907), who was well known as the pioneer of modern Wuhan. During his governing, apart from the development of state owned industries, at least ten western style education institutions were established and numerous selected youngsters were sent to western countries to study, who helped the acceleration of Wuhan's urban development following the western example after their return. This had a far reaching influence over Wuhan's local understanding of knowledge for urban development, even after the establishment of socialist China (WHCSG, 2000).

Taking advantages of both comparatively well developed modern industrial capacities and the strategic importance of the geographical position, Wuhan became one of the most favourable cities to receive state investment under the Maoist ideology of national development. Consequently, Wuhan was developed as a national centre of industry, science and education. Nevertheless, given the presence of a relatively high proportion of state owned enterprises and the domination of the central planning system, Wuhan's development was determined by the central government rather than the local authority (Liu, 2000). As discussed in chapter five, national understanding of knowledge for development at that time was framed by Maoist ideology where the city was seen as a production centre, and science and education were directed to serve this ideology.

The legacy of Maoist ideology for Wuhan made it extremely hard to transform into a market driven economy in the post-reform era, which, in turn, has resulted in the city losing its competitive advantages. One interviewee commented on this as:

... well, allegedly, it was because the influence of Maoist ideology still dominated our thinking on development, but, actually, I would say Wuhan was one of the biggest beneficiaries of Maoist ideology on regional development, which has thus built up a strong bureaucracy. This made the city subjectively rejecting any change... This was the case in the 1980s and most of the 1990s... (Director General of Wuhan Academy of Social Science, 27/05/2008).

However, change was eventually taking place under the guidance of the “scientific development concept” in the last few years. This can be found from its “Eleventh Five-year Plan (2006)”, “Wuhan Cultural Development Plan 2004-2010”, “Wuhan Urban Agriculture Development Plan 2006-2020”, “Wuhan Talent Development Plan 2006-2010”, “Wuhan Science and Technology Development Plan 2006-2010”, and bidding for the “national experimentation of developing resources saving and environmental friendly city (2007)”. These plans indicate at least that efforts are being made to cultivate various types of knowledge for multi-dimensional development.

### **7.3.2 Development dimensions in practice**

When “rising up the central region” was added to the national development strategy for developing the harmonious society in 2003, Wuhan was certainly expected to take the leading role because of its status as the largest city in the region. This was reflected in its recent plan to develop “five national centres in the central region”, namely: a transportation centre, a commercial and financial centre, a science and education centre, an information centre and an advanced industrial centre (WHDRC, 2005). In order to meet this goal:

[w]e must first of all develop as an eco-liveable city, a cultural richness city, an innovative city, a physically attractive city, a consumptive city, and intelligent city... so that it can provide a supportive environment (Secretary General of the Mayor’s Office, interviewed on 16/06/2008).

Wuhan has launched a series of public campaigns to coordinate the realisation of the above objectives. Typical examples in this respect are the substantial efforts made to create the national civilising city, the national sanitary city, and taking the experiment of developing the “resources saving and environmentally friendly city”. These will be discussed in detail in the knowledge synergy section.

Nevertheless, while policy on economic, cultural, and environmental development was prioritised, policies for social inclusion remain the biggest concern, particularly in relation to temporary migrants. Statistical information (WHSB, 2007) reveals that the amount of temporary migrants in Wuhan has increased steadily over the last three decades, reaching 1.83 million in 2007, of which 1.34 million coming from rural areas. A survey conducted by the Wuhan Academy of Social Science (Xu, 2006) shows that the

vast majority of these migrants were working in the labour intensive sector, such as manufacturing, construction, retail, and services industries, with very low pay. More than 95 percent of them lived in either rented rooms or accommodations provided by their employers, all of which were in very poor conditions, and there is no chance for them to buy a home in the city.

What is worse is that there were 113,300 children from these migration families aged between seven and fifteen years old, whose education has been generally overlooked or mistreated (Liao, 2006). According to Liao (2006), the government is on the one hand closing down numerous primary and secondary schools, and on the other hand, has made it difficult for migrants' children to go to public schools in the city by charging them high tuition fees, which are free to those who have full household registration status. Because not all of them can afford this charge, only half of them are registered as temporary students. The rests either go to "private schools" (established and run illegally by temporary migrants themselves with very poor conditions and teaching quality), or simply become working children.

Furthermore, discriminatory policies related to temporary migrants are also found in housing policy, national uniform examination for university recruitment, health care, unemployment support, pension schemes, and insurance, since none of them are designed to include temporary migrants' needs (Xu, 2006). The presence of these discriminated policies would undoubtedly trouble the development of the so called "harmonious city".

### **7.3.3 Knowledge environment**

#### ***7.3.3.1 Quality of place***

##### **Physical and social environment**

Wuhan is a city of natural beauty. There are more than one hundred lakes (about 2,200 square kilometres) within the city region, among which the East Lake is the largest natural lake sitting in the eastern part of the city, covering 33 square kilometres, the largest one of this kind in the country. Numerous lakes and rivers together with mountains and hills make it a beautiful natural surrounding. The city is divided into three parts by the Yangtze River and Han River, which has formed a major inland transport

system since ancient times, connecting Wuhan with nine other provinces (WHCSG, 2000). The shipping lines currently lead to 14 countries and regions. Both road and railway straight lines from north to south and from east to west are crossed here. The high speed passenger trains take less than seven hours to travel to Beijing and Guangzhou. Moreover, Wuhan Tianhe Airport is the only airport in central China region with 124 airlines flying to 45 major domestic cities, and 11 airlines link to Japan, South Korea, Thailand, Hong Kong and Macau (WHSB, 2007).

Meanwhile, public transportation in the city has been largely improved during the last decade and is being enhanced by the development of the metro system. Moreover, corresponding with the formation of the Wuhan Urban Agglomeration<sup>15</sup>, a public transportation system that interconnects eight other member cities has been planned and is due to be put in service in 2009 (HBDRC, 2007).

Virtually, Wuhan is one of the key national telecommunication hubs, where the Beijing-Wuhan-Guangzhou coaxial cable line intersects the Shanghai-Nanjing-Wuhan-Chongqing optic-fiber cable communication line. The city's installed capacity of the programmed telephone ranks in 4th place and the installed capacity of mobiles taking the 5th place among Chinese cities. By 2007, roughly one third of its total households were broadband users (WHSB, 2007).

Housing is problematic in Wuhan, especially for entry-level knowledge workers and students. Firstly, market housing prices were over 30 times higher than the average household annual income in 2007. However, newly built apartments were not decorated and furnished, which meant home buyers would have to spend hundreds of thousand RMB extra to make them liveable. Considering the average depositional income was 14,358 RMB per capita (WHSB, 2007), it would take more than forty years for average income households to repay their mortgage without spending on anything else. Secondly, housing policy has not been systematically designed to cover all social classes' housing needs. For instance, the Affordable Housing Program, which was designed to help only low income households (less than 80 percent of the average income) to buy their home,

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<sup>15</sup> A proposed collaborative initiative that will allow Wuhan working together with other eight cities that surround it to maximise strengths from each city to leading the central china region rising up



was not a solution, but rather a problem. This is because on the one hand, all these kinds of houses are built in suburban areas where there is a lack of urban functional infrastructure, and poor quality on the other. What is more, as noted by one interviewee:

the “affordable housing” is actually “not affordable” to the majority of low income households because they do not have money to pay the deposit, nor they can get mortgage... the truth is most of these apartments were sold to those whose incomes were close or above the average household income... but nevertheless, this has recently been made no longer applicable to these groups (Director General of Wuhan Academy of Social Science, 27/05/2008).

In addition, Wuhan municipal government has in recent years invested extensively in the leisure, culture, sports facilities, and public spaces. However, visiting the city during the fieldwork of the current study noticed that efforts were made substantially to build monumental projects rather than publicly accessible facilities. A typical example is that the government has invested more than 1.3 billion RMB to build a 2.15 sq.m cultural square. Meanwhile, most public accessible (affordable as well) facilities that were built in the pre-reform period have been demolished to make room for commercial property development.

### **Cultural environment**

Wuhan’s historical culture is very much related to the Yangtze River, which put Wuhan as the central node of connection in ancient times. As a result, Wuhan embraced geographical cultures from the north, south, west and east of China, causing Hankou to become one of the four most famous cities in the Ming Dynasty and throughout the Qing Dynasty. Opening Hankou Port to foreign trade after the Second Opium War, and especially the presence of foreign countries’ concession, has brought western countries’ culture to Wuhan. All of these formed the basis of Wuhan’s uniqueness of local culture, attracting millions of people to come in the past (WHCSG, 2000).

However, as a Taoist doctrine advised, “much is less”. It is the case when talking about Wuhan’s local culture. Indeed, it noticed that it is hard to tell what is representative of Wuhan’s cultural tradition. There is even no agreement between the interviewees of this study. Some emphasise the concentration of universities and therefore the educational or learning culture, while others observe that its modern industrial culture has a longer history than higher education. Meanwhile, some other interviewees would refer to the

commercial leisure culture drawing upon its history of being one of the four largest trade centres in the past:

All off these opinions are correct and incorrect since each has its concrete evidence but each alone lacks an overview... in fact, there is no one dominating culture that can characterise Wuhan's culture as a whole (Director General of Wuhan Bureau of Culture, 29/05/2008).

In recent years, the local government has tried to foster a socialist mainstream culture through organising public cultural events and activities, such as “the Summer of Wuhan”, “River Bank Cultural Arena”, and local community cultural activities that were launched under the “Cultural Development Plan (2004-2010). However, these highly organised activities have in fact nothing to do with the local folk culture, but are merely cultural events. Moreover, direct observation during the fieldwork has noticed that for all the three mentioned cultural activities, participants are exclusively high and middle income families. One interviewee commented that:

[i]t is hard to get low income families involved, you know, it is a very complicated social problem... since the low income families are normally less educated and with poor skills, who are usually taking labour jobs. They have no interest to take part in public activities... (Director General of Wuhan Bureau of Culture, 29/05/2008).

### **Economic base**

Wuhan has long been developed as an industrial city. As mentioned above, its modern industrial base was built after the Second Opium War and was enhanced during the Maoist era. As a result, Wuhan has become the largest city in the central region of China not only because of its population, science and education, but also because of the economy (CASS, 2007). One distinctive feature of Wuhan's economy is that state owned enterprises are the dominating force in the manufacturing sector, accounting for more than 70 percent of added value. Moreover, Wuhan is one of the few cities in the country whose tertiary sector exceeded its secondary sector as evidenced by the proportion of first, secondary, and tertiary industry, which is 4.1:45.8:50.1 in 2007 (WHSB, 2007).

According to the statistical information, the top ten industries in 2007 as measured by added value are: the iron and steel making industry, automobile and machinery producing, optoelectronics information, tobacco and food processing, biological engineering and

new medicines, petrochemicals, textile and garment industry, environment protection products, paper producing, and domestic appliances producing, among which tobacco and food processing, automobile and machinery, iron and steel making are growing faster than the rest. Meanwhile, wholesale and retail, finance, logistics and communications contributed more than 85 percent to the tertiary industry and the growth rates of wholesale and retail and finance both exceeded 15 percent in the last five years (WHSB, 2007). This corresponds to the city's development strategy as to develop as the industrial, finance, and logistics centre in the central region of China.

Added value by high-tech to manufacturing products in Wuhan are concentrated on optoelectronics information, iron and steel making, bioengineering and new medicines, and the automobile and machinery sectors. Nevertheless, in the tertiary sector, the added value was created by labour intensive service industries except finance and insurance, which is more or less knowledge intensive under the current state of the Chinese banking system.

Foreign direct invested (FDI) enterprises are exclusively manufacturing based with some engaging in producing high-tech products, but are nevertheless labour intensive. Given many FDI factories in coastal cities start to move into inland regions, Wuhan Municipal Government has decided to welcome such factories to be relocated in Wuhan (WHMG, 2008b). One interviewee sees this as a very good chance, as he put it:

On the one hand this will contribute Wuhan's economic growth in general and increase the share of private owned enterprises and bring advanced business management with them in particular. On the other hand, this will provide job opportunities (Executive Chair of Industrial Association in Wuhan, 27/05/2008).

Moreover, through the implementation of the "go for enterprises" action plan (WHMG, 2008a), the policy aims to promote private owned enterprises, the number of new company formation in the first half of 2008 exceeded 11,000, which was 25.4 percent higher than the same period in 2007 ([www.stats.gov.cn](http://www.stats.gov.cn) , accessed on 20/02/2009). This will help foster an entrepreneurial culture in Wuhan (Lei and Yu, 2008).

Overall, Wuhan's economy is by and large reliant on labour intensive industries. Although the Municipal Government has put in force many policies to promote

knowledge intensive industry, it is mainly related to high-tech manufacturing rather than research and development. As noted by one interviewee:

... We must take into account our mass of low skilled labour force... we must get jobs for them. We are making our endeavour to promote tertiary sector, but we do not want loose our competitive advantages in the secondary sector (Secretary General of the Mayor's Office, 16/06/2008).

### **Urban innovation engines**

The use of public spaces to facilitate public learning has been adopted as part of the lifelong learning system in Wuhan. During the fieldwork of this study conducted in the city, the Wuhan City Library, the English Language Corners, and local community schools were observed.

The visit to the Wuhan City Library noticed that the Wuhan Municipal Government has invested extensively in the city library, such as rebuilding the new library, establishing service points across the city, forming the mobile library, and digitalising the library, and so on. The weekly free public lectures, which cover all disciplines range from daily life, cultivation, health care, cooking, beauty, domestic decoration, micro-and macro-economy, price, housing and stock market, international relationships, history, indigenous knowledge, engineering, literature, environment, ethics and moral standards, and so on, gives the general public a chance to interact with experts. However, the visit to one lecture found that the majority of the audience was highly educated (sign books kept by the library). Moreover, the use of the city library is not free, both usage charges and deposits are applied regardless of fully registered permanent urban residents or temporary migrants as long as they can provide proof of identity (visited on 04/06/2008).

The English Language Corner occurred spontaneously in the university campuses in the late 1990s in Wuhan. Initially, participants were university students, English language teachers, and foreign teachers in the university. Nevertheless, the English Language Corners taking place in the public squares were organised by some non-profit making organizations and the media, and aimed to encourage one million Wuhan citizens to speak English since 2004 (Chen, Junwang *et al.*, 2008). However, this has actually led to the English Language Corners in Wuhan becoming a show of bombast.

Apart from the city library and public squares, local community spaces have also been used to facilitate public meeting and learning. Nevertheless, compared with above two, local community spaces are used for government led organised activities, which are more or less related to mainstream socialist ideology. This will be discussed as part of city learning in the knowledge synergy section.

### **7.3.3.2 Knowledge base**

As mentioned, Wuhan is the third largest city in terms of the capacity of science and education in the country. By 2007, there were 55 higher education institutions located in the city and seven universities were qualified as the “211 Universities”, among which Wuhan University and Huazhong University of Science and Technology are both top ten universities in the country (HEASG, 2007). The number of full time undergraduate students exceeded 770,000 with 185,000 part time mature students and over 75,500 postgraduate students, studying all academic disciplines (WHSB, 2007). Every year, more than 250,000 students graduated from variety of disciplines. Meanwhile, there are 106 science and research institutes in both the natural and social sciences, including one state laboratory, 13 national level key laboratories. There are 48 academicians of the Chinese Academy of Science and the Chinese Academy of Engineering who are working in higher education and research institutions in the city.

Nevertheless, it is noted that compared with its scientific and educational capability, Wuhan has generally failed to retain these talented people. Most students left to find jobs or setup businesses elsewhere in the country, particularly in coastal cities. Very few remained and found jobs in Wuhan (Sang, 2007). This has been criticised by several studies as being a lack of knowledge intensive jobs resulting from the low proportion of knowledge intensive enterprises (e.g. Li, 2007, Wu, 2008) in recent years.

Nevertheless, change has been taking place very recently. As stated by one interviewee of this study:

This was indeed a problem before, but we have made great efforts to sort it... as you may know, we introduced a new policy to encourage citizens to go for business in last year, in which preferential policy was specifically designed to help knowledgeable people and university students to create knowledge intensive business... this has been well received, as evidenced by the rapid increase of new

knowledge-based enterprises formation (Secretary General of the Mayer's Office, 16/06/2008).

However, as commented by another interviewee of this study:

it is too early to say the problem has been sorted, because the policy was not systematically designed... Students, entry level knowledge workers, and new start-up companies still have many difficulties in terms of living, working and doing business [in Wuhan] (Director General of Wuhan Academy of Social Science, 27/05/2008).

### **7.3.3.3 Knowledge culture**

Despite the strong capability of science and education, Wuhan generally lacks a cohesive knowledge culture, especially an entrepreneurial culture. Li (2007) attributes this to the presence of a high proportion of state owned manufactures, which are highly labour intensive, and the absence of private owned knowledge intensive businesses. Wu (2008) notes that "it was not until very recently, the links between universities and enterprises in the city were started to develop. At the same time, some state owned '211 universities' in Wuhan have developed strong links with many enterprises and local governments in coastal cities."

Lifelong learning in Wuhan has nevertheless received attention since 2003. This is evidenced by the efforts made to establish a lifelong education system, which aims to provide learning opportunities to all social groups. Apart from the formal higher education and professional training, universities and colleges are asked to undertake more part time programmes to assist those who do not have a degree certificate. Meanwhile, local community-based schools were established to facilitate non-certificate teaching and learning. Since then, the number of both mature students studying part-time in the universities and in local community schools has increased explosively. As one interviewee said:

The number of enrolled part time students study in the universities ranks the third after Beijing and Shanghai... from 2005, we gradually established a whole range of local community schools to facilitate lifelong learning. These schools consist of aging school [for retired people], temporary migrants school [for rural migrants], job seekers school [for laid off people], 4.30 pm school [for primary and secondary school pupils after their school], evening school [for employees], weekend school [for families], and disabled school [for disabled people]. Each is set for a specific

group to help them learn the relevant skills and/or knowledge (Director General of Wuhan Bureau of Education, 03/06/2008).

A visit to a local community school – Huaqiaso Residential Community School – during the fieldwork of this study found that although it is called a school, it actually has only one multifunctional room fully equipped with teaching facilities. The School Coordinator, who plays a management role in running the school, explained that most classrooms are shared with local primary schools in the evenings and weekends. These schools are not teaching for certificates, but to meet the demands of different social groups. Programmes that are taught at these schools must be approved by the city’s Lifelong Learning Commission led by the Wuhan Bureau of Education who is responsible for overseeing the city’s development of the lifelong education system. Course information is broadcasted on the local TV channel and in newspapers. Flyers of syllabuses for all specific schools are available in local communities and are free to take away. Table 7.3 illustrates a syllabus for a temporary migrants’ school.

**Table 7-3 Syllabus for temporary migrants (07-12/2008)**

Time	Venue	Module	Module tutor
Tuesday 7.30-9.30 pm	R 109 Yucai Primary School	Law and regulation	Officer from Jiang’an Urban District Bureau of Justice
Thursday 7.30-9.30 pm	R 109 Yucai Primary School	Urban life and culture; the Future of Our Country	Officer from Jiang’an Urban District Bureau of Culture
Saturday 8.30-10.30 am	Yucai Primary School	Meet the skills	Professionals or academics <sup>16</sup>
		... ..	... ..

Note: Module “Meet the Skills” is optional, participants can choose at least three sub-modules. The training programmes are using text books edited exclusively for rural labourers training, which are available from Xinhua Book Store

**Source: Author translated from the original flyer**

<sup>16</sup> The original flyer lists very detailed information, which divides the module into several sub-modules including Safety at Working, To be the Best Worker, Being an Employer, Building the Moral Standard etc.

The statistical information provided by the School Coordinator shows there were over 120,000 rural migrants took part in the training courses in Wuhan in 2007 and feedback was encouraging. Nevertheless, a tutor of the school saw this as only the starting point, which was far from a learning society.

Moreover, the visit to the Weekend School also noticed that the participants are mainly professional families. The School Coordinator said this was the case of most weekend schools. This gives rise to the question of whether the efforts made to family learning following this approach help the social inclusion or on the contrary to enhance social polarisation. Furthermore, it is also noted that such learning activity is strongly integrating Chinese political and cultural traditions.

#### **7.3.4 Knowledge synergy**

Both institutional mechanisms and policy measures, as well as public campaigns, are adopted to ease synergising knowledge for urban development in Wuhan. Establishing and upgrading development zones, relocating universities into development zones, and efforts made to develop national titled cities (for example, the National Civilising City, the Sanitary City, the Garden City, and the National Model City of Environment Protection), the resources saving and environmentally friendly city, and the Wuhan Urban Agglomeration, are typical examples of this kind. This section discusses Wuhan's approach of using these tools to synergise knowledge.

##### ***7.3.4.1 Establishing and upgrading development zones***

Wuhan has established numerous development zones and industrial parks since the early 1990s, among which the Wuhan Economic & Technology Development Zone (WEDZ) and the Wuhan East Lake High-tech Development Zone (now known as the Optical Valley of China – OVC) are designated state-level development zones. These two zones are both economically paramount to the city and are playing a vital role of leading the city's institutional innovation.



### **Wuhan Economic Development Zone**

WEDZ was founded in 1991 and was approved as a state-level development zone in 1993, located in the south of Hanyang suburban area. The planned area was enlarged to cover 193 square kilometres in 2005 (WEDZ, 2005). As stated in its establishing statement, WEDZ would be developed as a leading force for innovation both in terms of technology and institution (WEDZ, 1991). However, with no exceptions, WEDZ was solely a labour intensive manufacturing accumulation during the first ten years. Several hundreds of unrelated industries, including tens of FDI companies, were attracted to the zone because of its preferential policy.

Nevertheless, the link between WEDZ and the existing urban area was weak, so did the enterprises in WEDZ with universities and research institutions in the city (Zhang *et al.*, 2008). The revised development plan implemented from 2000 set the goal of WEDZ to develop as “the largest automobile producing centre in the central region of China and high standard new town exclusively for higher income class” (WEDZ, 2000). It was somewhat meaningless from a development perspective and made no intention to marry WEDZ with Wuhan’s rich knowledge resources.

Very recently, in the “Eleventh Five-year Plan (2006-2010)”, the goal was amended to develop another new town concentrating on high and new technology industries and high quality of place against the existing three towns: Hankou, Hanyang, and Wuchang (WEDZ, 2005). One interviewee of this study commented on this as:

Well, I would say there is nothing new with it but following in the steps of economic development zones in coastal cities. You know, what they [enterprises in WEDZ] need generally does not match Wuhan’s strengths in terms of technology and knowledge, but the cheap labour and land... even the relocation of Dongfeng Motor Corporation in WEDZ, did not help the formation of automobile industrial cluster... perhaps it will do in the future...but, the goal was set contradictory with what it is doing...you know, the majority people in the zone are labourers, but the plan was to develop a town not for them (Director General of Wuhan Academy of Social Science, 27/05/2008).

### **East Lake High-tech Development Zone**

Wuhan East Lake High-Tech Development Zone sits in the eastern suburban area of Wuhan. It was one of the first designated national HNTIDZs by the State Council in

1991 and was granted as OVC by the Ministry of Science and Technology in 2001 because of its distinctive capacity for R&D and production of optoelectronic information (MOST, 2001). The OVC comprises six specialised parks; an optoelectronic information industrial park, a bioengineering and medical industrial park, a national university science park, a software outsourcing services park, a high-tech agricultural park, and a modern equipment and machinery industrial park, and more than 40 university campuses. The planned area was extended to 232 square kilometres in 2001. From 1991 to 2007, the average economic growth of OVC was kept at 48.8 percent annually, and the total revenue reached 133 billion RMB in 2007. The OVC is now providing more than 200,000 jobs for high-skilled workers (WEHDZ, 2008).

Like the WEDZ, in the first 10 years, OVC was directed to develop as a manufacturing centre. However, from 2000 onward, following the reorientation of national development strategy, OVC amended its plan to develop as a knowledge intensive new town, which would take advantage of its proximity to Wuhan's rich knowledge resources. In order to do so, local preferential policy, which used to be given to all enterprises located in the zone, was redirected to be given to industries which related to Wuhan's technological strengths.

Meanwhile, land use policy was also revised in a coherent way. High quality housing, (international) schools, hospitals, shopping, sports, leisure centres, and other social facilities have been built. Moreover, houses were sold at subsidised prices to those who are qualified as high-skilled workers. These policies in combination with the establishment of national university science parks, high-tech business incubators, and available venture capitals, have immediately become a magnet in attracting both talent and knowledge intensive start-ups. In only a few years, a number of knowledge intensive industrial clusters have emerged and are growing rapidly (Liu, 2008).

Overall, from the city perspective, WEDZ and OVC are adopting different approaches to synergise knowledge resources. While WEDZ focuses on the use of mature production knowledge generated outside of Wuhan, OVC is paying more attention to transforming locally produced knowledge into production knowledge. Both are equally important to sustain the city's development in the longer term.

#### ***7.3.4.2 Letting the universities play their roles***

##### **Relocating and creating universities**

Before the year 2000, universities and other research institutions in Wuhan were not officially involved in the development of OVC and there was even no intention to link them. However, the last few years has witnessed a dramatic change of attitudes in terms of letting the higher education institutions play their roles of regional development. Tens of new higher education institutions have been established followed by the radical increase in the recruitment of students (WHSB, 2007). This has resulted in the expansion and creation of university campuses. While many cities elsewhere in the country preferred to develop university parks, which are normally isolated from urban areas and development zones, Wuhan decided to expand the spatial scale of OVC for relocating or developing new campuses. Since then, 42 universities have been relocated or established in OVC area, which allowed over 850,000 students to study there by 2007, accounting for 80 percent of the total in Wuhan (WHSB, 2007).

Nevertheless, it is noticed that apart from few national “211” universities, most newly established universities and/or colleges are purely teaching institutions, which has been criticised by one interviewee as:

... taking advantages of national preferential policy ... such as low price of land ... to do business for profit making. Less attention has been actually paid to improving quality of teaching and relating programmes to local needs ... (Director General of Wuhan Academy of Social Science, 27/05/2008).

##### **Promoting technology and knowledge transfer**

Following the change of national policy, universities are encouraged to be actively involved in local development by marketing their knowledge or technology. Wuhan Municipal Government has been working together with some national “211” universities to generate a technology and knowledge transfer model (see Figure 7.3 in next page). As shown in the figure, two new departments were established. At the university side, the Department of High-Tech Industry (DHTI) was formed under the leadership of a deputy president of the university to oversee technology transfer, high-tech investment, the fostering of an entrepreneurial culture, and university science park development.

Meanwhile, at the government side, the department of Productivity Promotion Centre (PPC) was added to the Bureau of Science and Technology of Wuhan to provide technological and knowledge services to small and medium enterprises. DHTI works closely with the PPC to exchange information about what is demanded and what is transferable technology and knowledge. Such information is then passed on to the supply and demand sides. Moreover, in corresponding to the government’s “go for enterprises” action plan, PPC and DHTI started to organise high-tech exhibitions twice a year from 2007 to allow individuals to see the producible technology.

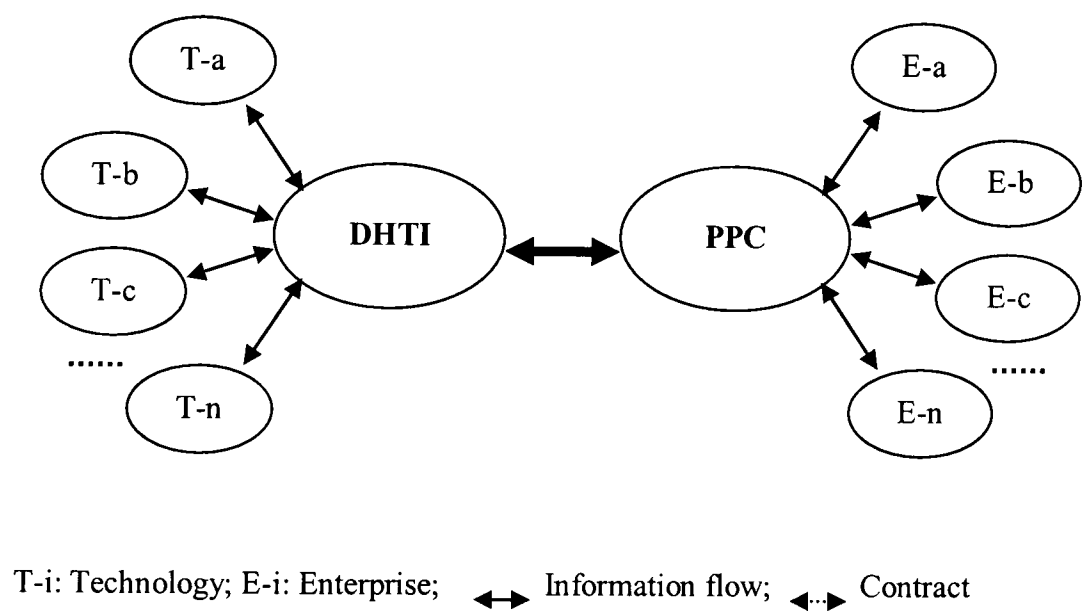


Figure 7-3 The illustration of technology transfer network

**Fostering entrepreneurial culture**

In order to promote entrepreneurial culture, universities are encouraged to set up their own businesses related to their knowledge and technology strengths. Academic staff are encouraged to become involved whilst keeping their academic positions. The DHTI also works closely with the Student Union, the Youth Society and the Business School, to launch a competition called “Going for Entrepreneurs”. Students (both individuals and groups) are encouraged to join the competition. The winner will receive investment from the DHTI to start business in a relevant incubator in the University Science Park.

### **Establishing university science parks**

Developing the university science park is another major way of synergising technology and knowledge for local development. Several quality universities in Wuhan have established science parks. Such science parks are seen as having similar characters with science parks elsewhere in the developed countries but are larger in scale (usually occupy more than 150 ha land area), with strong government leadership and enjoyment of more preferential policies.

Moreover, drawing on the successful experience of Silicon Valley, Wuhan has made extensive efforts to provide services such as venture capital, investment, marketing and management consultancies through working closely with the National Torch Program Office in Wuhan, venture capital investors, commercial banks, and consultant providers. Apart from these services, public lectures of this kind are also organised regularly. In addition, a start-ups club was also founded and holds regular events such as lunch time meetings, sports, and cultural activities.

What is more, under the government's new plan, fully furnished accommodation (studio flats) will be provided to entry level knowledge workers who are working in the incubating companies. "All of these are aimed to take advantage of successful experience worldwide to develop the uniqueness of China's own university science parks" (Director General of Wuhan Bureau of Science and Technology, 16/06/2008). The Managing Director of Wuhan University Science Park presented their ambitious plan:

... We will develop the science park as the largest one in the central region both in terms of number of incubating companies and rate of success ... in order to do so, we will first develop the park as a paradise for young entrepreneurs by providing one-stop services... (Managing Director of Wuhan University Science Park, 05/06/2008).

Overall, being the third largest education base of China, Wuhan's efforts to harness the intellectuals generated by the universities may be returned with mixed results. While the technology and knowledge transfer model, "going for entrepreneurs", and university science parks work well, relocating existing universities and establishing new ones in the OVC area may be taken as an advantage of loopholes in the policy.

#### ***7.3.4.3 Forming Wuhan Urban Agglomeration***

In 2003, Wuhan and other eight surrounding cities in Hubei Province jointly announced the formation of the Wuhan Urban Agglomeration (WUA). The initial aim of WUA was purely economic growth drawing upon the experiences of the Pearl River Delta Urban Cluster, the Yangtze River Delta Urban Cluster, and the Bohai Bay Urban Cluster. It soon evolved into a social political league, which broke the existing administrative border to build a cooperative system for territorial development. This represents a big step forward to transform regional development from internal competition to cooperation. Not surprisingly, it was immediately backed by Hubei Provincial Government and later by the Central Government.

The searching of WUA official web sites found that cooperation among the nine cities has been extended to cover industrial restructuring and redistribution, the inter-city transportation system, unifying marketing and finance, telecommunication, land use policy and urban planning, science and technology, library resources, and so on ([www.wcsq.gov.cn](http://www.wcsq.gov.cn) accessed on 20/02/2009). Although there is still no breakthrough on the Household Registration System and housing, working and pension scheme, it does show a plan to make changes in the near future (information derived from the WUA workshop, observed on 03/06/2008).

The WUA was designated to undertake the experiment of developing a Resources Saving and Environmentally Friendly (RSEF) society by the State Council in 2007. This has put the WUA in a privileged position in terms of enjoying national regional development policy. Although the State Council did not offer preferential policy related to tax release, it allows the WUA to establish independently institutions and to make regional policies based on regional specifics, which are not the case in other regions across the country (State Council, 2007b). Taking this advantage, the China Academy of Engineering appointed 29 academicians to form a Scientific Advisory Committee to WUA.

This is an unprecedented invaluable support from the central government, which is even bigger than any tax related preferential policy, because these academicians will undoubtedly bring their knowledge to WUA... you know, there was no other region have been able to get so many academicians to be as regional development advisors (Director General of Wuhan Development and Reform Commission, 26/05/2008).

Apart from the Scientific Advisory Committee, in March 2009, the Ministry of Environment Protection also signed an agreement with Hubei Provincial Government to lead jointly the development of the RSEF region (Zhou, 2009). According to the agreement, the Ministry of Environment Protection will provide environmentally related policy, technology, and regulatory system support.

Overall, the formation of WUA will allow Wuhan to exploit knowledge for development on a larger scale, while the involvement of the China Academy of Engineering and the Ministry of Environment Protection for the development of RSEF society will bring with it the most updated knowledge and technology to serve Wuhan's urban development.

#### ***7.3.4.4 Creating nationally-titled cities***

Wuhan has made extensive efforts in recent years to become a nationally-titled city, such as the National Civilising City, the National Sanitary City, the National Garden City, and the National Model City of Environment Protection, and so on. The Secretary General of the Mayor's Office sees these national titled cities as: "golden name cards, which will upgrade the city's image and improve quality of place" (16/06/2008). In order to win the title of the nationally-titled cities, Wuhan has launched a series of public campaigns involving government departments, NGOs, universities, schools, and enterprises, as well as citizens. The approach that the city is following is stated as:

The most important thing for the creation of these national titled cities is consensus. Without vast majority public involvement, we will never be able to achieve these goals. So, we must get this done through public education by setting compulsory modules in our local community schools... we also use multimedia as a tool to advocate our plan (Secretary General of the Mayor's Office, 16/06/2008).

In the speech to the Conference for Mobilisation of Citizens on a Creating National Civilising City, the Secretary General of the Chinese Communist Party in Wuhan said that:

We need to take this chance to transform Wuhan into harmonious city through this public campaign; we need to reform our urban management system; we need to create an environment that is encouraging innovation; we also need to promote lifelong learning... all these are the way we are working to create national civilising city ... however, we must be aware that whether we can win the title or not is not important, but the process through which we are changing our behaviour toward

harmony (author translated from the original document derived from the Mayor's Office 16/06/2008).

Nevertheless, the visit to the city and the local community school during the fieldwork of this study had noticed ironically that the actions the city has taken seemed to focus only on winning the titles. The indices for the above four national titled cities have been broken down to single goals. District authorities and local communities are asked to lead their jurisdiction to achieve these goals in a given time. Huge numbers of casual workers and volunteers are recruited to assist in maintenance and management work in the public spaces. Citizens are asked to behave morally and coherently toward the goals. Meanwhile, local TV channels, newspapers, and government websites all have a special programme or column and web pages for this campaign. Slogans and scrolls are hung everywhere in the street and public spaces throughout the city. However, compared with the government's overwhelming enthusiasm, citizens' reaction appears to be of less interest, leaving the government alone to play the "monodrama".

#### **7.4 Chengdu: from urban to territorial development**

Chengdu is the regional centre of southwest China, the capital city of Sichuan province with a population of roughly 11.12 million. The Chengdu metropolitan region covers 12.3 thousand kilometres, encompassing nine urban districts, two national level development zones, four county level cities, and six counties. The nine urban districts and the two national development zones are home to about three million registered citizens and one million temporary migrants (CDBS, 2008).

Chengdu's history as a city can be dated back to as early as 316 BC when the Emperor of the Qin Dynasty ordered the building of a regional administrative centre, which was thoroughly following Construction Code as discussed in chapter five. What makes it distinctive is that since it was built, the city had kept its original layout for more than 2,200 years, almost unchanged (CDCC, 2002). It was not until 1949 that the city started to reshape its spatial landscape. As a result, Chengdu has retained rich historical and cultural heritages and was one of the first cities named as the National Historical and Cultural City.

Benefiting from Maoist distributive regional development policy, Chengdu has been developed as one of the most important industrial, service, knowledge, and distribution



centres of south-western China. Although it lost its comparative advantages during the first two decades in the post-reform era, Chengdu has become immediately a favourable destination both for talent and investment flow since the central government decided to redevelop the western region in 1999. By 2007, there were 124 Fortune 500 companies establishing their regional headquarters or factories in the city. Seven countries including the US, Germany, France, Korea, Singapore, Thailand and Pakistan have set up consulates in Chengdu. More than 10,000 foreigners are now working and living in the city (CDBS, 2008). This section deals with Chengdu's efforts made to KBUD.

#### **7.4.1 Local understanding of knowledge for development**

Chengdu's local concept of knowledge for development is profoundly influenced by its historical culture. Indeed, there were two distinctive factors that were embedded in Chengdu's historical culture: Taoism and hedonism. Firstly, Chengdu (Qingcheng Mountain is located in Chengdu's city region) is the cradle of Taoism. The Taoist culture, which advocates "back to the nature", "following the natural law", and "integrating people with nature", has therefore taken the shape in Chengdu's view of the natural world and attitudes of life (Liu, 2009).

Secondly, Chengdu has been benefited historically from the Dujiangyan Irrigation and Flood Control Project<sup>17</sup>, which was built 2,300 years ago. In ancient times, this ingenious project allowed Chengdu Plain to become the most agriculturally productive region in the southwest of China (Zhang, 2008), and therefore made Chengdu become known as the "Granary of Heaven State (Tian Fu Zhi Guo)" in the country. People were thus enjoying the peaceful and relatively rich conditions of life, which consequently evolved to become a culture of hedonism.

The combined force of these two cultural factors formed the core of Chengdu's knowledge concept for development, that is, respecting nature and enjoying natural conditions without cupidity (Gan, 2007). This tradition was inherited and enhanced from time to time, even in the Maoist era when socialist ideology became the dominating

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<sup>17</sup> See for detailed introduction of Dujiangyan Irrigation Project at [http://en.wikipedia.org/wiki/Dujiangyan\\_Irrigation\\_System](http://en.wikipedia.org/wiki/Dujiangyan_Irrigation_System) this project became the UNESCO World Heritage Site in 2000.

national concept of knowledge for development it has not been completely shaken away. On the contrary, when the government loosened its control over the socialist political ideology in the post-reform era, this tradition was once again taking shape. Moreover, the recent change of national development ideology to emphasise “harmony” under the “scientific development concept” is by and large consistent with Chengdu’s tradition of culture. Regardless of whether it was coincidence or certainty, this gave Chengdu another chance to lead the “wave”.

#### **7.4.2 Development dimensions in practice**

Historically, Chengdu’s urban development behaviour was determined by its understanding of knowledge for development. The ancient Chengdu city was built based upon Feng Shui theory taking advantage of the area’s physical geography. This tradition remained unchanged until the establishment of socialist China when political economic ideology took charge (Liu, 2009).

Recently, Chengdu may not be counted as one of the top groups of either provincial capital or vice-provincial level cities in economic terms (NBSC, 2008). However, Chengdu was chosen by the State Council in 2007 to take the “Experiment of Transforming Dual Track System into Unified One” because of its achievement in this respect (Liang, 2007). From 2004, Chengdu has implemented a new development policy which aimed to integrate urban and rural development (CDMG, 2004). This policy for the first time in China’s socialist history has put territorial development into consideration. Under the guidance of this policy, a set of related policies including industrial distribution, social services, school systems, household registration, and infrastructure have been put in place. All of these policies offered significant investment into rural areas and pledged to give more help to villagers. Unlike any previous efforts made to help rural development throughout the country, Chengdu has been following an approach, which can be summarised as below:

- Removed the barrier completely between rural and urban by abandoning the Household Registration System, which allowed people moving freely between rural and urban for the first time after more than fifty years’ division;

- Help farmers developing agriculture related industries, such as agricultural tourism and agricultural products intensive processing;
- Investing in rural infrastructure and social service systems, including rural town development, schools, hospitals, roads, and pension schemes;
- Trying to reform rural farmland contractual responsibility system by allowing the transfer of the contractual right according to law and on a voluntary and compensatory basis so as to develop scaling up operation of agriculture;
- Help and encouraging villagers learning by establishing learning facilities and free lectures and seminars that are specifically designed for them;
- Listen to the villagers by taking consultations before related policies are put in force (drawing upon documents collected during the fieldwork, July 2008).

The distinctive feature of this approach is that it is trying to treat equally urban and rural areas by extending social services and social security schemes to rural areas, and redeveloping rural towns and villages. Most significantly, as the merging and closing down of schools continued in many cities elsewhere in the country, Chengdu has invested over 15 billion RMB in upgrading 460 primary and secondary schools in the rural areas between 2004 and 2007 (CDBS, 2008). Moreover, temporary migration children are allowed to study in schools in the urban areas without extra charges (CDMG, 2004).

Although there is still a long way to go, it has at least taken a concrete first step forward. As a result, the amount of urban temporary migrants has started to decrease and the associated crimes including robbery, theft, and other violent crimes in urban areas has also started to decline (Liang, 2007).

In addition, the improvement of rural conditions has also eased environmental development and enriched cultural environment. Accordingly, Chengdu has been awarded the title of the “National Civilising city”, the “National Model City of Environment Protection”, the “National Garden City”, the “National Sanitary City”, the winner of the “National Model of Human Settlements”, and one of the top “Ten Economically Active Cities” ([www.chengdu.gov.cn](http://www.chengdu.gov.cn) , accessed 20/04/2009).

What is more, the earthquake in May 2008 has destroyed many county and rural towns and villages within Chengdu city region, with many people lost their homes. The impact of the earthquake on Chengdu's economy and environment are immeasurable. On the other hand, it allowed the rebuilding of the towns and villages to a high standard in accordance with the territorial development plan.

### **7.4.3 Knowledge environment**

#### ***7.4.3.1 Quality of place***

##### **Physical and social environment**

The natural beauty of Chengdu can be found in its mountains, rivers, and the most fertile soils, which led to the city becoming historically known as the “Granary of Heaven State (Tian Fu Zhi Guo)”. The world largest “Panda Protection Zone” is in the city region, which attracts tens of millions of people from all over the world every year. Moreover, the regeneration of the Fu River and Nan River in the city started in 1992 won the UNEP “Distinctive Regeneration of Waterfront Award” in 2000 ([www.chengdu.gov.cn](http://www.chengdu.gov.cn), accessed on 20/04/2009).

After the establishment of socialist China, Chengdu has been developed as a leading hub of transportation and communications in southwest China. Apart from its railway and motorway networks, Chengdu Shuangliu Airport is the third international airport in the country after Beijing and Shanghai, flying to 90 domestic and 25 international destinations. Over 18 million passengers travelled via Shuangliu Airport in 2007. Based upon the territorial development plan, a public transportation network and highway system that will cover the great Chengdu city region are being built and will be completed in 2010 (CDCSEI, 2008, CDDRC and CDBUP, 2006).

Chengdu's leisure and cultural facilities are widely acknowledged. Being the most leisurely city, tea houses, pubs, and happy farmer's inns can be found every where within the city region, ranging from top class to road side open-air shops to meet the different demands. Apart from this, outdoor facilities for sports, culture and leisure are also attractive points of Chengdu's built environment.

Moreover, statistical information shows that roughly 100,000 house units were built every year in the last two decades, accounting for more than 80 percent of Chengdu's residential housing stock (CDBS, 2008). Nevertheless, compared with the high demand, the supply is far below, leading to the rapid increase of housing prices, which was further accelerated in the last five years partly because of the implementation of the integration of the rural and urban development plan. Unfortunately, there is no evidence to confirm that efforts have been made to stabilise the excessive growth of housing prices, which may be the big barrier for students and entry level knowledge workers, as well as middle and low income families.

### **Cultural environment**

As stated, Chengdu is a city full of culture rooted in Taoism and hedonism. The Taoist culture is the influential factor in determining development behaviour. One of the major branches of the Taoist is the hedonism, which can be referred to pleasure, leisure, and an entertaining way of life. This may be evidenced by the popularity of playing the game of Mahjong<sup>18</sup>, eating and drinking, and the tea house.

Although the game of Mahjong as an entertainment is played every where across the country, it has never been so popular than in Chengdu. Regardless of being a teenager or elderly, government official or unemployed, elite or mass, everybody can play and enjoy playing the game. In most cases, the game is played not for gambling but for entertainment, relaxation, and building the network – guanxi. In Chengdu almost all tea houses, restaurants, hotels, and public baths provide facilities to allow guests to play this game. What makes it meaningful is that playing Mahjong is now used as a means of business talk and more and more business contracts are signed on the Mahjong desks (Gan, 2007).

Chengdu is also well known for its unique catering style. As one saying said: “if the best cooking were in China, the best taste would be in Sichuan (Chengdu)”, indicating the high popularity of the Sichuan style of cooking. Indeed, eating in Chengdu is normally much cheaper than any other city in China. This is especially the case when eating in the

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<sup>18</sup> A popular game originated in China. The game is played by 2-4 people sitting around a desk. See for detailed description at <http://encyclopedia.thefreedictionary.com/majiang>

various happy farmer's inns in the suburban area of Chengdu, which in recent years have specifically provided organic food promoted by the local government. Many tourists were coming to eat as commented by the director of Chengdu Bureau of Tourism ([www.cdta.gov.cn](http://www.cdta.gov.cn) , accessed on 22/04/2009).

Another folk cultural element in Chengdu is tea. For people in Chengdu, the tea house is always the first choice of venue when meeting friends. Many tea houses also have comedy performances and provide facilities for traditional local entertainments, including Mahjong. Indeed, it can be said that tea house is a part of life for people in Chengdu.

Overall, tea houses, a unique catering style, and Mahjong form the core of Chengdu's distinctive folk culture, which in conjunction with its natural beauty, attracts more than 47 million tourists from all over the world travel to Chengdu every year in the last few decades (CDBS, 2008).

In recent years, in order to foster the so called "Socialist Mainstream Culture", Chengdu Municipal Government has launched a public cultural scheme: "Chengdu Feng", meaning "leading the trend". These activities include "Public Square Cultural Activities", "Chengdu Story Telling", "Culture in Community", "Chengdu Culture in School", and "Cultural Skills Training". Although this government-led public campaign was somewhat ideologically moralizing, the Chengdunese can always take it as a chance for self entertainment (Document collected from Chengdu Bureau of Culture).

### **Economic base**

Chengdu's modern industrial base was built during the Maoist era. In the first Five-year Plan, nine of 156 national key industrial projects were invested in Chengdu. In the 1960s and 70s, the so called "Great Three Front Lines" national program, which was launched as a concern for national defence, moved many heavy and military industries to rural areas in Chengdu city region. Many of these industries were moved to Chengdu's periurban area in the 1980s as a consequence of the change in national development strategy (CDCC, 2002).

Chengdu is one of the few cities in China whose tertiary industry exceeded its secondary industry, thanks to its uniqueness of culture and abundant tourist resources. Services industries, such as tourism, leisure, food, hotels, finance and insurance, transportation, and so on, play a key role in its economic growth. In addition to its tertiary industry, Chengdu's secondary industry encompasses mainly nine pillars: automobile making, aerospace, metallurgy and construction materials, biomedicines, electronic information, optoelectronic, food processing, furniture, and equipment manufacturing. Nevertheless, R&D capabilities are generally poor except few industries such as aerospace and biomedicines.

Moreover, taking advantage of the national program – Western Region Development – Chengdu has become the first choice of destination of investment for many foreign and domestic companies, which, in turn, has led to Chengdu's economic growth being among the highest rates as measured by GDP across the country in the last decade (CDBS, 2008). Meanwhile, the last few years have also witnessed the emergence and fast growth of creative industries (including cartoon, network games, software out-resourcing services) in Chengdu. Statistical information shows the added value generated by these creative industries in Chengdu has exceeded 5 billion RMB in 2007 (CDBS, 2008). Moreover, around 25 multinational and national companies, such as Microsoft, Intel, and Google had established their regional headquarters in Chengdu by 2006 (Xu, 2007). This will undoubtedly provide knowledge intensive job opportunities on the one hand and leading the growth of related industries on the other.

### **Urban innovation engines**

The heritage of history and culture has made Chengdu a city that phenomenally integrates learning with leisure. In Chengdu, in addition to the City Library, tea houses, book stores, public squares/parks, and restaurants, all have been used as learning facilities.

The Chengdu City Library may not be ranked as one of the top ten libraries in the country, but it must be one of the few libraries that provide Remote Access System services with connections to most databases. Since the completion of rebuilding in 2003, the library has invested extensively in developing the “Digital Library”. In the last five years, Chengdu City Library alone has made more than 31 million papers, books and

other archives available in a digital format. From April 2008, the library has been made free and open to everyone. As most city libraries do, Chengdu City Library also organises free public lectures and seminars every week, covering all public interest disciplines (drawing on the documents collected from the library during the fieldwork).

As mentioned, the tea house is an indispensable element of Chengdu's urban life. It certainly became an information centre and the arena that facilitated face-to-face knowledge transfer. Apart from the abovementioned performance and Mahjong, it also plays an important role in settling conflicts and disputes between neighbours and/or peoples from any social class (Wang, L., 2006). Moreover, the tea house also provides an ideal place for business talk.

Chengdu has also become known very recently for its innovative use of bookshops which have been effectively transformed into "reading clubs". Developing the reading club based on the bookstore emerged in 2004, when a private owned bookshop, the Big Impression Study Room (BISR), started to call for membership to its reading club. As stated in its vision, the shop is to "provide people a platform for reading for relaxation". By providing space and organising activities for discussion, workshops, seminars, meeting the authors (all indoor activities are provided with tea services), finding the books for readers, and reading group outdoor activities, the BISR has become a franchising group with more than 30 shops and 70,000 club members (visited during the fieldwork of this study in July 2008).

The development of the English Language Corner in Chengdu has to be attributed to two foreigners: one American and one Irish. The former launched the first English Language Corner in Chengdu in 1985 and has voluntarily worked on it for the last 24 years. Meanwhile, an Irish individual is running an Italian restaurant named the "Bookworm Bar". For many Chengdu people, the greatest attraction of the restaurant is its book shelves, which are full of English books in their original editions. Guests can read books for free while waiting and eating. The restaurant also organises an English Salon every evening. Nevertheless, most guests are professionals of high income classes due to its high costs (visited during the fieldwork of this study in July 2008).



#### **7.4.3.2 Knowledge base**

Since the 1950s, Chengdu has been targeted by the central government as a centre for science, technology, and education. Several higher education institutions were moved from coastal regions to Chengdu in the 1950s and 1960s. Meanwhile, many defence related research institutions were established in the Chengdu city region. These together with existing universities and research institutions formed Chengdu's knowledge base. By 2007, there were 40 universities in Chengdu with 544,000 students studying all disciplines (CDBS, 2008). Five universities including Sichuan University, Southwest Jiaotong University, University of Electronic Science and Technology of China, Sichuan University of Agriculture, and Southwest University of Finance and Economics, are national "211 Universities". At the same time, the number of research institutions has reached 120, among which electronic, space science, railway and engines, and Chinese traditional medicines, are national leading research forces. This is further strengthened by the presence of 14 academicians at the China Academy of Science and the China Academy of Engineering.

In very recent years, taking advantage of the Western Region Development program, many large companies (both foreign and domestic) have been relocating their regional headquarters to Chengdu. This brought with it opportunities for Chengdu to develop a knowledge intensive economy. What is more, this has by and large stimulated the transition of military knowledge intensive industries to civilian ones by collaborating with these companies. According to the statistical information, the number of active researchers had exceeded 64,400 in Chengdu's 120 research institutions by 2007 (CDBST, 2008).

Moreover, being the pioneer of the integration of rural and urban development, Chengdu has put in force a set of policies for attracting and retaining university students and knowledge workers. Apart from offering subsidised housing and settling funds, two industrial parks have been established specifically for knowledge intensive start-ups founded by young entrepreneurs. The success of this can be evidenced by the fast growing of the creative industry such as cartoons, network games, and software written (according to the documents collected from Chengdu Bureau of Science and Technology during the fieldwork in July 2008).

#### **7.4.3.3 Knowledge culture**

Chengdu's knowledge culture can be traced back to 2,000 years ago in the Han Dynasty, when public schools were established to teach linguistics, literature, and science. These schools were among the earliest in the country's educational history (CDCC, 2002). The concentration of knowledgeable people has involuntarily played the role of leading innovation. The world's first paper currency was invented in Chengdu in the Song Dynasty (Zhu, X., 2004).

Contemporarily, unlike in any other cities, people in Chengdu can always find ways to link formal things with relaxation or entertainment. As mentioned above, tea houses have been made ideal places in Chengdu for public learning. This can be evidenced by the story telling traditions in tea houses in Chengdu. The story tellers may not be prestigious people but they must know something better than the audience. Topics vary depending on the tellers' background, which may cover all aspects of the world and personal experiences (Wang, L., 2006). Of course, some of the stories may not refer to knowledge, but they do help the audience to learn about the society, especially for those who are not well educated. Indeed, story telling has served as a major means of public learning in Chengdu's urban life.

Very recently, in order to be consistent with the implementation of policy on the integration of rural and urban development, a government-led public campaign was launched to help low income families' and rural residents' learning. Both organisations and public individuals are asked to donate books, periodicals, audio-visual products, televisions, computers, DVD players and so on, to establish rural community study rooms. Volunteers were recruited to help organise reading activities, such as reading group discussions, workshops, and seminars to foster rural residents' learning abilities. Meanwhile, pupils in urban areas are encouraged to make friends with rural pupils through regular meetings, writing, and sharing books and toys. A visit to one of these rural study rooms during the fieldwork noticed that although the condition of the study rooms were poor, there were still many people crowded there to find readings of interest. Children were crowded around the computer, though the computer was not connected to internet due to the lack of service supplier.

The “learning family” is another public campaign led by the government to foster a learning culture. It asks families to set up a bookshelf and a reading corner and suggests that every month families should read at least one book or article and write down a review, which will then be posted in the community’s common room. At the end of each month, the reviews will be assessed and the winner will be introduced to the local newspaper or TV programme for publishing. This campaign has been welcomed by citizens, particularly professionals.

Furthermore, the fast growing of the BISR’s reading club, the overcrowded English Language Corners and salons also indicate another informal learning culture in Chengdu. Overall, regardless of how it is taking place, learning in the city has generally evolved as a part of life. The efforts made to help rural residents’ learning will inevitably change their knowledge structure, therefore giving them the chance to have a better life.

#### **7.4.4 Knowledge synergy**

Given the nationwide development climate, Chengdu has also endeavoured to exploit knowledge potentials to serve urban development. The establishment of various development zones, national university science parks, transformation of military technology for civilian use, integrating rural and urban development, developing national titled cities, and so on, are all seen as the efforts of this kind. This section discusses these efforts.

##### ***7.4.4.1 Development zones***

Given the fact that Chengdu has integrated its rural areas into urban development and a territorial development plan is being implemented, rural areas have been taken into account equally with urban areas when making any development decisions. So far there are 21 industrial development zones in Chengdu city region, including three state-level zones, nine provincial level zones and nine city level zones. Each urban district and county has one of these zones. However, except the three state-level zones, the rest are relatively small in scale. Most of these zones were established after 2000 taking advantage of the national program of Western Region Development. According to the Territorial Development Plan (2006), each zone should focus on one particular industry that is highly relevant to its natural and traditional strengths. Under this plan, the

government has tried to reorganise industries within the territory by relocating them to the relevant zones. Meanwhile, manufacturing industries that sit outside the zones are encouraged to move into development zones. By 2007, roughly 69 percent of Chengdu's manufacturing industries are located in these development zones (Ma and Wang, 2008), accounting for 71 percent of industrial added value (CDBS, 2008).

It is noted that while development zones are used by the local government as a means of institutional innovation for economic growth, higher education institutions in Chengdu have not been actively involved in these initiatives, leaving the government to play the "monodrama" (Ma and Wang, 2008). Moreover, from 2004 onward, governments and development zone authorities have attempted enthusiastically to develop the so called "headquarter economy"<sup>19</sup> through attracting multinationals and national large companies to establish regional headquarters in the zones. However, as argued by Deng (2006), there is still a long way to go for Chengdu to become a headquarter economy both in terms of policy environment and talent pool. Furthermore, even the headquarter economy as a theory itself has been criticised by Gu (2006) as being "opportunism" since the presence of headquarters do not actually contribute significant economic growth but statistical bias.

#### **7.4.4.2 University science parks**

Developing a university science park as an institutional mechanism of synergising knowledge for the local economy started in 1994 when the Southwest Jiaotong University founded its first science park in Chengdu, five years earlier than central government's national university science park policy. Another two science parks of this kind in Chengdu are the Sichuan University Science Park and the University of Electronic Science and Technology Science Park. All three parks are jointly invested by local governments, industries, and universities and run by joint ventures. The review of documents collected during the fieldwork of this study found the following common features of the three science parks:

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<sup>19</sup> The term of "headquarter economy", which was introduced by Zhao (2004), a Chinese economist, has been regarded as a key development theory by Chinese policy makers. The main point is that the presence of headquarter of large company can increase significantly the city's GDP. But, this is actually a statistic bias since the current Chinese statistic calculates sales income on the basis of headquarters' account, while rejecting branches'.

- One university's science park is spatially segmented with the main park located in the university campus and others located in somewhere else in the city region. Each coordinated park may focus on one particularly transferable and producible technology;
- Technology transfer to the partner companies dominates the science parks' business;
- Incubators are divided into technology and business incubations and mainly serve their own university students and graduates;
- Scales of these science parks are comparatively small and facing difficulties in managing growth.

#### *7.4.4.3 Transfer of military technology*

As stated, numerous military research institutions moved into Chengdu to serve the relocation of military industries during the 1960s to 1970s. Some of these research institutions are national leading research bodies, such as electronic, aircraft design, space, and biomedicines (CDBST, 2008). In the post reform era, with the change of national defence strategy, military research institutions were encouraged to serve civilian industries. In Chengdu, the collaboration followed four approaches: technology transfer, contract research, joint research, and establishing joint venture (SCASS, 2002). One interviewee commented on this:

The military industry in the Maoist era laid a concrete foundation for Chengdu's industry, allowing military research institution to collaborate with civilian industries engendered Chengdu's high-tech industries in the post reform era... Microsoft, Intel, and many other multinational companies came to Chengdu not only because of our physical environment and geographical advantage, but more importantly because of Chengdu's technology base, which very much relies on the reputation of military research institutions... without the collaboration, Chengdu's electronic and information industry and civil aircraft industry would not be developed so well (General Director of Chengdu Academy of Social Science, 15/07/2008).

The above argument has been proved by statistical information (CDBST, 2008). As it shows, many coastal manufactures have founded their new companies in Chengdu in collaborating with Chengdu's military research institutions since 2000.

#### ***7.4.4.4 The integration of rural and urban development***

Following the territorial development approach, Chengdu is leading the way in stimulating potentials of all its members for a better development. Indeed, the 60 years dual track system of urban and rural development has resulted in the social division - not only physical and materially, but also in cultural, habitual, and psychological terms. This division was so deeply rooted in people's lives therefore everybody was used to it, even rural residents themselves cannot tell what is wrong with it. In fact, it was not until very recently (perhaps beginning in 2003 or 2004), that the national policy started to shed light on rural residents and rural development. Even though, in most cases, local governments are making only perfunctory efforts or symbolic gestures towards the implementation of the new national policy. Nevertheless, Chengdu's efforts for the first time after 60 years have actually placed rural residents and rural development as equals to urban residents and urban development. One interviewee explains:

For a long time, rural people's talent and creativity have been considerably underestimated or simply neglected and restricted. This was ... hm ... I would say a national fault, or a policy bias... what we are doing now is to correct it, to give rural people the chance. As you will see, rural people's talent and creativity have been released more than ever... our rural areas have assumed a totally new look in the last few years,... but, sadly some areas have been destroyed by the earthquake, but I believe we will rebuild a much better new Chengdu city region relying on our people's talent (Director of Chengdu Development and Reform Commission, 09/07/2008).

From an urbanisation perspective, what Chengdu is following is rather a "counter-urbanisation" approach. Different from the approach that dominates currently, which advocates the building of megacities as a means of urbanisation, Chengdu is trying to develop an urban system, a Chengdu city region, not only from the perspective of administration, but services and transport (CDDRC and CDBUP, 2006, CDMG, 2004). The implementation of the Territorial Development Plan (2006) will allow people in Chengdu to choose freely where to live and how. On interviewee commented on this:

This is the biggest progress we have ever made, you know, we have more than 11 million people live in the city region, but we actually cared only three million [urban residents] of them, while left the rest eight million [rural residents] to look after themselves without giving them any support but farmland in the past 30 years... we gave no chance to rural residents and we even did not listen to them... but with the territorial development, we give play to the initiative of all 11 million people. This is the enhanced positive force to drive our development better and better and

eventually to realise a harmonious city region (Director General of Chengdu Academy of Social Science, 15/07/2008).

Nevertheless, the review of the territorial development plan noticed that policies have not been systematically designed and there are still many difficulties and barriers that need to be overcome. Even though, a visit to the rural areas noticed that people's enthusiasm has been largely stimulated and the attitudes to the plan are generally positive.

#### ***7.4.4.5 Developing nationally-titled cities***

Chengdu has won almost all titles of the nationally-titled cities: the "National Civilising City", the "National Model City of Environment Protection", the "National Garden City", the "National Sanitary City", the winner of the "National Model of Human Settlements" award, and one of the "Ten Most Economically Active Cities". These titles represent the general achievement of urban development in social, cultural, and environmental terms, making Chengdu the only provincial capital and vice-provincial city boasting these honours (xinhua.net. accessed on 03/02/2009). The Secretary General of the Mayor's Office attributed these achievements to the development of a learning city and the implementation of a territorial development plan. As he stated:

We would never be able to get these jobs done if we were not putting the education first and taking the whole city region into consideration. First, through the development of learning city, people's potential of learning has been released and through the social learning, we achieved a great consensus in making efforts to balance social, cultural, and environmental development while pursuing economic growth. Second, the implementation of the territorial development strategy has greatly stimulated the initiative and creativity of people... imagine, with the high consensus and creativity from our people, what cannot be done? (interviewed through telephone on 05/02/2009).

As discussed in the previous section, people in Chengdu are willing to share their knowledge. The government-led campaign of developing the learning family has helped the improvement of social learning abilities, which in conjunction with the city's knowledge sharing culture, facilitated the development of a coherent knowledge environment. Meanwhile, the implementation of the territorial development plan extended this environment to cover the entire city region, which in return, brought great consensus with it to support government's work. Indeed, the effectiveness of this has been evidenced by the fact that Chengdu's winning of above national titles which were

all taking place after Chengdu Municipal Government announced the integration of the rural areas into urban development in 2004.

## **7.5 Cross-case synthesis**

The above three sections presented the findings from three case studies. For each case, the researcher has made a generic analysis of urban development activities under the four themes: how knowledge is understood and defined for urban development; what dimensions of development are pursued in the city; what the city does in developing a cohesive knowledge environment; and how the city synergises knowledge resources to coordinate its development efforts. Nevertheless, it is noted that organising the writing in this way may be difficult for readers to capture the whole picture. This section therefore synthesises the findings across the three cases.

### **7.5.1 Understanding of knowledge for development**

In all three cities, understanding of knowledge is influenced by the city's historical and cultural traditions. Knowledge is defined for development is dominated by socialist ideology. Historically, Hangzhou and Chengdu have inherited Chinese orthodox tradition and culture, whereas Wuhan adapted more western knowledge about development.

Contemporarily, Chengdu has kept its tradition largely unchanged even in the Maoist era under the circumstance of “class contending” and “cultural revolution” and post-reform period when Deng Xiaoping's economically centred theory became the dominating thought of the country. Meanwhile, Hangzhou has become one of the leading cities to pursue economically centred ideology where knowledge has been biased to technology or industrial know-how, whilst social knowledge generally received less attention than it should be. Wuhan is somewhere in the middle between Chengdu and Hangzhou.

Very recently, Hangzhou responded to the “scientific development concept” with economically centred thought, where social justice and inclusion were being thought of as not as urgent as economic growth. In the meantime, Wuhan paid more attention to developing an advanced industrial city, which is of interest in terms of resources saving and being environmentally friendly, whereas Chengdu has started to endeavour to become a harmonious city region in social, cultural, economic, and environmental terms.



### **7.5.2 Development dimensions in practice**

Economically, Hangzhou has been managing to transform from a labour intensive manufacturing based industry to a knowledge intensive economy with service industries. Meanwhile, Wuhan is attempting to develop as a high-tech manufacturing centre and to upgrade its traditional manufacturing base, with Chengdu working on becoming a centre for the headquarters of both multinational and national large enterprises and military high-tech industrial bases.

Culturally, Hangzhou has lost many cultural heritages and traditions, but is now trying to retrieve and marry its traditional culture with the cultural economy by promoting culturally related traditional industry, whereas Chengdu's development has been dominated by its traditional culture. In the case of Wuhan, there is a lack of a culturally distinctive tradition. Meanwhile, in all three cities, government-led efforts have been made to develop the socialist mainstream culture.

Socially, Chengdu has made concrete progress in terms of social justice and inclusion through the implementation of a territorial development plan in the last few years, whereas Hangzhou and Wuhan are making only perfunctory efforts or symbolic gestures in this direction, particularly in terms of temporary migration related policy.

In all three cities, environment protection has been prioritised. As stated, Chengdu has won the four highest national titles (the "National Civilising City", the "National Sanitary City", the "National Garden City", and the "National Model City of Environment Protection City") that related to environment protection. Wuhan has been designated to undertake the experiment of developing the "Resources Saving and Environmentally Friendly City", indicating that its previous work has been recognised by the State Council. Meanwhile, Hangzhou has won three of the four national titles except the national civilising city.

### **7.5.3 Knowledge environment**

Quality of place in all three case study cities has been generally improved in the last two decades, but varies in specific aspects. There is no significant difference between the

three cities in terms of built environment. Nevertheless, high prices of housing and poor public transportation are seen as major problems in the all of the three cities.

In terms of cultural environment, Chengdu is full of traditional culture, and Hangzhou has made extensive efforts to retrieve its cultural tradition, whereas Wuhan seems to have failed to reserve its cultural tradition apart from the bureaucracy left by the Maoist ideology. Not surprisingly, governments in all three cities are trying to foster a mainstream socialist cultural environment. However, these attempts received reactions only from professional families, where both high and low income families appeared to show no interest.

Hangzhou has developed competitive advantages in the economy by taking advantage of preferential policy and investment from the central government under Deng Xiaoping's uneven development policy. This has given Hangzhou the opportunity to take the "earlier mover's advantage" to transform into creative and knowledge intensive industry and high-tech manufacturing, but Wuhan and Chengdu are not far behind. In all cases, efforts are being made to develop industrial clusters, which aimed to form the self-sufficient supply chains with particular attention being paid to increasing R&D capability. Chengdu and Wuhan are trying to upgrade their traditional industry by investing in R&D.

City libraries and other public spaces have been used both deliberately and spontaneously as a means of knowledge creation and dissemination in all three cities with Chengdu leading the way. Through government investment and public donations, Chengdu has established a library system covering its territory and made all of its libraries open to all of the public for free. In order to help less educated people to learn, Chengdu has also called for voluntary work to help farmers reading. In the case of Hangzhou, a formal library system covering major towns and suburban areas has been founded by the government, but made free to use for only its permanent urban residents. Meanwhile, Wuhan is using a so called "Lorry Library" to serve suburban areas with a usage charge. Free public lectures organised by the library are meaningful for citizens' learning, but unfortunately, it is rare for less educated and/or low income groups to participate. This has also been the case for community-based learning activities. From this perspective, Wuhan's various community schools appeared to be more effective than others.

Moreover, the welcoming of using public spaces to learn, especially the English Language Corners, reflects the spontaneous learning culture in all three cities.

Both the number of universities and university students have been increasing significantly since 2000, with Wuhan at the forefront. Nevertheless, apart from few national “211 Universities”, many other universities have been problematic both in research and teaching quality, as evidenced by the employment difficulties of university students in all three cities. Facing this problem, Chengdu has made efforts to retain all students by offering special help, while Wuhan and Hangzhou have both set up criteria for attracting and retaining students who are needed by the city’s industries. Furthermore, although the amount of academicians of both CAS and CAE in Wuhan is larger than the other two, the creative class and high-skilled workers performed better in Chengdu and Hangzhou than in Wuhan. Both Hangzhou and Chengdu are doing better than Wuhan in developing a cohesive cultural environment and fostering a knowledge culture.

#### **7.5.4 Knowledge synergy**

Both institutional mechanisms and policy frameworks have been used as a means of synergising knowledge for development in all three cities. While the former is used mainly for economic growth through the creation of development zones and establishing university science parks, the latter is intended to ease social, cultural and environmental development through public campaigns.

From an institutional perspective, establishing development zones is common in all three cities. Each of the three cities has at least two state level development zones – ETDZ and HNTIDZ. However, none of these zones were intended to synergise knowledge resources locally for development in the 1990s, but took advantage of national preferential policy that was only offered to industries located in the zones. Change nevertheless occurred with the reorientation of land use policy in 2000, which allows land in the zone area to be used for social, cultural, leisure, and residential purposes. Since then, the goals of the state level ETDZs and HNTIDZs in the three cities have been amended to develop as knowledge intensive new towns/urban districts. Hangzhou went even further by integrating its HNTIDZ into an ordinary urban district, while Wuhan is relocating more than 40 universities to the zone.

Establishing university science parks is used as a means of efficiently exploiting university knowledge and technology in all three cases. A number of preferential policies have been applied to these science parks, such as land prices, tax and housing. University science parks in Chengdu are jointly invested in and run by universities and partners from industry, while they are invested in and run jointly by government and university partnerships in Hangzhou, whereas in Wuhan, universities are in charge of investing and managing the development of the science parks. Meanwhile, Wuhan has made good progress in letting the universities play a role in knowledge transfer and fostering an entrepreneurial culture. Moreover, while science parks in Hangzhou and Wuhan are opening for all start-ups which satisfy the selection criteria set by the science park, Chengdu's university science parks are generally serving only university students and academic staff, with a main function of knowledge and technology transfer to their partners.

Both Chengdu and Wuhan are synergising knowledge resources from the extended scales. Wuhan is trying to effectively use the knowledge resources from the surrounding eight prefectural cities by forming the WUA, which has been set to work together under the guidelines of the urban agglomeration proposal. This will allow Wuhan and the other eight member cities to develop a unified economic region to compete in the national and even international market. Meanwhile, Chengdu is implementing the territorial development plan, which pays more attention to social justice and inclusion, as well as synergising territorial resources for economic growth.

In all three cases, the governments have launched numerous public campaigns to foster socialist mainstream culture for developing a harmonious society under the "scientific development concept". Establishing the lifelong education system, community learning, family learning, and various learning competitions, are commonly employed as a means of fostering knowledge culture in all cases. Nevertheless, all the efforts that have been made to do so are deliberately connected with the creation of nationally-titled cities.

## **7.6 Chapter summary**

This chapter has brought together the concerns of the current study by applying the analytical framework to the selected Chinese case studies. For each case study, both secondary and primary data were analysed under the four central themes and subordinate

themes. Drawing upon the synthesis of the findings from the three case studies, some key points are summarised as follows.

Firstly, local understanding of knowledge is influenced by the city's historical and cultural traditions and national development ideology. The local historical culture has been the dominating factor of Chengdu's understanding of development. The impact of the Maoist development ideology on Wuhan can be found easily everywhere. Meanwhile, Hangzhou has been enjoying the benefits brought by Deng Xiaoping's "uneven development" policy. From this perspective, local definitions of knowledge for development are not positively correlated with the economic state of development. On the contrary, it indicates that the more advanced the economy, the narrower the definition of knowledge being adopted for development, as evidenced by the cases of Hangzhou and Chengdu. From a cultural perspective, it implies that the more Chinese traditional culture is inherited, the broader definition of knowledge for development the city has adopted. Moreover, it is also noticed that Hangzhou is embracing a narrow sense of knowledge economy, while Wuhan and Chengdu pursue a broad concept in this respect. This can be evidenced by the fact that in the last few years, Hangzhou has made extensive efforts to promote the creative industries, whilst taking no action on the departure of the labour intensive manufacturing industry, whereas Wuhan and Chengdu are attempting to upgrade local older industries through investing in building the local capacity of R&D.

Secondly, development dimensions that are addressed by local practices are following a similar trend with the local definition of knowledge for development. Although Hangzhou is a much bigger economic entity than Chengdu, the latter has paid more attention to social inclusion and justice whilst pursuing economic growth, whereas the former has deliberately set a discriminatory policy to exclude vulnerable social groups (such as temporary migrants) to share the economic outcome, but to accept their contributions. Meanwhile, Hangzhou sees its cultural traditions as an economic resource, while Chengdu reserves its traditional culture as a means for the betterment of public life. Moreover, Chengdu is endeavouring to abandon the "dual track system" through the implementation of the territorial development plan, whereas Hangzhou's recent policy is actually strengthening this system.

Thirdly, much attention has been paid to the improvement of the built environment in the urban proper over the last two decades. Therefore, urban areas have been more attractive than ever in all three cities. However, less has been invested in the surrounding rural areas, with Chengdu begun nevertheless to make efforts to treat its rural hinterland more or less as equals to its urban areas. In all three cases, the high price of housing and scarcity of social housing have made it difficult for middle and low income families to live in the city. Meanwhile, the attractiveness of a city's cultural environment is determined by its traditional culture which gives no role for ideologically related cultural settings. Economically, Hangzhou is in the process of a transition to a knowledge intensive economy, while Wuhan and Chengdu are trying to upgrade their old industries whilst pursuing the knowledge intensive industries. In all three cases, public spaces have been used to facilitate public learning, through which Chengdu is trying to provide an equal chance to all, but discriminatory policies have been set by Hangzhou authorities. Moreover, the findings from the three cases indicate that a city's knowledge base as measured by the presence of universities and number of students does not necessarily mean the better performance of development. Rather, having the knowledge culture is vitally important.

Fourthly, the use of institutional mechanisms, such as the establishment of ETDZs and HNTIDZs in the three cities would have nothing to do with developing a knowledge culture or effectively synergising knowledge for development if there were no structural mechanisms established to localise knowledge resources. This was the case in the first ten years of the ETDZ and HNTIDZ movement. However, the combined efforts made by local governments, universities, and industries to establish university science parks and business incubators in all three cities, and providing universities with a role in fostering an entrepreneurial culture and facilitating knowledge transfer adopted by Wuhan, in recent years, have filled in the gap. In the meantime, synergising knowledge for developing the "harmonious city" (the various national titles) has been problematic both in Hangzhou and Wuhan, whereas Chengdu is leading the way in this direction.

## **8 Conclusion**

### **8.1 Introduction**

Chapter one set out the motivation of the current study and the aims and objectives. Chapter two examined a wide range of literature that was argued to be closely related to KBUD, in which the definition of KBUD was refined and the literature gap was identified. In order to ensure the research objectives could be fully achieved, chapter three discussed the methodological issues, and the most appropriate research methods were chosen to guide the current research. Following this guideline, chapter four undertook a review of international initiatives of KBUD, and the study of the Chinese cases was presented in chapters five, six (stressing more on methodological issues), and seven.

Drawing upon the above work, this chapter will provide a conclusion to the current research effort. In so doing, it will return to the beginning and briefly summarise how the findings from this research make the whole picture clear. Then the research aim and objectives outlined in chapter one are revisited. This is followed by a discussion of the contributions to knowledge this study may contribute and the limitations associated with it. Some recommendations both for policy making and future research are presented in the final section, which will bring the current research to its end.

### **8.2 Conclusion of the research issues**

#### **8.2.1 Towards the theoretical arguments**

Building upon a variety of disciplines of literature reviewed in chapter two, this study first refined the concept of KBUD as to embrace all types of knowledge, the wisdom, to rule development behaviour, which fully corresponds to the needs of enhancing sustainability in social, economic, cultural, and environmental terms. The development of knowledge city is about engaging people of the whole community to make consensual efforts to the fair distribution of knowledge so that it can benefit all. Drawing on this

definition, this research has made three theoretical arguments. Firstly, it argues that the need for knowledge for the making of knowledge city should include all types of knowledge and wisdom. In this sense, any attempt to limit knowledge to a certain type will bias the concept of KBUD. The second argument has been made by this research is that knowledge city is an advanced form of KBUD which embraces the concept of both the knowledge society and the knowledge economy in a wide sense rather than limiting it to the knowledge economy in a narrow sense. The third argument is related to the question of KBUD for whom, where it argues that the fundamental feature of the knowledge city lies in its justice and inclusion. It is developed equally for all members of the community.

The above arguments are normative in nature following the tradition of planning discipline. Based upon these arguments, this research maintains that understanding the holistic meaning of knowledge and defining it for serving and ruling development behaviour is fundamental for a city to develop toward KBUD. Local development activities need to address not only economic growth but also balance social, cultural and environmental sustainability. A city needs to develop a cohesive knowledge environment, which encompasses high quality of place, cohesive knowledge culture, and concrete knowledge base. Such an environment encourages the engagement of the whole community for fairly creating, transmitting and utilising knowledge for upgrading urban development behaviour in a sustainable manner. In order to facilitate the creation of a cohesive knowledge environment and to ensure such an environment benefits all, there is a need to establish appropriate and efficient institutional mechanisms and policy frameworks encouraging, facilitating, and regulating knowledge creation, transmission, and utilisation, which involves all members of the community. These elements formed a generic framework that guided the current study in analysing empirical data. The next section synthesises findings both from the review of international KBUD initiatives and the Chinese case studies.



## **8.2.2 Synthesis of findings**

### ***8.2.2.1 Findings from international case studies***

#### **Local Understanding of knowledge for development**

The international case studies found that although the importance of knowledge for development has been realised by all eleven case study cities, it is defined differently. Generally, the developed cities have a broader definition of knowledge than the emerging industrial cities. The developed cities tend to embrace not only technological, but all other types of knowledge in serving and ruling their development behaviour, while the emerging industrial cities are paying more attention to technological knowledge for economic growth. Meanwhile, in the developed cities, efforts are being made to make knowledge accessible to all to generate equal opportunities both for personal development and social equity and inclusion, whereas the emerging industrial cities are developing as a condition for knowledge elites. As argued by this research, the need for knowledge for KBUD should include all types of knowledge and require engaging people of the whole community. In this regard, the well developed cities are doing better than the emerging industrial cities.

#### **Development dimensions in practice**

The well developed cities are endeavouring to balance development behaviour to address social, economic, cultural, and environmental issues, while the emerging industrial cities tend to prioritise economic growth over other development dimensions. Meanwhile, making development for all has been set as the goal of development by the well developed cities, whereas the emerging industrial cities are attempting to develop for the elite few. Considering the theoretical arguments this research has made, which observe that urban development behaviour needs to coordinate the needs of enhancing social, economic, cultural, and environmental sustainability if it is to develop toward knowledge city, what the developed cities are doing is more likely to lead to a knowledge city. In terms of the emerging knowledge economy, although majority of the case study cities (Manchester, Melbourne, Barcelona, Delft, Newcastle, Singapore, Dubai and Cyberjaya), are taking the narrow sense of what is meant by knowledge economy as discussed in chapter two, the success of Munich and Austin (which are following a broad approach),

may stand for a more sustainable trajectory for their future. Nevertheless, this is a point that is subject to debate.

### **Knowledge environment**

Both the developed cities and the emerging industrial cities have paid great attention to creating a physically attractive environment in recent years. Consequently, there is actually no significant difference between the 11 cities in their physical environments. Nevertheless, the developed cities are trying to retrieve the city's historical and cultural heritages and maintain its specific folk culture for the cities' identity, while the emerging industrial cities are developing physically attractive conditions to pursue the western culture for knowledge elites, as seen in Dubai and Cyberjaya. From an economic perspective, Austin and Munich both integrated their knowledge strengths into productivity, while Hsinchu strives to become a high-tech manufacturing centre, whereas other cities are pursuing a narrow sense of knowledge economy. Furthermore, social inequality remains a major problem both in the developed and the emerging industrial cities, with few exceptions such as Austin and Singapore, though the developed cities are making efforts to close the gap, whereas what the emerging industrial cities are doing is actually enlarging it.

Up to this point, it seems to suggest that the emerging industrial cities may have the opportunity to catch up with the developed cities in terms of developing physically attractive environments and a knowledge economy. However, taking the development behaviour into consideration, a well constructed built environment may not be attractive without a vibrant cultural identity, not to mention the increasing social inequality which may hold back the city's development sustainability. Moreover, as argued in the theoretical discussion, without a concrete knowledge base and a cohesive knowledge culture, the city's development activities will have nothing to do with KBUD. The success of Munich, Austin, and Singapore coincide with this argument. Although Dubai and Cyberjaya have both made intermediate successes, this may be challenged by their ability to localise knowledge and develop a cohesive knowledge culture.

## **Knowledge synergy**

The development of science park, science city, high-tech industrial park, knowledge centre, and so on, has been adopted by some cities as a means of effectively synergising knowledge for development. However, the emerging industrial cities (such as Hsinchu and Cyberjaya) tend to use it for economic growth, while the former industrial cities (for example, Newcastle Science City and knowledge clusters in Munich) are promoting a much broader concept of knowledge for increasing multi-dimensional development sustainability. Meanwhile, the developed cities have made substantial efforts to develop institutions and cohesive policy frameworks for regulating knowledge transmission, among which are knowledge clusters and networks, lifelong education systems, turning public spaces into innovation engines, and public campaigns, but this has not been found in the emerging industrial cities. Moreover, some of the developed cities, such as Barcelona, Melbourne, and Manchester have legitimated their political structure and approaches for coordinating knowledge creation, dissemination, and utilisation, whereas emerging industrial cities tend to use government power to do so, which may lead to the concern of the continuation of such development efforts in the future.

From the progressive perspective, development behaviour pursued by the developed cities and the emerging industrial cities can be related to the two successive forms of KBUD discussed in chapter two. While the former are developing toward becoming a knowledge city, the latter are creating technopoles. However, this is not always the case. As evidenced by the development trajectory of Singapore, which has made a great leap frog over the last few decades to become a leading city moving toward becoming a knowledge city.

Putting all these together, a conclusion can be drawn as that in a general sense, having the comparative advantages in terms of knowledge base and knowledge culture, the developed cities have established cohesive institutional mechanisms and policy frameworks and tend to embrace a broader definition of knowledge than the emerging industrial cities and define it to serve and rule their development behaviour toward sustainable manner in social, economic, cultural, and environmental terms. The developed cities, therefore, are leading the direction of KBUD. However, the “developed city” as employed by this research to represent those cities, which are in the post-

industrial stage and/or at the leading position of industrial or knowledge economy within the 11 case studies cities, is by no means the pre-condition for a city to develop toward a knowledge city. Rather, establishing an efficient institutional mechanism and developing an appropriate policy framework to generate a cohesive knowledge environment, especially a concrete knowledge base and a vibrant knowledge culture, so as to engage and benefit people of the whole community to develop appropriate urban development strategies and by employing up-to-date knowledge, are fundamentally important.

#### ***8.2.2.2 Findings from the Chinese Case studies***

##### **Local understanding of knowledge for development**

Chinese understanding of knowledge for development is jointly influenced by China's traditional culture, national development ideology, historical and cultural traditions, and Western development knowledge. China's traditional culture is deeply rooted in the combination of Confucianism, Taoism, and Chinese Buddhism, which has dominated exclusively the conception of Chinese knowledge for more than 2,000 years. This tradition was characterised as "primitively harmonious". Starting from the late nineteenth century and throughout the following few decades, the arrival of Western development knowledge has impacted on the traditional concept of China's development knowledge. The second half of the twentieth century has marked a significant change in the national concept of knowledge for development, which boasts a paradoxical Marxist and market economy with Chinese Characteristics. Although it was challenged by Western philosophy and the recent Chinese national development ideology, the foundation of traditional Chinese culture has never been shaken fundamentally.

The change of national development ideology from the beginning of the 21<sup>st</sup> century, which calls for a "harmonious society" following the "scientific development concept" approach, signals a return to the traditional Chinese concept of knowledge and development from the Maoist political ideology and Deng Xiaoping's economically centred paradigm. The "harmonious society" may be seen as the Chinese version of knowledge society, which stresses the dynamic balance between development activity and the natural world; economic growth and social, cultural, and environmental sustainability; development and social justice and inclusion; and between now and future.

Compared with the theoretical argument of knowledge for KBUD, the “harmonious society” embraces a much broader concept of development.

In relation to the three case study cities, the influence of China’s traditional culture, national development ideology, local historical and cultural traditions, and Western development knowledge, is different to each city. Due to the relatively remote and isolated location where the influence of Western development knowledge was comparatively small, and that although under Maoist ideology, the central government has located many military industries in Chengdu city region, these factories have little connection with the city, Chengdu was able to keep the Chinese traditional culture and local historical traditions. Wuhan was growing based upon Western development knowledge but was later on replaced by and large by Maoist development ideology, which has evolved to be “metaphysics”, which may also be referred to as bureaucracy. Hangzhou became one of the major beneficiaries under the Deng Xiaoping’s uneven development policy and has enjoyed fast economic growth over the last three decades. Its local culture, therefore, has evolved to coexist with its urban life.

Nevertheless, the “scientific development concept” turn of national development ideology has hampered its influence on all three cities’ understanding of knowledge for local development. In this context, Chengdu, benefited from its well kept Chinese traditional culture and local traditions, has gained the comparative advantage in the development toward “harmonious city”, though its GDP per capita remains the lowest (but the fastest growing over other two in the last few years) compared to Wuhan and Hangzhou. This does not coincide with findings from the international case studies, which suggest a positive correlation between local definitions of knowledge for development and its state of economic development. Rather, the Chinese cases show that the local understanding of knowledge is by and large influenced by the city’s historical and cultural traditions and national development ideology.

### **Development dimensions in practice**

Findings from the analysis of development dimensions in practice suggest that although the importance of balancing economic, cultural, and environmental dimensions has been perceived by all three cities, social issues, such as inequality and exclusion, are the major concerns across the three case studies, particularly in Wuhan and Hangzhou. Despite the

efforts that have been made to develop social inclusion and justice in the Chengdu city region in the last few years by taking advantage of being appointed to undertake the national experiment of integrating rural and urban development, social problems still remain. Moreover, Hangzhou as well as Wuhan are actually setting more barriers to exclude vulnerable social groups (such as temporary migrants), preventing them from benefiting the outcome of the urban development while drawing on their efforts. Given the highly centralised political state where social policy is following a top-down approach, this requires national policymaking based on local specifics and clarifying division of responsibilities between central and local governments.

Efforts made by the three cities in restructuring the local economy are following different approaches, which are somewhat similar to the different definitions of the knowledge economy presumed by the international cases studied in this research, and coincide with theoretical debates on this issue. Whereas Wuhan and Chengdu both are trying to localise knowledge resources for local economic growth through investing intensively in R&D for upgrading old local industries, Hangzhou is attempting to attract knowledge workers for growing creative and knowledge intensive service industries. Drawing on this, to compare with the three cities' economic conditions, whether a city pursues a narrow or broad sense of knowledge economy does not appear to have a positive correlation with their state of economic development. On the contrary, it seems that the better the economic condition (as measured by GDP per capita), the more likely a city follows a narrow sense of knowledge economy and the more economically centred in terms of the development behaviour.

### **Knowledge environment**

Findings from the three case studies suggest mixed results in creating a cohesive knowledge environment. Firstly, while much attention has been paid to improve the built environment in the urban centre over the last two decades in all three cities, less has been invested in their surrounding hinterlands, with Chengdu starting to make efforts to treat its rural hinterland more or less equally with urban areas in the last few years. Nevertheless, in all three cases, the high price of housing and scarcity of social housing has made it hard for students, entry level knowledge workers, and other middle and low income groups to live in the city.

Secondly, a key objective of local government (actually led by central government) has been the promotion of culture on the basis of socialist ideology. However, there is little evidence of success in this regard.

Thirdly, intensive investment in higher education in the last few years has significantly improved a city's knowledge base. However, the comparison of the three cities revealed that having a high level knowledge base does not mean necessarily a better performance of urban development toward KBUD, as evidenced by Wuhan, which has the best knowledge base but the lowest economic growth and relatively poor social and cultural development.

Fourthly, whether a city has a cohesive knowledge culture determines the ability to turn its knowledge base into driving force of urban development. Knowledge culture can be fostered by encouraging citizens' learning, which can be achieved through (apart from the school system and higher education) establishing a lifelong education system, such as community schools, free public lectures, various public learning activities, public involved cultural events, and turning public spaces into innovation engines. As seen in the three cities, through the campaign of developing the learning city, a knowledge culture is being created. Yet, problems remain, among which is the exclusion of those temporary migrants, the less educated, low skilled, and low income groups.

### **Knowledge synergy**

The establishment of ETDZ and HNTIDZ may be seen as the Chinese version of technopoles and the major effort made to create institutions to facilitate knowledge transfer. However, the ETDZ and HNTIDZ in the three case study cities had nothing to do with institutional mechanisms for effectively synergising knowledge because they were developed merely as manufacturing centres during the first decade of life. It is the establishment of national university science parks in the ETDZ and/or HNTIDZ areas, especially the high-tech incubators, foreign educated returnees' business incubators, national and local key labs which provide facilities and services to local industries, and so on, making the ETDZ and HNTIDZ become meaningful to technopoles.

National policy appears to be another key ingredient for Chinese cities to develop toward KBUD. Apart from the development of ETDZ and HNTIDZ, numerous national

programmes, such as nationally titled cities that were launched or renewed under the new strategic goal of developing the “harmonious society”, are seen as another major effort made to mobilise knowledge resources to serve urban development activities moving toward the knowledge city. However, as evidenced by the three cases, the bidding to become various nationally titled cities relies exclusively on government-led public campaigns. There is a lack of systematically designed and legitimated policy frameworks. Given the fact that national policies often fell to become politically motivated speculations played by local politicians under the circumstance of centralised political system in the country in the past decades, this gives rise to the concern of the continuity and the actual effectiveness of these efforts,

### **8.2.3 Concluding remarks**

Looking back at the whole journey of the current research, it first refined the concept of KBUD and, in particular, the knowledge city, based on which this research has made three normative arguments to answer the questions regarding KBUD for what and for whom, which have not been clearly answered by the existing literature. This research then proposed a framework, which consists of the key elements and pre-conditions for a city to develop toward a knowledge city. The study of the international cases affirmed the theoretical arguments this research has made. The importance of the key elements and pre-conditions posed by the research has also been proved by the experiences of international KBUD initiatives. Moreover, findings from the international case studies also suggest that although there is a general trend that the well developed cities have the comparative advantage in transforming into knowledge cities, the state of development is by no means the determining condition for a city to develop toward KBUD. Rather, the making of knowledge city relies on the ability to engage people of the whole community to establish an efficient institutional mechanism and develop an appropriate policy framework, which encourage and facilitate the creation of a cohesive knowledge environment, especially upgrading the city’s knowledge base and fostering a cohesive knowledge culture, to mobilise and apply all types of knowledge to serve and rule urban development behaviour so that it corresponds fully to the needs of enhancing the city’s social, economic, cultural, and environmental sustainability.



Findings from the Chinese case studies do not coincide with the general trend that is found from the international case studies, which seem to suggest that the well developed cities may have comparative advantages in terms of transforming into knowledge cities, but confirm the importance of the key elements and pre-conditions proposed based upon the theoretical arguments. The empirical evidence from the Chinese case studies, nevertheless suggests that the key elements and pre-conditions are meaningful only if they are conducive to make connections with and adopted for coordinating localised knowledge creation, transmission and utilisation, which are regulated for the great collective interests, in other words, for people of the whole community, for social equity and inclusion.

The Chinese case studies also suggest that in a country in the process of economic decentralisation whilst retaining political power centralised, national policy plays a vital role in leading urban development toward KBUD. The very recent change of national development strategy, which aims to develop a “harmonious society” following the “scientific development concept” approach, is seen as a major political motivation for cities to develop a “harmonious city”. However, despite this, a cohesive policy framework has been missing. Instead, the implementation is made to rely on fragmented policies, experimentations, and government-led public campaigns. Although national programmes, such as creating numerous nationally titled cities, has provoked inter city competition across the country and received intermediate effects from the political point of view, the actual effects need to be evaluated empirically and systematically.

Nevertheless, the Chinese experience of developing a “harmonious society” following the “scientific development concept” may suggest that there may exist other development geographies outside the EU-America regions, which are based on different cultural, social, philosophical, and political settings. However, this does not mean China (at least the three case study cities) has developed and practiced a theoretically mature KBUD approach against the one suggested by Western scholars drawing on the experiences of the EU-American cities. On the contrary, there is still a long way for China (both national and local level and the three case study cities in particular) to go.

Indeed, if it is to turn the “scientific development concept” and the “harmonious city” into KBUD or knowledge city, China needs to solve first of all the following major

problems as revealed in the case studies. Firstly, the “dual track system” and “Household Registration” system which are seen as the biggest barriers that hold back the social equity and inclusion. Secondly, national land use and housing policy, which discriminate against rural low skilled workers, as well as entry-level knowledge workers to settle in the city. Thirdly, national insurance, health care, compulsory education, unemployment benefit, working safety, and pension schemes, are all fragmented, problematic, and exclusionary in nature. Fourthly, the low wage policy (especially in the labour intensive sector) and the inappropriate income tax policy which have resulted in the dramatic increase in social inequality. Fifthly, the division of responsibilities between the central and regional and local governments regarding the social and public services, which is seen as a key factor in affecting local development policy making. As it shows, the first four problems are related to social exclusion and inequality, which have emerged to be the biggest concern of Chinese urban development, while the last problem is concerned, from the KBUD perspective, with developing an appropriate policy framework based on the local specifics.

In summary, this research has developed the understanding of KBUD, in particular, the knowledge city, and suggested a set of key elements and pre-conditions for analysing and making policy toward knowledge city. By examining the international KBUD initiatives, it notes that the well developed cities may have comparative advantages in transforming into knowledge city, but the state of development is not a determining pre-condition in doing so, but the localised knowledge definitions, knowledge environment, especially knowledge base, knowledge culture, and the efficient institutional mechanisms and the appropriate policy frameworks, which call together available knowledge resources to make consensual efforts to enhance the city’s social, economic, cultural, and environmental sustainability. This was confirmed by the Chinese cases, which seems to suggest that the vision of developing a “harmonious city” may lead to a broad concept and widely applicable theory of urban development if China can solve the social problems that resulted by the current urban development policy.

### **8.3 Contributions and limitations**

Having concluded the journey of the current study, it is noticed that there is a need to look at the distinctiveness of the current study and the limitations that are associated with

it. In doing so, the research objectives set in chapter one were compared with the findings from the review of literature and the international and Chinese case studies. Drawing on this, it suggests that the current study contributes to knowledge both from theoretical and practical perspectives. Meanwhile, it has not been free of limitations. This section discusses this in detail.

### **8.3.1 Contributions to knowledge**

#### ***8.3.1.1 Theoretical contributions***

Being an emerging field of study, this research has found there were four fundamental questions of KBUD which were either biased or not clearly answered by the existing literature. By answering the four questions through the theoretical arguments and empirical evidence, the current research made its contributions to knowledge in the following way. Firstly, it refined the concept of KBUD (knowledge city in particular) by extending its definition, which was dominated by the economic perspective in the current literature, to embrace the concept of balancing social, economic, cultural, and environmental sustainability. This will make KBUD more appropriate as an approach to be followed by cities competing in the era of a globalised knowledge society.

Secondly, it has been made clear that the state of a city's development presents a starting point but not the decisive pre-condition for a city to develop toward a knowledge city. Instead, those elements identified by this research are vitally important, especially establishing efficient institutional mechanisms and developing appropriate policy frameworks so as to foster a cohesive knowledge environment.

Thirdly, the findings from this research coincide with the issues raised by the policy transfer study, which observe that most replications of policy frameworks adopted by the "best practice" (Hospers, 2006) regions or cities generally failed to be aware that the least transferable conditions are usually those explaining the success of the "best practice".

Fourthly, this research has opened a new area for debate regarding whether the Chinese experience is leading to another development geography, which may challenge the orthodoxy of EU-American development geography. With the distinctive historical, cultural, social, political, economical, and philosophical traditions, China is unlikely to

duplicate policies that are effective in EU-American regions. However, since the world's largest ever scale of urbanisation will take place in China at an ever quickening pace in the next few decades, whether it can be managed to follow a balanced manner of sustainability in social, economic, cultural, and environmental terms, will profoundly affect the world's development agenda. By making its point that follows the KBUD approach to make the "scientific development concept" applicable for the development of "harmonious city", this research will provoke more studies in this area.

#### **8.3.1.2 *Practical applications***

This study also has significant practical applications. Firstly, it has made it clear that China needs to solve its social problems, such as mentioned in the previous section, if it is to manage urban development toward "harmonious society". As will be discussed in section 8.5, the policy recommendations offered by this research provide options for policy implications for China's urban development. Secondly, the analytical framework adopted in this thesis can be applied to cities or city-regions which intend to develop toward KBUD. The framework can help both at the pre-decision making stage and the evidence-based policy evaluation. Thirdly, following the themes (both higher order and lower order) emphasised by this study, national, regional, and urban policy-makers can develop a cohesive policy framework so as to ensure the city's development behaviour fully corresponding to the needs of KBUD. Fourthly, for cities outside Europe and North America, it brings confidence to them to take the late mover's advantage by having a KBUD plan in advance, which has not been the case for most western cities.

#### **8.3.2 Research limitations**

This research, like any other case study research, has limitations associated with it. First of all, as discussed in chapter three, some methodological limitations are associated with the research, such as the representativeness of data and the generality of findings. For the former, because the subject being studied is a whole city or city-region and urban development practice involves variety stakeholders, it is impossible for a doctoral research study to collect data from all of them. Although efforts have been made to triangulate data resources, it might still be biased wherever triangulation is not possible. In terms of generalising the research findings, since case studies seek to reveal causal

relations and processes, it is not intended to generalise findings from the selected cases. Therefore, the generality of the researching findings is constrained.

Secondly, given the doctoral research, the international case studies were conducted on the basis of secondary data. This may miss out the “tacit knowledge” that is embedded in the first hand data.

Thirdly, the scheduled fieldwork in Chengdu was interrupted by the earthquake in May 2008. Only a few targeted key informants participated in the interview, while others offered unpublished documents instead or were interviewed later via the telephone. Although most of the data collected from Chengdu has been triangulated, it might still be biased involuntarily by the documentation.

#### **8.4 Reflections on the research objectives**

At the beginning, the researcher set out five objectives for the current PhD study. As the journey is now coming to its end, it is important to revisit these objectives with outcomes derived from this study.

The first objective, which was set to refine the concept of knowledge-based urban development, has been fully achieved by presenting an inclusive and applicable definition of KBUD drawn from the review of literature, covering not only the field of KBUD but also knowledge, development, knowledge economy, knowledge society, knowledge management, and knowledge-based development.

To develop an analytical framework for analysing knowledge-based urban development was set as the second objective for this study. In the research practice, it was derived from the review of the above mentioned literature and has been adopted as an analytical template for conducting the analysis of both international KBUD initiatives and Chinese case studies.

In order to draw a whole picture of the global trend of the KBUD movement, the third goal of this study was to examine international KBUD initiatives in their real context. In so doing, a desk-based research has been conducted, through which 79 cities or city-regions have been scrutinised and 11 of them were selected deliberately covering both well developed and emerging industrial cities. By applying the secondary data collected

from multiple sources, it has come with a conclusion of what it looks like in terms of the global movement of KBUD.

The main objective of this study was to examine the practice of Chinese cities against KBUD. In order to do so, the impact of China's traditional culture on its national concept of knowledge and urban development, and its history and national development policy has been reviewed. Three cities with vice-provincial level autonomous power were chosen to conduct the empirical study. The researcher's previous working experience both derived from working as a senior manager in a state-owned urban development company and as a senior officer at the planning department has built up a wealth of knowledge, which has proved very useful in understanding extremely complicated Chinese circumstances. The network that developed during his working in China enabled the researcher to collect the invaluable data so as to be able to conduct an effective analysis. This objective has been achieved.

Finally, drawing on the findings from this study, it was set to offer some suggestions for Chinese urban development policy toward the making of knowledge city and future research directions. This will be done in the following section.

## **8.5 Recommendations**

### **8.5.1 Recommendations for policy options for China**

#### ***8.5.1.1 Legitimizing a integrated policy framework***

Developing a “harmonious society” following the approach of the “scientific development concept” as the national development ideology is broad and meaningful from a knowledge society perspective. However, national and local policies for implementing this strategy were often fragmented and sometimes controversial. As found in this research, national education policy, household registration policy, the dual tract system, health care, pension scheme, unemployment benefit, housing policy, industrial policy, regional development policy, urban planning and land use policy, building design, and so on, all discriminated against vulnerable social groups (low income, rural temporary migrants) whilst favouring those groups already benefiting. This indicates the mismatch between the strategic goal and how it can be achieved. Behind this lies the lack

of systematically designed policy framework under which sectional policy can be made in a cohesive way. Such a policy framework should be legitimated and applicable with dividable measurements to allow policy making both at national and local levels to consensually coordinate with the strategic goals and carry out transparent and independent evaluation.

#### ***8.5.1.2 Clarifying division of responsibilities between central and local government***

This study has found that many problems in implementing the “scientific development concept” can be attributed to the unclear division of responsibilities between the central and local governments regarding the social and public services. Indeed, there is no clear and legitimated framework to state the rights and responsibilities across China’s five tiers of government. The central government receives twice as much revenue as it spends, whilst leaving more than twice responsibilities of providing basic public services to local governments (Dunford, in press). This is the main reason of why city level governments set up barriers to reject the provision of basic public services such as education, health care, unemployment benefit, and so on, to temporary migrants and rural residents under their jurisdiction. Moreover, this has also contributed to the increase in regional disparity. In this regard, only if the division of responsibilities is clearly designed in accordance with the abovementioned integrated policy framework that is conducive to the strategic goal, can it manage a consensual behaviour toward the strategic goal.

#### ***8.5.1.3 Making policy decision based on local specifics***

As indicated in this study, local policy is not made in the local context but following policies made by the central government. To this end, it has become the norm that local governments react to the central government’s policies in two diametrically opposed ways. If the central government’s policy is about to generate revenue or has potential to do so, or to be benefited from the political perspective, local governments will enthusiastically strive to be the first. Otherwise, if the central government’s policy is about to spend on improving public services without financial support from the central government, local government will only take some symbolic action, or take this as a chance to charge for such services they provide. For instance, the recent policy introduced by the central government asks city level governments to provide basic health care and education to temporary migrants and their child. However, in all three case

study cities, temporary migrants have to pay extra public administration fees and compulsory education fees for their child for receiving these services. Moreover, in another extreme case, local governments do nothing to help something in need if there is no clear policy made by the central government. All of these call for a system which can ensure local development policy is based on what is needed, and which policies works well and which do not in the local context. In doing so, research based policy making and evaluation are highly recommended.

#### ***8.5.1.4 Making the “scientific development concept” applicable***

Following the “uneven” development paradigm, growth pole has become the ruling theory pursued by both central and local governments. At the national level, certain regions cities, and special zones are in favour of national preferential policies which are accompanied by the state investment and other resources allocation. Meanwhile, regional and local governments do something similar at the relative scales. This is seen as the key factor causing the increase of regional disparity. Although the “scientific development concept” has been introduced in recent years, it is hardly to be accepted as a mature development theory as found in this study. Therefore, more detailed studies which take into account the Chinese history, traditional culture, current state, and global trend, are needed to comprehend the “scientific development concept” so that it can become an applicable development theory.

#### ***8.5.1.5 Paying greater attention to social inclusion and equity***

As noticed by this study, social inclusion and inequality have become the major concern of the social stability. Over 140 million temporary rural migrants (about a quarter of the total urban population) in the urban areas working in labour intensive manufacturing and services sectors have actually been a major contributor to China’s economic growth over the last three decades. However, compared to their contributions, they receive only one-third of the average wages earned by permanent urban workers. This in conjunction with other discriminatory policies has excluded rural residents from sharing the outcomes of development. The discriminatory policy prevents these temporary migrant workers and their children from living in cities not only in materialistic but psychological terms. In their efforts to survive, a high proportion of crimes are found to be committed by



temporary migrants. In this concern, an inclusive policy to allow all members of society to share fairly the outcomes of development is urgently needed.

#### ***8.5.1.6 Fostering a cohesive and inclusive knowledge culture***

Although the vital importance of having a cohesive knowledge culture has been generally recognised, there is a lack of systematically designed policy to make knowledge accessible to all. In most cases (for example in Wuhan and Hangzhou) well educated groups are enjoying the facilities available for learning, while rural migrants, less educated, and low income groups are excluded. This has led to the increase of social polarisation. Therefore, making the policy which helps to foster a cohesive and inclusive knowledge culture not only in terms of living and working but also in policy making is recommended.

#### **8.5.2 Recommendations for future research**

This study has generally answered “what” and “how” questions in the emerging field of KBUD study. By answering these questions, it has found that in a general trend the well developed cities are leading the way in developing toward knowledge city. Meanwhile, experiences from the Chinese cities emerged to raise a different paradigm, which may not follow in the steps of the developed cities. This gives rise to a number of questions that need to be studied further. Firstly, why the well developed cities took a broader approach than the emerging industrial cities in managing KBUD facing the challenge of the emerging knowledge society? Secondly, within the developed cities, there is the question why and how some cities like Austin and Munich embrace a broad sense of the knowledge economy whilst others do not. Thirdly, with regard to the three Chinese case study cities, Chengdu appears to be benefiting from its historical traditions of culture. This gives rise to another question, that is, how this historical culture influences its knowledge concept and knowledge culture. Fourthly, as stated in the previous section, China’s recent change of development strategy toward the “harmonious society” following the “scientific development concept” is potentially leading to the rising of other development geographies against western ones, but this calls for systematic studies.

These are the questions closely related to the current study. Nevertheless, with regard to the theoretical study of KBUD, or in particular the knowledge city, as noticed in the

literature review, the question of how to develop an integrated index that allows evaluation studies to be carried out remains. Overall, all of these questions call for more empirical and theoretical research in the future.

## 8.6 Afterword

The last year has seen the “worst financial crisis since the Second World War” that originated in the United States as a result of credit crunch. The economic and financial crisis has also uncovered the social and political problems that overshadowed by the economic growth. This indicates the failure of economic centred approach to development. Therefore the need to develop a truly sustainable economy has risen up the political agenda. Even within the economics, much work is now under way to extend the boundary of economics to include work by psychologists, political scientists, and sociologists (Stiglitz and Akerlof, 2009). On the lessons to be learned, Stiglitz and Akerlof note that

[w]e have much to learn, too, from economic history. For all the fanfare surrounding financial innovation, this crisis is remarkably similar to past financial crises, except that the complexity of new financial products reduced transparency, aggravating fear about what might happen should there not be a massive public bailout.

In relating to the current research, as discussed in this thesis, the Western definition of development, which has been the dominating understanding of development over the last one and half centuries or so, has resulted in the world, regardless of developed and less-developed countries or regions, the search for a narrowly materialistic centred well-being. The current global recession can be seen as a result of the lack of holistic understanding of development. Drawing on the current research, it is argued normatively that there is a need to redefine the concept of development so that it can better serve and rule our development behaviour toward economically, socially, culturally, and environmentally sustainable in a balanced manner.

The traditional Chinese understanding of development which derived from the combination of Confucianism, Taoist, and Chinese Buddhism appeared to be “harmonious” in terms of economic, social, cultural, and environmental development. As evidenced by this study, the quality of life and happiness are not driven decisively by economic growth but the “harmonious environment”, which is similar to knowledge environment defined by this study. Such an environment may be developed through

engaging all members of the whole community to make consensual efforts to the betterment of their life through the sophisticated use of human wisdom.

Nevertheless, even within China its traditional understanding of development has been replaced by and large by the Western understanding of development. Indeed, over the last three decades, the economic centred development policy and the economic decentralisation in China have resulted in many local authorities becoming profit making organisations. Chinese cultural traditions (include cultural heritages), social justice, and environmental sustainability were giving way to economic growth. Not surprisingly, this has led to the destruction of cultural traditions and heritages, the radical increase of social inequality, and the over exploitation of natural resources and the environment degradation. Moreover, due to the lack of a systematically designed policy framework, the economic decentralisation has resulted in local and regional authorities no longer share the same interest with the central government. As a result, it has become often that national development strategies and policies are found not properly implemented by local and regional authorities. Tensions have therefore been developed which, in turn, risks the general social stability.

The recent change of national development strategy which calls for developing a “harmonious society” following the “scientific development concept” signals an effort made by the central government to return to the tradition of Chinese understating of development. However, since the abovementioned “lock-in” has already developed, path dependence may make it difficult for China to redirect immediately regional and local development behaviour. Nevertheless, as evidenced by the case of Chengdu, this may be achieved through developing an appropriate institutional mechanism and an efficient policy framework to foster a cohesive knowledge environment based on the traditional Chinese culture both in national and regional scales. In this regard, the recommendations offered by the current research are thought to be highly relevant.

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# Appendix

## Selected websites

### Associations and international organizations

OECD

[www.oecd.org](http://www.oecd.org)

UN ESCO

[www.unwesco.org](http://www.unwesco.org)

UN Department of Economic and Social Affairs

[www.un.org/esa/desa](http://www.un.org/esa/desa)

UN Centre for Regional Development

[www.uncrd.or.jp](http://www.uncrd.or.jp)

European Union

Knowledge

Society

Homepage

[http://europa.eu.int/comm/employment\\_social/knowledge\\_society/index\\_en.htm](http://europa.eu.int/comm/employment_social/knowledge_society/index_en.htm)

Europe's Information Society

[http://europa.eu.int/information\\_society/index\\_en.htm](http://europa.eu.int/information_society/index_en.htm)

EU activities - Information society

[http://europa.eu.int/pol/infso/index\\_en.htm](http://europa.eu.int/pol/infso/index_en.htm)

European Association for Information on Local Development

[www.aeidlbe](http://www.aeidlbe)

European Cities Network

[www.eurocities.org](http://www.eurocities.org)

EU Statistics Division – Eurostat

<http://epp.eurostat.cec.eu.int>

World Bank

[www.worldbank.org](http://www.worldbank.org)

World Bank Institute

[www.worldbank.org/wbi](http://www.worldbank.org/wbi)

World Bank local Economic Development

[www.worldbank.org/urban/led](http://www.worldbank.org/urban/led)

Sustainable

Development

<http://lnweb18.worldbank.org/ESSD/sdvext.nsf/43ByDocName/SustainableDevelopment>

Knowledge for Development

[www.worldbank.org/wbi/knowledgefordevelopment/](http://www.worldbank.org/wbi/knowledgefordevelopment/)

Learning

Programs:

Sustainable

Development

[www.worldbank.org/wbi/sustainabledevelopment/](http://www.worldbank.org/wbi/sustainabledevelopment/)

World Secretariat of Cities and Local Government

[www.camval.org](http://www.camval.org)

Centre for Urban and Regional Development Studies (CURDS), University of Newcastle,  
UK [www.ncl.ac.uk/curds](http://www.ncl.ac.uk/curds)

International Network for Urban Research and Action

[www.inura.org](http://www.inura.org)

CITYNET

[www.citynet-ap.org/en/index.html](http://www.citynet-ap.org/en/index.html)

Global Urban Observatory (GUO)

[www.unchs.org/programmes/guo/default.asp](http://www.unchs.org/programmes/guo/default.asp)

Ibero-American Community for Knowledge Systems

[www.iberioamericana.org](http://www.iberioamericana.org)

ICLEI-Local Governments for Sustainability

[www.iclei.org](http://www.iclei.org)

Knowledgeland

<http://english.kennisland.nl/english/Home/index.html>

Learning Towns and Cities

[www.lifelonglearning.co.uk/learningcities/](http://www.lifelonglearning.co.uk/learningcities/)

Metropolis

[www.metropolis.org](http://www.metropolis.org)

TeleCities

[www.telecities.org](http://www.telecities.org)

United Cities and Local Governments

[www.cities-localgovernments.org/uclg/](http://www.cities-localgovernments.org/uclg/)

European Urban Knowledge Network

[www.eukn.org/eukn/](http://www.eukn.org/eukn/)

### **Cities and city-regions**

Amsterdam (Netherlands)

[www.amsterdampartners.nl/index.html?/service/aboutus.php](http://www.amsterdampartners.nl/index.html?/service/aboutus.php)

[www.onstat.amsterdam.nl/pdf/2003\\_yearbook\\_region.pdf](http://www.onstat.amsterdam.nl/pdf/2003_yearbook_region.pdf)

Róterdam (Netherlands)

[www.rotterdam.nl/](http://www.rotterdam.nl/)

Delft (Netherlands)

[www.delft.nl/webEN/content.jsp?objectid=33776](http://www.delft.nl/webEN/content.jsp?objectid=33776)

Washington (USA)

<http://access.wa.gov/>

Atlanta (USA)

[www.seattle.gov/](http://www.seattle.gov/)

Austin (USA)

[www.ci.austin.tx.us/](http://www.ci.austin.tx.us/)

Boston (USA)

[www.cityofboston.gov/](http://www.cityofboston.gov/)

Chicago (USA)

<http://egov.cityofchicago.org/city/webportal/home.do>

Silicon Valley (USA)

[www.siliconvalley-usa.com/](http://www.siliconvalley-usa.com/)

Houston (USA)

[www.cityofhouston.gov/](http://www.cityofhouston.gov/)

Los Angeles (USA)

[www.lacity.org/](http://www.lacity.org/)

Ohio (USA)

[www.ohioknowledgeeconomy.org/](http://www.ohioknowledgeeconomy.org/)

New England (USA)

[www.creativeeconomy.org](http://www.creativeeconomy.org)

New York (USA)

[www.state.ny.us/](http://www.state.ny.us/)

San Francisco (USA)

[www.ci.sf.ca.us/](http://www.ci.sf.ca.us/)

Philadelphia (USA)

[www.ipphila.com/](http://www.ipphila.com/)

Phoenix (USA)

<http://phoenix.gov/>

Pittsburgh (USA)

[www.city.pittsburgh.pa.us](http://www.city.pittsburgh.pa.us)

Seattle (USA)

[www.seattle.gov/](http://www.seattle.gov/)

Bangalore (India)

[www.bangalore.com/](http://www.bangalore.com/)

Bhubaneswar (India)

[www.idcoindia.com](http://www.idcoindia.com)

Dhirubhai Ambani (India)

[\[b.com/companies/companies\\\_r/reliance\\\_infocom/20021227\\\_knowledge\\\_city.html\]\(http://b.com/companies/companies\_r/reliance\_infocom/20021227\_knowledge\_city.html\)](http://www.domain-</a></u></p></div><div data-bbox=)

**Barcelona (Spain)**

<http://www.bcn.es/english/ihome.htm>

[www.22barcelona.com/index.php?lang=en](http://www.22barcelona.com/index.php?lang=en)

**Bilbao (Spain)**

[www.bm30.es/](http://www.bm30.es/)

**London (UK)**

[www.knowledgeboard.com/cgi-bin/item.cgi?id=125574&d=pnd](http://www.knowledgeboard.com/cgi-bin/item.cgi?id=125574&d=pnd)

**Birmingham (UK)**

[www.birmingham.gov.uk/](http://www.birmingham.gov.uk/)

**Manchester (UK)**

<http://www.manchesterknowledge.com/>

**Newcastle (UK)**

[www.newcastle.gov.uk](http://www.newcastle.gov.uk)

[www.newcastlesciencecity.com/](http://www.newcastlesciencecity.com/)

**Cambridge (UK)**

[www.cambridgema.gov/index.cfm](http://www.cambridgema.gov/index.cfm)

[www.cgkp.org.uk](http://www.cgkp.org.uk)

**Cardiff (UK)**

[www.cf.ac.uk/news/03-04/031103.html](http://www.cf.ac.uk/news/03-04/031103.html)

**Edinburgh (UK)**

[www.edinburgh.gov.uk](http://www.edinburgh.gov.uk)

**Calgary (Canada)**

[www.smartcalgary.ca/](http://www.smartcalgary.ca/)

**Montreal (Canada)**

[http://ville.montreal.qc.ca/portal/page?\\_pageid=5977,40491560&\\_dad=portal&\\_schema=PORTAL](http://ville.montreal.qc.ca/portal/page?_pageid=5977,40491560&_dad=portal&_schema=PORTAL)

[www.montrealinternational.com/docs/MtlSavoir\\_En.pdf](http://www.montrealinternational.com/docs/MtlSavoir_En.pdf)

[www.cmm.qc.ca/asp/bulletin.asp?ID=21&item=124&lang=2&Rubrique=4978](http://www.cmm.qc.ca/asp/bulletin.asp?ID=21&item=124&lang=2&Rubrique=4978)

Denmark

[www.denmark.dk/](http://www.denmark.dk/)

Dubai Knowledge Village

[www.kv.ae/](http://www.kv.ae/)

Dublin (Ireland)

[www.dubchamber.ie/Uploads/2020%20Vision.pdf](http://www.dubchamber.ie/Uploads/2020%20Vision.pdf)

[www.dublincity.ie/Pages/Homepage.aspx](http://www.dublincity.ie/Pages/Homepage.aspx)

Ennis (Ireland)

[www.ennis.ie/cgi-bin/eiat.cgi?page=information\\_age\\_town.htm](http://www.ennis.ie/cgi-bin/eiat.cgi?page=information_age_town.htm)

Helsinki (Finland)

[www.helsinki.fi/](http://www.helsinki.fi/)

Kyoto (Japan)

[www.kantei.go.jp/foreign/index-e.html](http://www.kantei.go.jp/foreign/index-e.html)

Taodok Science Town (South Korea)

<http://park.org/Korea/Pavilions/PublicPavilions/Government/most/taedok.html>

Oslo (Norway)

[www.oslo.technopole.no](http://www.oslo.technopole.no)

Lillestrøm (Norway)

[www.lillestrom.no/](http://www.lillestrom.no/)

Lyon (France)

[www.cities-lyon.org/fr/vilnius-knowledge-economy](http://www.cities-lyon.org/fr/vilnius-knowledge-economy)

Stockholm (Sweden)

[www.stockholm.se/english/](http://www.stockholm.se/english/)

Malmö (Sweden)

[www.malmo.se/html/](http://www.malmo.se/html/)

Manukau (New Zealand)

[www.manukau.govt.nz/reports/sm-response.pdf](http://www.manukau.govt.nz/reports/sm-response.pdf)

Medellín (Colombia)

[www.cta.org.co/publicaciones/Agenda.pdf](http://www.cta.org.co/publicaciones/Agenda.pdf)

Melbourne (Australia)

[www.melbourne.vic.gov.au/cityplan/infopage.cfm](http://www.melbourne.vic.gov.au/cityplan/infopage.cfm)

Monterrey (Mexico)

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Singapore

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Beijing (China)



[www.beijing.gov.cn](http://www.beijing.gov.cn)

Zhengzhou (China)

[www.zhengzhou.gov.cn](http://www.zhengzhou.gov.cn)

[www.zhengdong.gov.cn/](http://www.zhengdong.gov.cn/)

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[www.hlhtz.gov.cn/](http://www.hlhtz.gov.cn/)

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**China Government**

Ministry of Science and Technology

[www.most.gov.cn](http://www.most.gov.cn)

Ministry of Education

[www.moe.gov.cn](http://www.moe.gov.cn)

National Bureau of Statistics of China

[www.stats.gov.cn](http://www.stats.gov.cn)

Development and Reform Commission

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