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Developing a knowledge-based urban development analysis framework: the case of Multimedia Super Corridor, Malaysia

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Structured Abstract

Purpose – In the global knowledge economy, investment in knowledge-intensive industries and information and communication technology (ICT) infrastructures are seen as significant factors in improving the overall socio-economic fabric of cities. Consequently knowledge-based urban development (KBUD) has become a new paradigm in urban planning and development, for increasing the welfare and competitiveness of cities and regions. The paper discusses the critical connections between KBUD strategies and knowledge-intensive industries and ICT infrastructures. In particular, it investigates the application of the knowledge-based urban development concept by discussing one of South East Asia's large scale manifestations of KBUD; Malaysia's Multimedia Super Corridor.

Design/methodology/approach – The paper provides a review of the KBUD concept and develops a knowledge-based urban development assessment framework to provide a clearer understanding of development and evolution of KBUD manifestations. Subsequently the paper investigates the implementation of the KBUD concept within the

Malaysian context, and particularly the Multimedia Super Corridor (MSC).

Originality/value – The paper, with its KBUD assessment framework, scrutinises Malaysia's experience; providing an overview of the MSC project and discussion of the case findings. The development and evolution of the MSC is viewed with regard to KBUD policy implementation, infrastructural implications, and the agencies involved in the development and management of the MSC.

Practical implications – The emergence of the knowledge economy, together with the issues of globalisation and rapid urbanisation, have created an urgent need for urban planners to explore new ways of strategising planning and development that encompasses the needs and requirements of the knowledge economy and society. In light of the literature and MSC case findings, the paper provides generic recommendations, on the orchestration of knowledge-based urban development, for other cities and regions seeking to transform to the knowledge economy.

Keywords – Knowledge-based urban development; knowledge economy; knowledge worker; Multimedia Super Corridor; Malaysia.

Paper type – Academic Research Paper

1 Introduction

Globalisation and the intensification of the knowledge economy, shaped by the growth of the information and communication technology (ICT) sectors, have resulted in the radical alteration of the urban environment through dynamic processes of economic and spatial restructuring (Castells, 2000; Slabbert, 2006; Metaxiotis et al., 2010). In the knowledge economy, classical production is replaced with more abstract forms of production, and accordingly (as activities in the knowledge sector become more important) it requires conditions and environments, different from the commodity-based manufacturing economy (Knight, 1995). Furthermore, within the knowledge economy, knowledge and ICTs are considered to be as important as established factors of production (i.e. land, labour, capital) in the creation of jobs and wealth (Cooke, 2001). Consequently, there is an increasing need for urban planners to explore new ways of strategising planning and development to encompass the requirements of the emerging knowledge society (Yigitcanlar and Martinez-Fernandez, 2010). Knowledge-based urban development (KBUD) provides an approach to foster the element and production of knowledge in urban development. It assures enabling conditions for cities in global competition and aims to make them compatible with the knowledge economy through mechanisms for the promotion, creation, and exchange of knowledge and innovation (Ergazakis et al., 2004). Over the last 20 years the desire to remain competitive and prosperous within the knowledge economy has compelled the developing nation of Malaysia to undertake structural transformation, in an effort to move the economy from primary commodities base and agricultural dependence, to a manufacturing base and export driven system, with a focus on high technology and capital intensive industries (Ramasamy et. al., 2004). Until recently, due to the country's rich natural resources and relatively low-cost labour force; economic growth and prosperity in Malaysia has been almost entirely supported by commodity-based manufacturing-led industries (Yigitcanlar and Sarimin, 2010). The knowledge economy, with its non traditional factors of

production, offers Malaysia a platform from which the developing nation can achieve more sustainable economic and socio-spatial growth, and consequently become globally competitive.

2 Background

Interest in the knowledge economy has been stimulated by its promise to provide cities and regions with opportunities for sustaining a rapid rate of economic growth, enhance global competitiveness, and strengthen their capabilities to be innovating, adaptive and create indigenous technologies. The knowledge economy is broadly characterised by non-diminishing resources, such as knowledge, whereby knowledge inputs are rapidly expanding in tandem with technology and innovation. Specifically, it refers to the generation of income through the creation, production, distribution and consumption of knowledge and knowledge-based products; in which the outputs are not only raw materials and quantified goods, but also a highly skilled and educated labour force capable of producing abstract goods such as information, software and management (Yigitcanlar et. al., 2008a; 2008b). Within the knowledge economy traditional factors of production (i.e. land, labour and capital) are accompanied by information, innovation and the transference of skills using technology such as the internet, and knowledge is a key driving force underlying growth and a valuable commodity, not only as a factor of production but also as a commodity to be traded (Cooke, 2001; Hearn and Rooney, 2008). As Cooke (2001) states the knowledge economy, is not dependent on traditional factors such as proximity of the industry to the raw materials and availability of a transport hub to distribute produced goods, and consequently cities and regions are experiencing an increased mobility of capital and labour. Figure 1 below delineates the evolution of information and knowledge as key factors effecting economic development (for more information see Drucker, 1993).

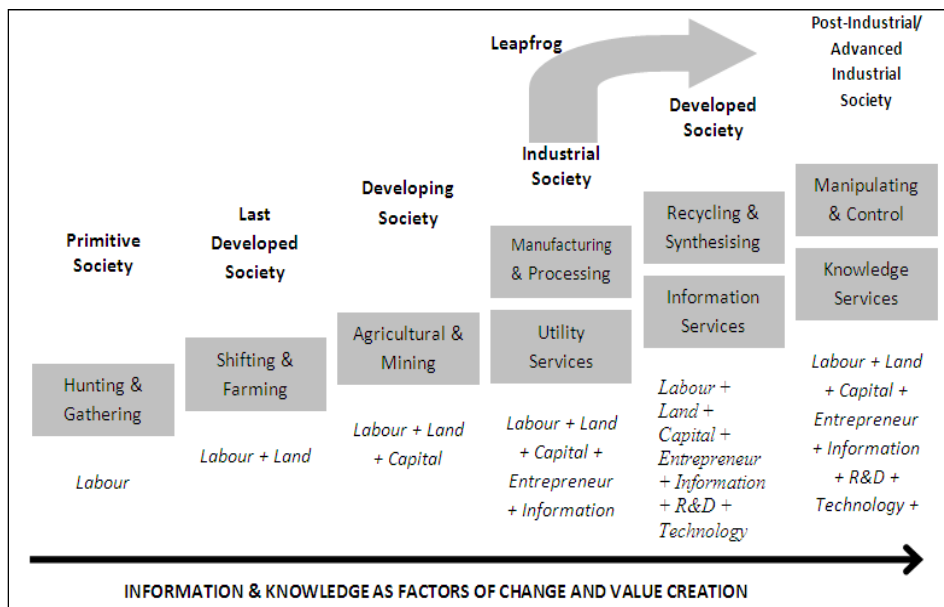


Figure 1 Evolution of factors effecting development (Mohan et al., 2004)

As much of the knowledge economy is focused in the creation of abstract goods produced by a highly educated labour force, and key assets include higher levels of per capita wealth, skills and knowledge; making a place attractive to global talents and investment is of primary importance. KBUD is a strategic management approach for cities and regions within the knowledge economy, which supports the transformation of advanced economies from manufacturing to knowledge-based activities, through a focus on catering for and attracting knowledge-based and high-technology industries that are expected to contribute significantly to employment, GDP and exports. Consequently, KBUD strategies are being implemented in the planning, development, management, and spatial organisation of economic activities, within many cities and regions.

2.1 Knowledge-based Urban Development

KBUD transcends many areas of economic, social and urban policy, and proposes various improvements, including higher levels of economic success and knowledge intensity, industrial diversity, strong academic institutions, excellent communications and transport infrastructure, and differentiation strategies to investors and individuals for economic success (Yigitcanlar et al., 2008d). Primarily, KBUD is an economic development strategy that codifies technical knowledge for the innovation of products and services, including urban services, market knowledge for understanding changes in the economy, financial knowledge to measure the inputs and outputs of production and development processes, and human knowledge in the form of skills and creativity, within an economic model (Lever, 2002). It aims at a local economic development that is competitive and integrated with global knowledge economy. In addition KBUD indicates the intention to increase the skills and knowledge of residents and employees as a means for intellectual, human and social development (Gonzalez et al., 2005). It aims to increase the quality of life by providing necessary services for societal development. Moreover, KBUD builds a strong spatial relationship among knowledge community precincts for augmenting the knowledge spill-over effect that contributes significantly to the establishment and expansion of creative urban regions and supports linkages and knowledge transfer between these precincts (Yigitcanlar et al., 2008c). It also aims an urban development that is ecologically sensitive, sustainable and safe. Figure 2 below outlines the key actors of KBUD required to facilitate the necessary knowledge-intensive activities within a city or region, for knowledge economy transformation.

Whilst cities and metropolitan regions have always been considered to be centres of knowledge generation and related activities, advances in various ICTs are supporting a marked increase in the knowledge-base of city and resulting in cities that are more dynamic and responsive to community needs. Accordingly, many cities and regions have been impacted by the development of virtual market places and organisations and ICTs have become one of the pillars of KBUD and the knowledge economy; providing connections to corresponding global nodes and contributing to the formation of open cosmopolitan societies (Corey and Wilson, 2006). As a result, the central conditions of KBUD include such things as: knowledge infrastructure (e.g. universities, research and development institutes); technological infrastructure (e.g. information and communication technologies); connections to the global economy (e.g. international companies and finance institutions); and concentrations of well-educated and creative people (e.g. knowledge and creative workers) (Van Winden and Berg, 2004; Carrillo, 2006).

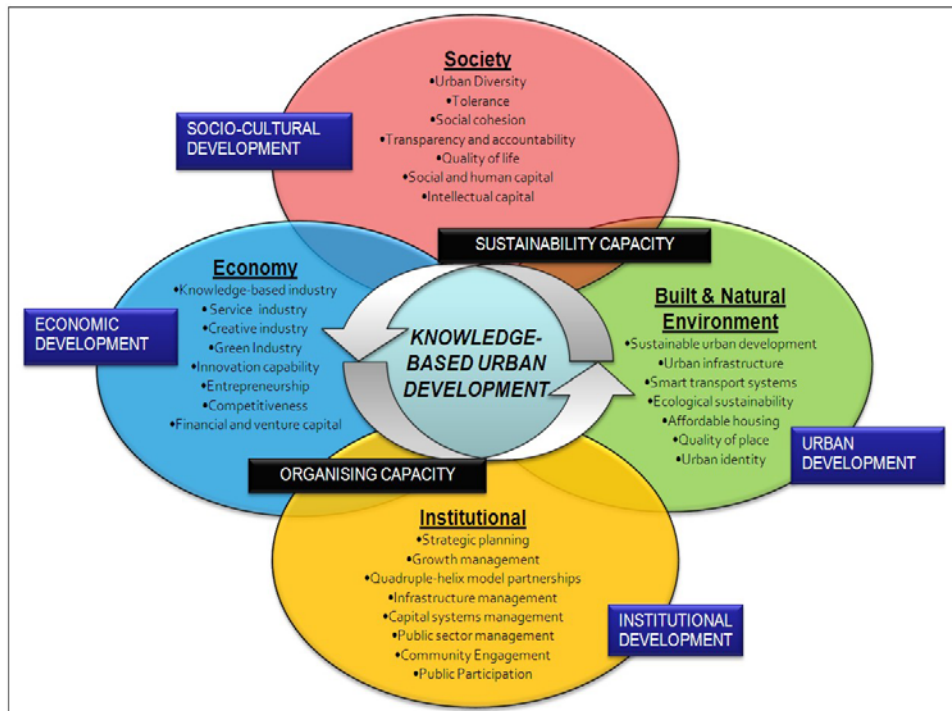


Figure 2 Key actors of KBUD (Yigitcanlar, 2009)

3 Malaysia's Transformation to the Knowledge Economy

In recent years, development policies in Malaysia have been refocused to accommodate activities that rely more heavily on knowledge and human capitals, and they adopt various basic foundations of the knowledge economy; such as human resource development, research and development, information infrastructure provision, science and technology, financing and equity, and the minimisation of the digital divide (Jaffee, 1998). The Malaysian experience represents a new paradigm in the creation of value for the knowledge economy, in so far as it aspires to transform not just the economy but also the national identity, and conveys the new socio-spatial vision for the nation, through KBUD strategies. As Mohamad (1998) suggests, Malaysian KBUD initiatives move beyond a strategy for the creation the ideal environment for technology, to an attempt to alter the way of life itself to one that fosters the establishment of a knowledgeable population. Malaysia has a number of other planning mechanisms, such as the five year Malaysia Plan and Outline Perspective Plan, which seek to recreate Malaysia as an information-based society. For example, under the current economic blueprint for the nation, Ninth Malaysia Plan (spanning 2006 -2010), knowledge development is placed as the second of five priority development driving forces. Furthermore strategies are contained with each that attempt to provide the physical infrastructure required for knowledge acquisition and technological transfer. As the Malaysian planning system is based on the British model, a plan-led system directed by policies outlined in the hierarchical order of plans, the future spatial development of the nation is considered to correspond well with the intent of KBUD (Al-Furaih et al., 2007).

3.1 Knowledge-based Urban Development in Malaysia

The intention to transform Malaysia to the knowledge economy first became evident in the mid 1990's with the release of the National ICT Agenda (NITA), which is underpinned by KBUD initiatives for the creation of the ideal environment for the ICT and multimedia sectors (Economic Planning Unit, 2001). Generally, NITA serves to guide the formulation of strategies for the development, promotion and utilisation of ICT's, and in turn seeks to promote Malaysia to a realm of global competitiveness in the ICT sectors. Consequently, NITA serves as a catalyst to attract and retain knowledge workers, industries and businesses, through the creation of an attractive and suitable environment for the development of ICT and related industries. KBUD within the agenda is basic telecommunications infrastructures in addition to a corridor development project comprising five designated cyber cities: Kuala Lumpur City Centre, Kuala Lumpur Tower, Technology Park Malaysia, Cyberjaya and Malaysian Technology Development Corporation, and University of Putra Malaysia Incubator Centre. Malaysia's shift to the knowledge economy has also become part of a wider national plan to sustain economic growth and increase prosperity through amplifying the role knowledge has to play in driving productivity (Economic Research Services Department, 2000). 'Vision 2020' is the thirty year plan that aspires to achieve more sustainable growth in Malaysia's gross domestic product (GDP) and, in terms of economic performance and technological capabilities, elevate the country to a higher trajectory to achieve a 'developed nation' status (Mohamad, 1996). It is intended that the Malaysian public can unite under the vision that seeks to make over Malaysia as a robust and resilient nation; in which the society is more democratic, progressive and tolerant, whilst retaining strong moral and ethical values. Specifically, the plan endeavours to achieve a national shift to the knowledge economy; supported by the establishment of ICT sectors and implementation of various KBUD strategies. For example 'Vision 2020' challenges the nation "to establish a scientific and progressive society, a society that is innovative and forward looking; one that is not only a consumer of technology but also a contributor to the scientific and technological civilisation of the future" (Economic Planning Unit, 2006:39). Furthermore, significant commitments to KBUD contained within the plan, are most obvious in the ambitious Multimedia Super Corridor (MSC) multi-billion dollar project (Yigitcanlar and Sarimin, 2010).

4 ICT Development in Malaysia

Malaysia's aforementioned Multimedia Super Corridor Project (MSC), an ICT hub of next generation telecommunications infrastructure designed to promote multimedia products and services within a legislative framework; is one of the largest and considered to be one of the most significant KBUD undertakings within south-east Asia. The MSC project seeks to provide Malaysia with a world leading example of ICT development; supported through the creation of an urban corridor incorporating 'state-of-the-art' multimedia infrastructure, an efficient transportation system and an attractive living environment (Yigitcanlar and Sarimin, 2010). Figure 3 indicates the location of the MSC within its local and regional setting.

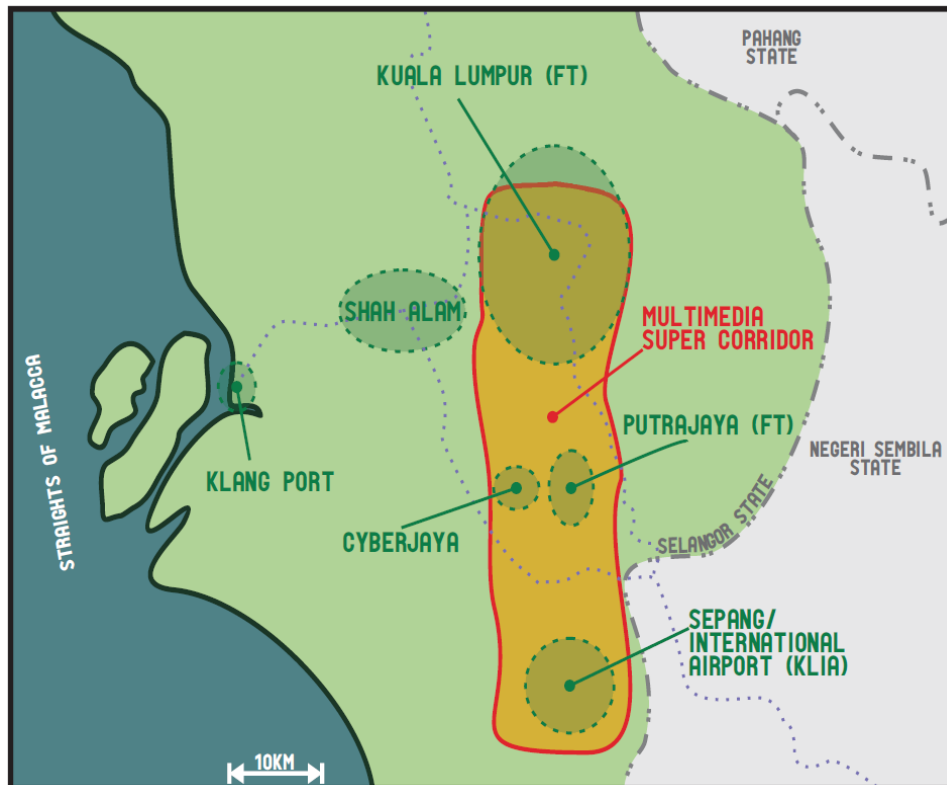


Figure 3 Location of the Multimedia Super Corridor (Bowman et. al., 2008:9)

It is intended that the MSC will function as a multimedia catalyst to provide Malaysia with the high technology environment necessary to attract knowledge workers, techno-entrepreneurs and industries to invest and operate within the nation. Furthermore, it is envisaged that the MSC region will become a global centre for research, development and design, and have the capacity to be the operational headquarters for numerous multinational firms. In order to achieve this vision and support the orderly development and efficient management of land and resources; development within the region is governed by a number of KBUD strategies in the form of local area plans and urban design guidelines contained within various planning and policy documents (Federal Town and Country Planning, 1997a; 1997b). KBUD is utilised as a strategic mechanism for physical, economic and socio-cultural development processes, to realize highest quality-of-life opportunities for all socio-economic levels of resident, and achieve a socially and culturally rich community within the MSC. For example KBUD is delineated through various objectives, such as “to facilitate a human oriented, intelligent city in harmony with nature” and “to promote opportunities for vibrant enterprise, commercial and residential development” (Federal Town and Country Planning, 1997a; 1997b). Furthermore, KBUD directs the development of the physical attributes necessary to establish the MSC as a centre for information and technological advancement, such as appropriate advanced telecommunication infrastructure for multimedia and ICT industries, and in doing so contributes to the promotion of new industrial sectors within the region to support growth of the knowledge economy (Yigitcanlar and Sarimin, 2010).

4.1 Multimedia Super Corridor

The overall full implementation and execution of the MSC is estimated at an approximate twenty year timeframe divided into three phases of activities, with operational management the designated responsibility of the Multimedia Development Corporation (MDeC). The MDeC successfully completed the first phase of the MSC between the years of 1996 and 2004; and were responsible for instituting a world-leading framework of cyber laws, establishing Cyberjaya as the world's-first intelligent city, and attracting a core group of world-class companies (Yigitcanlar and Sarimin, 2010). In addition seven 'Flagship Applications' have been launched, and function to support the expansion of: R&D clusters; electronic government; world-wide manufacturing networks; borderless marketing arenas; tele-medical; smart schools; and multi-purpose activities. The first phase of the MSC comprises an area approximately 750 square kilometres and incorporates cluster developments of seven distinctive functional zones; these designations include Airport City, Cyber Village, High-Technology Park, R&D Centre, Tele-suburb and two intelligent cities, Putrajaya and Cyberjaya (MDeC, 2008). As the name suggests, the Airport City zone is proposed as a development centre to provide support to the Kuala Lumpur International Airport and Aeronautical Services Centre. Cyber Village designations are intended to provide nucleuses for local ICT in the form of small and medium-scaled enterprises (SME's). High-Technology Parks are proposed as the locations for high-tech industrial related activities and institutions for industrial research and development. R&D Centres are located within the heart of the MSC, and are intended to be cluster developments between collaborative academic and corporate research and development institutions. Tele-Suburb zones act as the residential areas of the MSC, and are the areas proposed for the development of smart homes, smart schools and smart neighbourhood local centres. Finally, the corridor includes two intelligent cities Putrajaya and Cyberjaya; wherein Putrajaya is Malaysia's new federal administrative centre and electronic government, and the latter Cyberjaya is a development hub of ICT and multimedia companies (Mukhtar, 2008). Both intelligent cities consist of various designated zones for housing, enterprise, government services, open space, institutions, and commerce and businesses (Federal Department of Town and Country Planning, 2005; 2006). Cyberjaya, in particular, covers an area of approximately 7,000 hectares and serves to provide the infrastructure and facilities required to support multimedia industries in the MSC, in addition to accommodating a residential population of approximately 240,000 Malaysian's and a further 10,000 foreign knowledge workers. The MSC is currently within its second phase, aimed at linking the corridor to other cities around Malaysia and the globe, and is expected to be completed toward the latter part of 2010. It is proposed that the MSC will link to other international cyber cities by creating a web of corridors and establishing 'world class' companies. Ultimately the MDeC endeavour to develop a number of intelligent and globally well-linked cities and establish the MSC as a global exemplar for flagship applications and cyber laws. The third and final stage (2010-2020), proposes a nation-wide expansion of the corridor, so as to transform overall society and the nation into the knowledge economy envisaged by 'Vision 2020' (MDeC, 2006; 2008).

5 Discussion

The overall founding principles and key development strategies of the MSC can be seen to be closely linked to the central conditions of KBUD, which in turn highlights Malaysia's ongoing transformation from classical industrial society to knowledge

economy. For example within the first phase of development of the MSC, many KBUD conditions have proven successful in stimulating national economic growth, such as: ICT and technological infrastructure (i.e widespread optical fibre development); international investment and connections to the global economy (i.e. foreign corporations and five gigabit international gateway); concentrations of knowledge and creative workers (i.e. Putrajaya and Cyberjaya); knowledge institutions (i.e. R&D Centres and Cyber Villages); and organisational capacity (i.e. Flagship Applications, Vision 2020 and National ICT Agenda). Strategic policy thrusts, which concentrate on the development of e-commerce, e-public services, e-learning, e-economy and e-sovereignty have been coordinated with a number of tactical policies within the MSC; these include a federal government 'Bill of Guarantee', and strategies, offering both attractive financial and non-financial incentives to local and international investors. The foremost policy focuses on the development of the key physical infrastructure, such as Kuala Lumpur city centre, Kuala Lumpur Tower, and Kuala Lumpur International Airport in addition to Putrajaya and Cyberjaya. Largely the policy serves to integrate logistical hubs by providing a rapid rail link to Kuala Lumpur, and a smart highway between the two intelligent cities. The succeeding policy centres on the execution of legal procedures to aid in the advancement of electronic commerce and multimedia applications. The subsequent policy centres on the expansion of high-capacity telecommunications and logistics infrastructure. Specifically this policy delineates the widespread development of a ten gigabit digital optical fibre throughout the MSC, and the use of ATM switches to provide fibre-optic connections to buildings; in addition to providing a five gigabit international gateway with direct linkages to the USA, Europe and Japan as well as the other Asian nations. The final policy seeks to reiterate the fundamental importance of a high powered organisation such as the MDeC, in the continued operational management of the MSC beyond 2020.

In addition to these policies, and in order to encourage the establishment of knowledge industries in the MSC (i.e. ICT and multimedia companies); the Malaysian federal government has established a 'Bill of Guarantee'. The guiding principles of and government commitments contained within the bill are summarized as follows (MDeC, 2006):

- Provision of 'world-class' physical and information infrastructure;
- Unrestricted employment capacity of local and foreign knowledge workers;
- Freedom of ownership and exemption of MSC companies from local ownership requirements;
- Unrestricted capacity to source global capital for infrastructure development;
- Provision of competitive financial incentives, including tax free periods and investment and duty free tax allowances;
- Exceptional intellectual property protection regulations and cyber laws;
- Freedom from internet censorship;
- Provision of globally competitive telecommunications tariffs;
- Awarding of key infrastructure contracts to companies with regional operations centres in MSC;
- Establishment of MDeC as leading agent for operational management of MSC.

Beyond ICT and multimedia industries the MDeC also seeks to attract non-ICT businesses to the MSC, especially enterprises within the finance, insurance and real-estate sectors. Consequently, and in conjunction with the 'Bill of Guarantee', the MDeC offers MSC companies access to various financial and non financial incentives. For example,

companies are provided five years exemption from Malaysian income tax, renewable for a period up to ten years. Alternatively companies can participate in a one hundred percent (100%) Investment Tax Allowance for up to five years on new MSC development investments (provided they qualify under the Promotion of Investment Act 1997), duty free importation of multimedia equipment as well as R&D grants for local SME's. In terms of non-financial incentives for example, knowledge workers can participate in a fast-tracking system for obtaining working visas, which permit foreign employees multiple entries for an initial period of up to five years. Furthermore companies have rights to the unrestricted employment of foreign knowledge workers, freedom of ownership, freedom to source capital globally, intellectual property protection, execution of cyber laws and a healthy physical environment (Yigitcanlar and Sarimin, 2010).

In terms of the organisational capacity and institutional development processes required for successful KBUD, the MSC is influenced by a number of key government appointed agencies. The principal agency for the MSC is the aforementioned Multimedia Development Corporation (MDeC), which serves as a 'one-stop agency', charged with the responsibility of facilitating the operation and ensuring the success of the MSC, including the companies located within the corridor. The MDeC are obligated to advise the Malaysian Government on legislation and policies relating to specific MSC matters, and set the regulations for national multi-media operations. Furthermore, MDeC functions to develop and manage the MSC in line with the vision to realise Malaysia as a globally recognised location for ICT and multimedia innovations, services and operations (MDeC, 2008). As a supporting agency to MDeC the Cyberview Corporation, is the government agency spearheading the development of, and overall proprietor of Cyberjaya. Cyberview's mission is to realise Cyberjaya as an ICT nucleus of the MSC and centre from which to fulfil specific initiatives of 'Vision 2020'. The primary roles assigned to Cyberview include coordinating joint ventures within Cyberjaya, and ensuring that all activities are achieved in accordance with MSC guidelines. Furthermore, Cyberview is responsible for the physical development of Cyberjaya, including land administration and enterprise matters, and built form, provision of amenities and maintenance (Cyberview Corporation, 2009). Subsequent to Cyberview Corporation is the Setia Haruman Corporation, which acts as the master developer of Cyberjaya. Setia Haruman is entrusted with the tasks of planning, designing and provision of primary infrastructure for the Cyberjaya 'Flagship' zone. The 'Flagship' area covers approximately 7,000 acres of freehold land equipped with a multitude of intelligent network services and interactive broadband services, and comprises four key zones: enterprise; commercial; institutional; and residential. Setia Haruman is also responsible for the marketing and selling of land parcels and real estate developments, in addition to offering assistance for the attainment of planning approvals for land reconfiguration and buildings, both commercial and residential (Setia Haruman Corporation, 2009). Finally, Sepang Municipal Council (SMC) formerly the Sepang District Council, is the local planning authority for Cyberjaya and have administrative power for approximately 60,000 square kilometres of developable land within the MSC. The responsibility of SMC as the local planning authority for Sepang is set out under the Local Government Act 1976, and is of critical importance as the unique agency with executive power to provide planning, and development approvals within, and community services to Cyberjaya (SMC, 2008).

5 A knowledge-based urban development analysis framework

An overall KBUD conceptual framework is developed on the basis of the extensive literature review (Figure 4). The first tier of the conceptual framework shows the three main dimensions laying the foundations of this research are i.e. the theoretical foundations, KBUD foundations and knowledge city foundations. The theoretical foundation is the most crucial aspect in developing the conceptual framework. Four main theories that are related to the key ideas of this research have been identified i.e. economy, urban planning and human capital. The theories selected are Relational Theory (Graham and Healey, 1999), New Growth Theory (Romer, 1986), Human Capital Theory and Creative Class Thesis (Florida, 2004) and Actors Network Theory (Callon and Latour, 1992); where each provides a different insight towards the research problems. The conceptual framework is developed based on the KBUD foundations which consist of four different categories of development identified in the literature namely urban development, economic development, human and social development and institutional development. Each dimension shows the respective specific components that need to be comprehended. The knowledge city foundations were also taken into consideration as the cities which have successfully undergone the KBUD process would label themselves as knowledge cities. In this case, the knowledge cities foundations are more focusing on aspects like knowledge base, economic base, socio-cultural base and institutional base. In addition, the knowledge cities foundations also emphasise on the quality of life and place which covers aspects like urban diversity, accessibility and connectivity and social equity. The conceptual framework also shows the supporting elements that further reinforce the foundations for this research that can be seen from the second tier of the conceptual framework. The supporting elements include KBUD actors, KBUD levels, KBUD models, KBUD benchmark and KBUD assessment methods where each has a distinct component to support the overall conceptual framework in developing the KBUD assessment framework. The overall methodology to develop a KBUD analysis framework is shown in Figure 5.

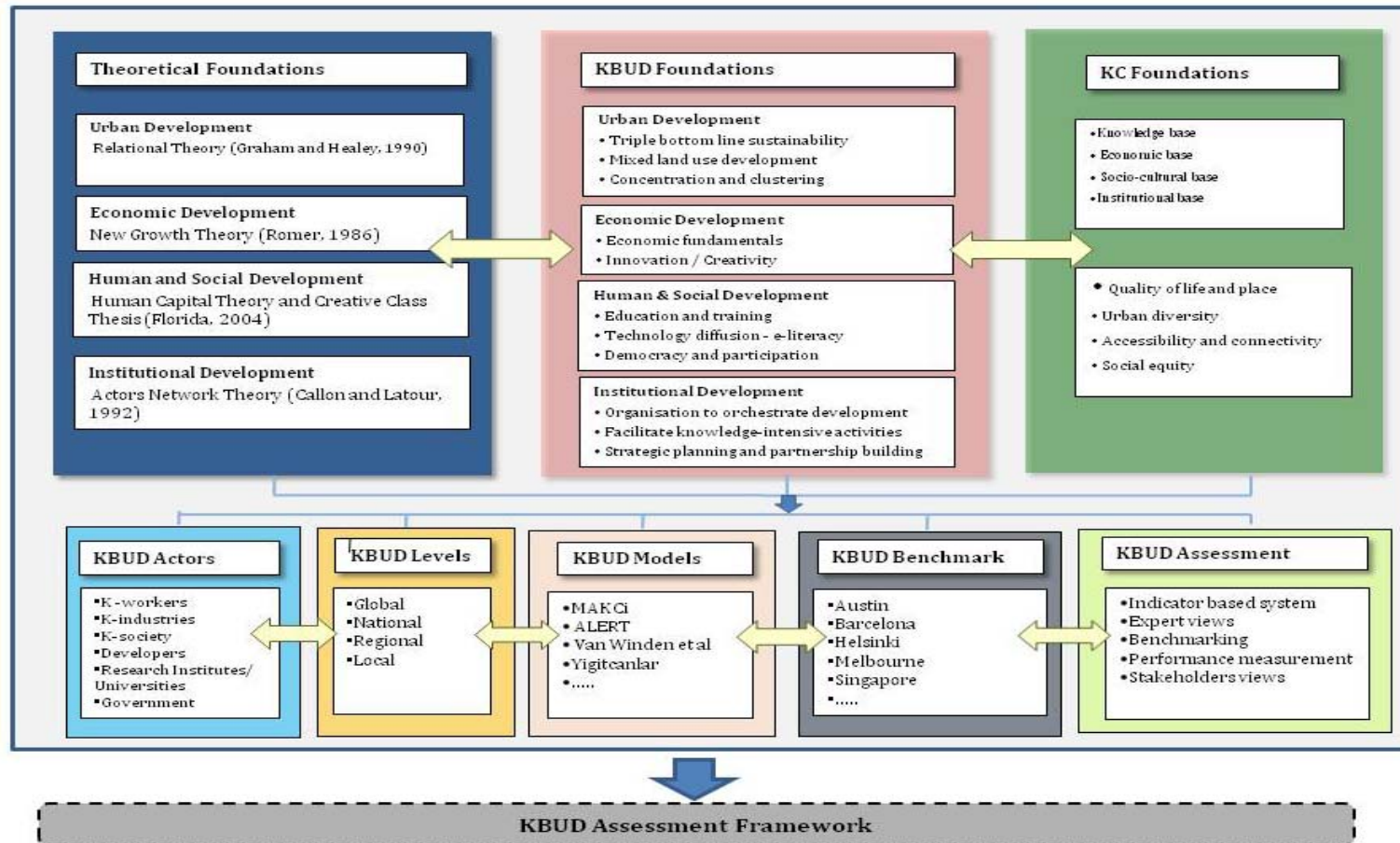


Figure 4 A conceptual framework for KBUD analysis

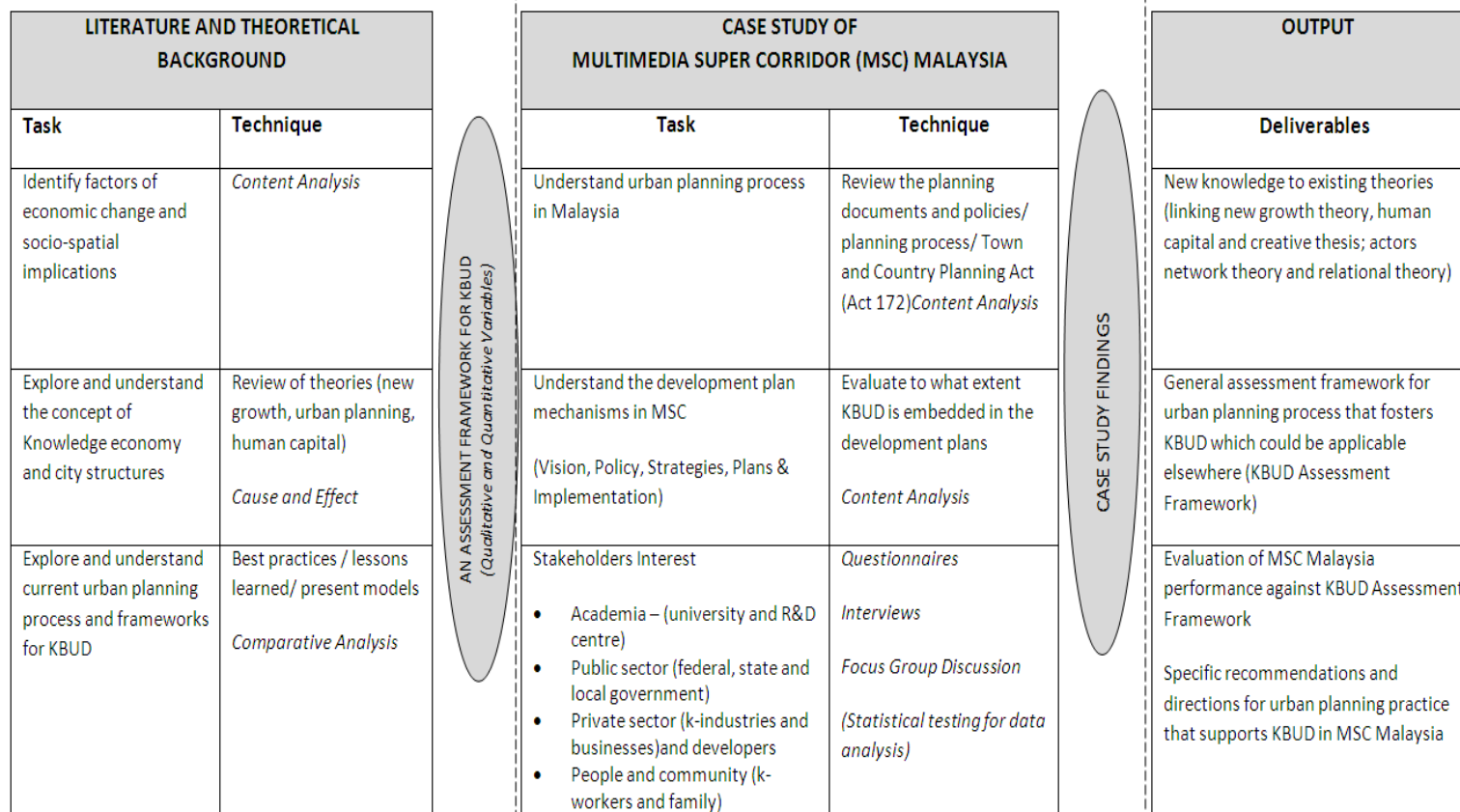


Figure 5 The overall methodology to develop a KBUD analysis framework

So far after an extensive literature review and theoretical understanding a preliminary KBUD analysis framework has been developed (Table 1). In the next stage of the study a Delphi survey will be used in order to finalise the development of the KBUD analysis framework. This will also be followed by the validation of the framework via additional ground-truthing by additional analyses and synthesis. Finally, at the last stage in the lights of the findings of the research the study will produce policy recommendations for stakeholders that are aiming to orchestrate the knowledge-based development of MSC.

Table 1 Preliminary KBUD analysis framework

DOMAINS	WEIGHT	CHARACTERISTICS	INDICATORS	PARAMETERS
Society (Socio Cultural Development)	25%	Quality Of Life	Housing Affordability	Levels of housing affordability for average income group
			Community facilities	Number of community facilities per capita
		Human & Social Development	White collar jobs	Ratio of white collar: blue collar jobs
			Literacy rate	Trend analysis of literacy rate
		Intellectual Capital	Level of education	Ratio of population with tertiary education
K-workers	Number of k-workers per capita			
Environment (Urban Development)	25%	Quality of Place	Green area	Ratio of green parks per capita
			Urban amenities	Ratio of selected urban amenities per capita
		Sustainability	Public transport initiative	Percentage of government budget on public transport
			Environmental Programmes	Percentage of government budget on environmental programmes
		Unique Identity	Cultural Factors	Numbers of international cultural events
Cultural Facilities	Number of cultural facilities			
Economy (Economic Development)	25%	Knowledge-based	Knowledge industries and businesses	Number of knowledge industries and businesses
			R&D centres	Number of R&D centres
		Competitive	Foreign Direct Investment (FDI)	Trend analysis on FDI
			Multinational HQs	Numbers of multinational head quarters (HQ)
		Creative and Innovative	Creative industries	Number of creative industries
Patents	Number of patents per year			
Management (Governance)	25%	Strategic and integrated	Vision of organisations	Direction of vision of the organisation
			Multidisciplinary personnel	Number of personnel within the organisation
		Democratic and Transparent	E-government	Number of government services with e-facilities
			E-submission	Number of e-submission for planning application
		Social equity	Wealth distribution	Percentage of wealth distribution among the 20% richest
Access to employment	Numbers of unemployment			

6 Conclusion

It is evident that ICT's and KBUD are playing a major role in shaping the physical, infrastructural and economic development of Malaysia in its transformation to knowledge economy. Notwithstanding criticisms levied at Malaysia's federal government with regard to the underdevelopment of socio-cultural support processes for the knowledge society; Cyberjaya as the largest manifestation of KBUD mechanisms provides a good example of success in inward investment and job creation. As Bunnell (2004:148) states, "by the infrastructural and economic criteria of its proponents, [the] MSC is perhaps the qualified success". Lepawsky (2005) further highlights the uniqueness of the MSC as the driver of national development and its role in the alteration of Malaysian identity. He states that the MSC "is not [only] just another physical location, or just another industrial or technological park – and it is not a far eastern imitation of the Silicon Valley, [but also] represents a new paradigm in the creation of value for the information age" (Mohamad, 1998:107, cited in Lepawsky, 2005:10). Whilst some of the benefits of KBUD strategies within MSC policy are obvious, urban planning and development at such a large scale requires additional time before the project can be more comprehensively evaluated. Beyond project dynamics, the physical development of the MSC is also subject to the global economic conditions and as Bunnell (2004) suggests the physical development of Cyberjaya has suffered critical infrastructure delays as a result of economic recession in 1997. Whilst, when compared to other digital districts such as Boston and Silicon Valley, the overall development of the MSC continues to progress, the current global financial crisis is having a similar impact on development as did the recession of 1997 (Indergaard, 2003 cited in Bunnell, 2004). Nonetheless, the MSC is a long term plan, and although largely driven by the private sector, it has full supported of the Malaysian Government and is regarded as a national strength within the knowledge economy.

In general, there are a number of lessons that can be learned from the development of MSC. Firstly, whilst other global examples of KBUD are commonly locally based (i.e. Delft, Barcelona, Silicon Valley), the MSC is unique in so far as it is positioned on the national agenda. Consequently KBUD is evident in the vision for the MSC, and has been translated into the various development plans which guide the direction of future development within the nation. This systematic approach ensures that elements of KBUD are continuously embedded within any future proposed socio-spatial development of Malaysia. Secondly, the successful development of the MSC to this point can be in part attributed to the concerted effort of both the public and private sectors. High levels of government intervention in combination with a continuous commitment to ensuring the success of KBUD initiatives have helped increase confidence in the MSC for international investors and reduce the impact of unfavourable market forces. Further to this, the creation of the MDeC, as a 'one-stop-agency' for operational management of the MSC is a critical institutional factor in the organisational capacity of KBUD. The final lesson that can be learned from the MSC development is that KBUD initiatives need to be correctly sited and phased. For example undertaking the first phase of MSC development in the Klang Valley Metropolitan Area (KLMA) was advantageous to the project in terms of obtaining an inimitable location. In fact, the MSC can be seen to have a 'unique niche' as it offers a comprehensive package with attractive surroundings and good quality of life (Taylor, 2003). In addition, the current breadth of local knowledge workers in Kuala Lumpur, Malaysia's capital city, has contributed to the successful establishment of KBUD initiatives; especially as KLMA offers a good quality urban setting from which the physical environment of Malaysia can be further enhanced.

At least in part the success of KBUD within the context of the MSC can be attributed to the comprehensive and cooperative effort from all levels of government within Malaysia. Notwithstanding, continuous policy monitoring is further required to ensure that the objectives of the MSC and 'Vision 2020' are appropriately achieved, so that Malaysia can become more competitive within the global marketplace. KBUD is a dynamic, participatory and strategic process and it requires a careful and delicate orchestration where the real success cannot happen in a short span of time, and hence continuous evaluation and assessment is required. Furthermore, particular attention needs to be paid to intangible factors of the knowledge economy such as the community attitudes and culture, as public input into the planning and development of the physical environment can serve to enhance the success of KBUD initiatives. The continued progress of the MSC into its second phase has proven it to be an appropriate platform for the manifestation of KBUD strategies to achieve the nation's 'Vision 2020' and transport Malaysia to developed nation status within the knowledge economy. In addition the MSC has become the key driver in making Malaysia more responsive to the threats and opportunities presented by the market driven and technology oriented economic globalisation. In the case of other developing nations, with similar characteristics to Malaysia, elevating KBUD initiatives to the national agenda is recommended as an effective strategy for transformation to the knowledge economy. Overall, the MSC is functioning to provide Malaysia an opportunity to enter the global marketplace through becoming an international centre for knowledge industries, enterprises and society.

Finally the KBUD analysis framework that has been developed for MSC is far from complete. Once the study is finalised, this research project will produce a very useful analysis framework that not only MSC stakeholders, but also stakeholders elsewhere in the world working towards orchestrating the knowledge-based development of their city and regions will highly benefit from.

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