Beyond the Digital Divide: Creating Knowledge Societies.

Ravi S. Sharma, Elaine W. J. Ng, Mathias Dharmawirya & Lee Chu Keong
Wee Kim Wee School of Communication & Information
Nanyang Technological University
Singapore

ABSTRACT

The research reported in this on-going research investigates the notion of knowledge assets developed within digital communities in the course of their economic or leisure activities. Ideally, the resulting knowledge is universal, affordable and relevant; this inclusiveness is a hallmark of any information or knowledge society. We first synthesize the related research literature covering the areas of knowledge based economies, knowledge societies and knowledge policies. We then develop a model using 13 dimensions that we claim are critical for creating a knowledge community in the digital economy. The model is validated against critique from a Delphi panel of researchers in the area and then secondary (but authoritative) data covering about 20 cities and several multi-faceted socio-economic studies of knowledge cities. We next use the model for a qualitative discussion of Singapore, Dubai and Los Angeles as baseline knowledge societies in order to test the model's applicability. We conclude with the major findings of how the may be best exploited in order to create sustainable knowledge societies. Tersely stated: culture is the key to creating knowledge societies and time is the essential ingredient for such a culture to come about.

Keywords – National Intellectual Capital, Sustainable Development, Knowledge Economy, Knowledge Policy.

1. Introduction

"Does the aim of building knowledge societies make any sense when history and anthropology teach us that since ancient times, all societies have probably been, each in its own way, knowledge societies?" (UNESCO, 2005, p 27). In this article, we claim that it does and attempt to support this claim with a conceptual model that articulates why and how, particularly for the countries of the so-called south. In an environment of globalization and competition, governments at regional, national, provincial and municipal levels have turned to knowledge as a strategic asset that drives sustainable economic advantage. The value of knowledge is particularly enhanced when it is created, shared and re-used within a critical mass of a society that possesses the requisite absorptive capacity or the ability to understand and apply knowledge. As Rodrigues (2003) states: "...what is at stake is more than information: it is knowledge, which implies cognitive capacity, learning, cultural patterns and understanding - in a single word, people." (p. 4). We may term such a community of people a *knowledge society*, an integral feature of a knowledge based economy with its consequent higher

quality of life and standard of living afforded to its members – an aspect which appeals to much of the advanced as well as developing world.

The term knowledge society was first coined by Peter Drucker in 1969 and is often used interchangeably with "Knowledge Based Economy" (UNESCO, 2005). When OECD defined *Knowledge-Based Economy* (KBE) as being "directly based on the production, distribution and use of knowledge and information" (OECD, 1996), it was readily adopted and later expanded to also cover the "production, distribution, and use of knowledge is the main driver of growth, wealth creation and employment across all industries" (APEC, 2000). It is generally accepted that a KBE does not rely solely on high technology industries for growth and wealth production, but also requires industries in the economy to be knowledge intensive. It further introduced the notion that the knowledge required by a KBE is wider than purely technological knowledge; also including, for example, cultural, social and managerial knowledge. What is also accepted is the idea from Joseph Stiglitz (the 2001 Nobel Economist) that knowledge is a "global public good" that is most effective when shared without distribution inequities. Hence the community of people and the manner in which they organize themselves play a major role in creating a knowledge society.

In order to create such a knowledge society or economy, the conditions for knowledge-sharing have to be conducive, where knowledge is a public good with universal access to the community and low entry costs. As Koichiro Matsuura (2006), UNESCO's Director-General puts it: "An economy based on the sharing and diffusion of knowledge provides an opportunity for emerging nations to increase the well-being of their populations." He goes on to cite the examples of several communities which have transformed themselves into network societies favorable to "knowledge seeking, innovation, training and research". He concludes that knowledge sharing is indeed a powerful tool in both the fight against poverty as well as the key to wealth creation.

From the academic arena, Powell and Snellman (2004) posit that although the causal factors of a KBE is subject to much discussion and debate, current studies may be classified into three major areas of research: (i) the rise of new science-based industries and their role in social and economic change (ii) sociology and labor economic investigations on whether new kinds of jobs and novel forms of work organizations have emerged in knowledge societies and (iii) managerial focus on the role of learning and continuous innovation inside firms. Alternately, Houghton & Sheehan (2000) suggest that as society progresses up the value chain of quality and productivity, the role of knowledge as a factor of production and its subsequent influence on skills, learning, organization and innovation are increasingly the determinants of success.

Hence there is considerable agreement that the increasing importance of knowledge and learning is an international trend as rapid technological advances have resulted in a highly integrated

global marketplace (APEC 2000; Conceicao et al. 2003; Dolfsma 2006; Fahey & Prusak 1998; Houghton & Sheehan 2000; Powell & Snellman 2004; Rodrigues 2002; Soete 2006; UNESCO 2005). Economies, which are versatile and can adapt rapidly to the changing environment by exploiting the opportunities offered by the knowledge will prosper while those, which lag behind, may lose their competitive edge. The central role of knowledge and learning has been embraced universally and has hence raised challenges for countries in the formulation of public and economic policies.

As advanced and developing economies make the inevitable approach towards knowledge societies, we also witness a revolution that is characterized by the amalgamation or transformation of various aspects of society which do not only include technology changes, but one that involves institutional and cultural impact as well (Rodrigues, 2003). It is therefore abundantly clear that the creation and measurement of a knowledge society moves beyond the realm of human capital and includes what is known as structural and relational capital (cf. Stewart 1999; Bontis 2001; Edvinsson 2000).

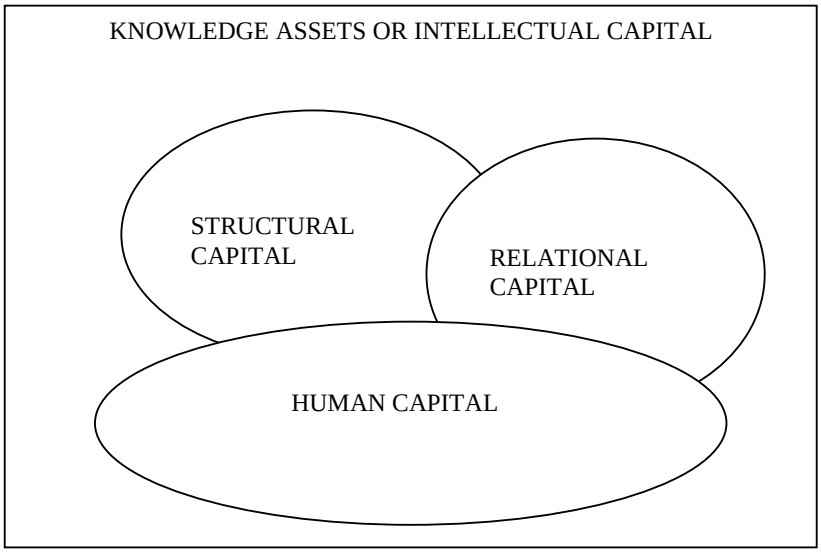


Figure 1: The Intellectual Capital of a Knowledge Society

Knowledge (even when it is explicit rather than tacit) is fluid and this unique feature makes it difficult to quantify in conventional financial management and hence to justify its value in metrics form. This intangibility of knowledge can be explained in terms of Intellectual Capital (IC) shown in Figure 1. More formally, IC refers to the knowledge, skills and technologies used to create a competitive edge for an organization or community. IC captures the soft and intangible part of the value of business enterprises in addition to the traditional balance sheet (Bucklew & Edvinsson, 1999). The benefits of having substantial IC in a society are: improved productivity, greater

innovation, new thinking and of course, increased economic value. In a pioneering work, Stewart (1999) had categorized IC as essentially made up of Human Capital (HC) and Structural Capital (SC) (also including the idea of Customer Capital in the context of a business enterprise). To this, Bontis (2001) - also inspired by Edvinsson (cf. 2000) had added Relational Capital (RC). HC is the knowledge, skill and experience of the employees within an enterprise; SC is the organizational structure, technology and professional systems which remain within society; and RC (which is often used interchangeably with Social Capital) is the relationship of trust and authenticity that members enjoy within a community.

The United Nations sponsored World Summit on the Information Society joint declaration on moving towards a knowledge era for all, had put in place infrastructure targets in tele-density, access and training (ITU 2002). And indeed, in much of the developing world, impressive gains have been made over the past 5 years in achieving universality and affordability in telecommunications services, particularly in the mobile sectors of China, India and Indonesia. Sharma & Azura (2005) have shown that an enterprise-oriented regulatory regime that promotes the build-up of information-communications technologies (ICT) infrastructure is one pillar of this growth. Cultivating user communities is the other pillar. Empowering the mass market with information literacy skills is yet another. They then build on the major trends in the prolific growth of telecommunications in the major markets of the region and outline some of the best practices that have been adopted by regulators and user communities. These include addressing the digital divide between haves and have-nots in the various communities and summarizing some key challenges for policy makers and private enterprise in the information society with the goal of strengthening the knowledge economy and directing efficient investments.

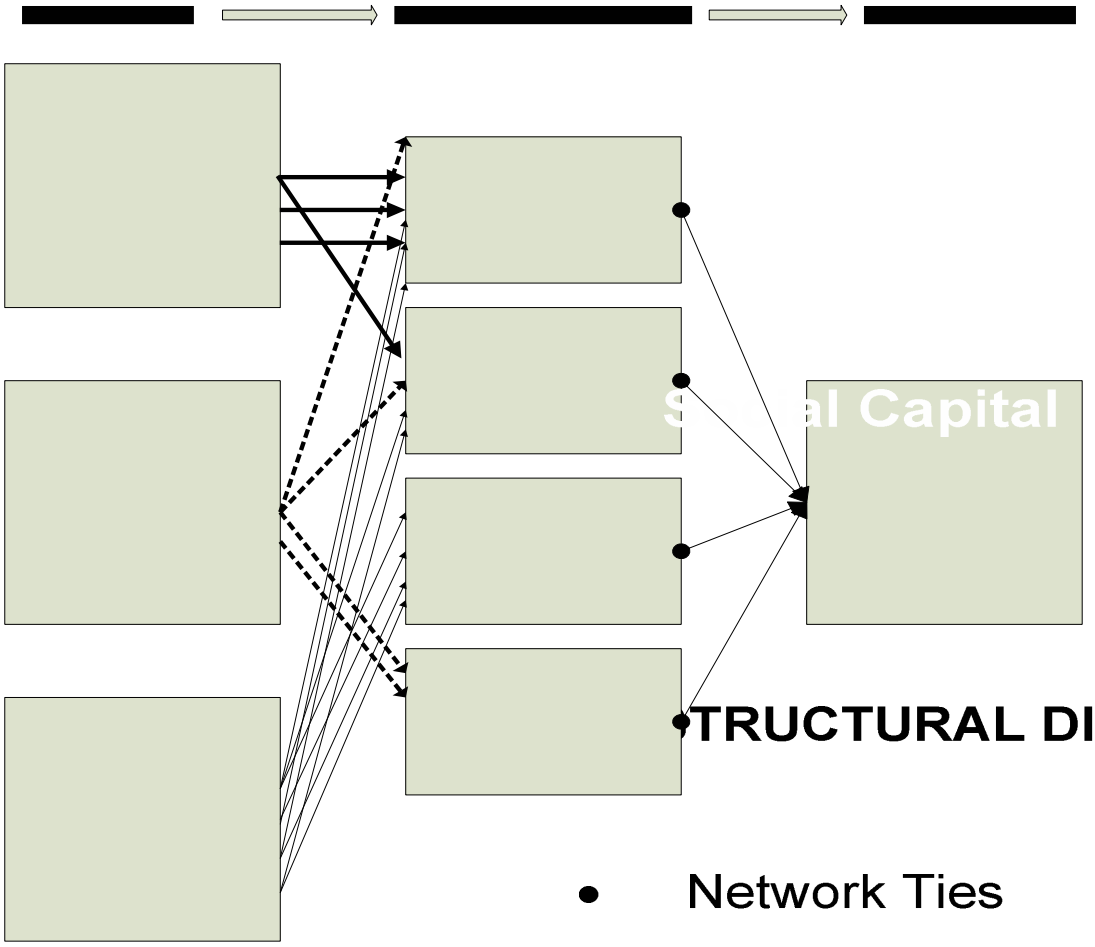
However, it is now known that that access to ICT infrastructure, training and applications is passé. In this article, we seek to understand the dimensions of knowledge societies beyond the obvious ICT and technology base. More specifically, we investigate the critical factors and outcomes of creating and sustaining a knowledge society. In the next section, we review the literature that comprises significant research in the area of knowledge societies, communities and economies. We develop this into a framework for articulating the more significant factors and outcomes that make up a knowledge society. We also interviewed 5 thought leaders for qualitative and anecdotal validation of our model with action research in order to establish validity. Following this, we sought secondary empirical data for some 20 major economies spanning the advanced to the developing world (the so-

called North to the South) for some insights as to whether these factors and outcomes hold. To test the model for its usability, we used the framework and dimensions to assess knowledge communities at various stages of economic development and geographic structure – Singapore, Dubai and Los Angeles – and determine some policy implications. Finally, we conclude with some thoughts on whether these lessons may be replicated such that development of knowledge societies becomes pervasive.

2. Literature Review

In a retrospective review of research in the area of the wealth of nations, Edvinsson (2003) reported that the well-known Skandia Navigator was easily translated from the corporate to national environment to encompass the following foci: financial (eg per capita GDP and national debt); market (eg balance of trade, net IP flows); human (eg quality of life, health and education levels); process (eg business leadership, service producing organisations); and renewal and development (eg R&D expenses, business start-ups). He also cites the work of the pan-European body – Eurostat – as a leader in developing statistical indicators for the new economy which enable a fuller understanding of the knowledge economy and the relationship between intangible assets and socio-economic activity (cf. http://europa.eu.int/en/comm/eurostat/research/retd/sine.pdf). Building on this Edna Pasher and her associates have suggested several additions to assess the IC of Israel such as: external debt, international events, openness to different cultures, language skills, teaching effectiveness, freedom of expression, entrepreneurship, risk taking, venture capital funds, immigration and absorption, women in the professional workforce, book publishing, museum visits, alcohol consumption (presumably implying the appreciation of the finer things in life rather than any manner of addiction), scientific publications.

Invariable the common thread of most IC measure is the propensity with a society to communicate and share values, and more generically, knowledge. Knowledge sharing is unlikely to be successful unless it is communicated in a manner which is accessible and comprehensible to recipients. Hence there is a need for a common understanding within society on how, when and why knowledge is diffused for a common good. Nahapiet and Ghoshal (1998) call the lack of a common language "the cognitive dimension of social capital". Attributes of the cognitive dimension include a shared paradigm and a common understanding of society's goals. The two other dimensions in Nahapiet and Ghoshal's framework are: the "structural" dimension which refers to the formation of both formal and informal networks that enable individuals to identify others with potential resources and the "relational" dimension which addresses issues around trust, shared norms and values, obligations and identification among members of a group.



adapted from: Nahapiet and Ghoshal (1998)

Figure 2: Basis for Knowledge Creation and Exchange.

However, as Figure 2 depicts, the three dimensions of social capital are not mutually exclusive but interactive. For instance, strong interaction ties among people from different vocations and stratas of society (social dimension) improve intra-society communication, enable information to be shared more freely and create a trusting working environment (relationship dimension). In turn, such a relationship helps to create common values and a shared vision (cognitive dimension). Hence they (*ibid*) define social capital (differently from other IC researchers such as Bontis, Edvisson and Stewart) as "the sum of the actual and potential resources embedded within, available through, and derived from the network of relationships possessed by an individual or social unit." Increasing social capital will positively impact four intermediate variables and subsequently foster the creation and sharing of organizational knowledge :-

1) access to parties for combining or exchanging intellectual capital,
2) anticipation of value through combining or exchanging intellectual capital,
3) motivation of individuals to combine/share intellectual capital,

4) ability of society to change according to the needs of its environment.

Therefore societies have for some time organized themselves in order to achieve a healthy environment of knowledge development and sharing. The characteristics of a knowledge society are that they are part of a knowledge economy; possess high absorptive capacity; have structures and cultures that facilitate frictionless knowledge diffusion and sharing; undergo complex chains of creation, production and distribution including inter-functional collaboration; and are sustainable learning communities with an emphasis on innovation (cf. APEC 2000; Houghton & Sheehan 2000; Powell & Snellman 2004; UNESCO 2005). If these characteristics can be embraced by the community at large, then, conventional public policy holds that a competitive economy and a higher quality of life is the outcome.

Drawing on the synthesis of Edvinsson (2003) of what constitutes the IC of nations and the framework of Nahapiet and Ghoshal (1998) which suggests how knowledge societies organise themselves, a review of the highly-cited literature on the social, structural and relational aspects of knowledge societies was conducted. This was followed by a critical analysis of the related literature from which the authors devised a set of dimensions that contribute towards the formation and evolution of a successful knowledge society. As will be elaborated in the next section which describes the research methodology, this process was and cumulative and iterative. However, Figure 3 conceptualizes a model that draws the work of Nhapiet and Choshal (ibid) and operationalizes the 4 major philosophical constructs of a knowledge society with some 13 dimensions which may serve as measurable and actionable items for policy-makers. In short, the model in Figure 3 transforms the three components of the "Intellectual Capacity of a Knowledge Society" (See Figure 1) into what is proposed as the four fundamental pillars on which a knowledge society is built on – 1. Infrastructure; 2. Governance (which together form Structural Capital); 3. Human Capital; and Culture (which is a part of Relational Capital). Guided by this framework, a review of the related literature has unearthed the dimensions necessary for creating and sustaining a knowledge. It is apparent that the 13 dimensions are not mutually exclusive to any one pillar. More specifically the definitions of the 13 dimensions indicate that they overlap as contributing factors and outcomes of the infrastructure, governance, human capital and culture facets of a knowledge society.

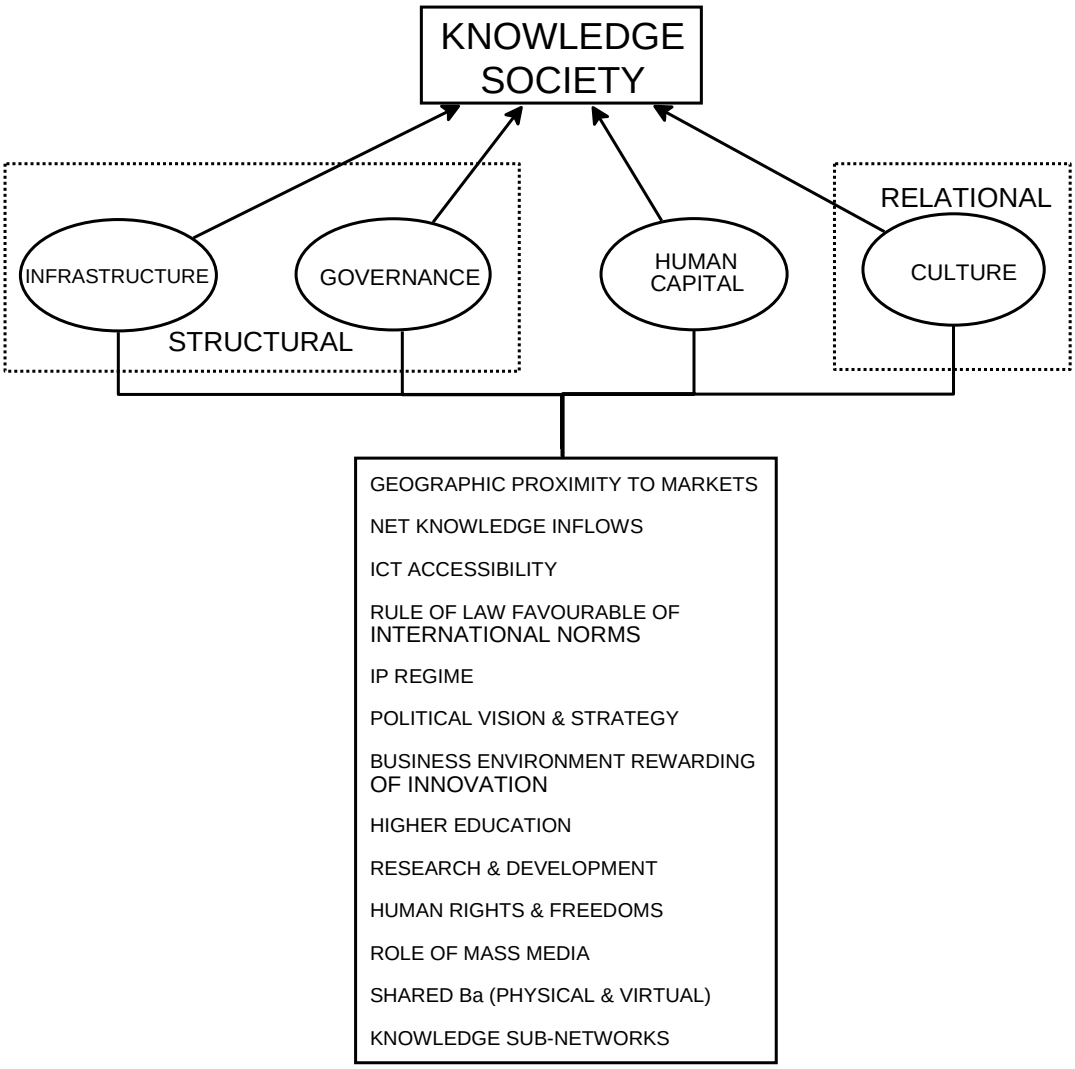


Figure 3: A Framework for Analysing Knowledge Societies.

2.1 The Four Pillars of a Knowledge Society

Pillar 1: Infrastructure

One of the first basic transformations that a society goes through in evolving into a KBE is the nature and scope of its investments in infrastructure. Gaps emanating from inefficiencies of knowledge creation, transfer and re-use amongst the citizenry form a great impediment to developing into a KBE. Mansell (2002) suggests that an effective means of eradicating such gaps is to provide an efficient infrastructure which includes more than basic amenities (water, electricity, sewage, transportation, security services, and a currency / stock exchange) to also encompass township planning, advanced systems of education and

healthcare, and even networked communities. Hence, efforts to develop knowledge societies do not stop at the level of basic infrastructure as ends in but which can in turn benefit society by providing it with the necessary skills and expertise required for functioning in a knowledge intensive economy with speed as well as value. In other words, structural inefficiencies attributable to power cuts, traffic jams, inadequate schooling, unavailable specialist healthcare, poor financial systems, and so

Pillar 2: Governance

Governance may be considered to be the effective macro-management of knowledge resources within a society. In order to effectively utilise the typically expensive infrastructure, there has to be appropriate policy measures in place; that is, governmental intervention (at the municipal, provincial or federal level) is necessary to put in place the elements that promote the effective usage of infrastructure and human capital resources – increasingly scare commodities. This is why both Pillars 1 and 2 fall under the Structural Capital of a Knowledge Society. In fact, for societies to move beyond the digital divide and further evolve into a knowledge society, greater policy intervention is needed to harness the potential of new media developments to enable a greater number of citizens to acquire new media literacy (Mansell, 2002).

Pillar 3: Human Capital

Much of the literature on knowledge societies emphasizes the significance of human capital as a key component that gives these societies an edge in competence over others (Houghton & Sheehan, 2000; Olssen & Peters, 2005; UNESCO, 2005). In fact, many societies understand the importance of managing knowledge gaps and in particular, narrow such gaps between the information rich and poor, because information enriches a society's human capital, which in turn boasts creativity that is essential for the knowledge economy (Olssen & Peters, 2005). Previously, the industrial era saw machines replacing labour, whilst in the knowledge economy, uniquely human (tacit) skills are increasingly in demand (Houghton & Sheehan, 2000). Indeed, "there is a link between human capital and the economic growth of cities" (Cheng et al., 2004, p.100).

Pillar 4: Culture

This is the most unique pillar of the four as most societies are already aware of the importance of infrastructural developments; governance and human capital are replicable and transferable, hence culture is the competitive factor that makes a knowledge society unique. According to Ergazakis et al. (2006), some cities have failed to be developed as knowledge cities even as much investment is made towards developing other areas such as transport infrastructures. What this means is that more attention has to be paid to the needs and expectations of the workers in the knowledge-based economies, such as in the provision of arts and cultural attractions, and other aspects that help improve overall quality of life. Culture also includes attitudes and assumptions about learning, and the objectives of education on the whole. Post World-War II Budapest was a city in which learning was viewed as integral part of living, and soaked in the culture, the city produced a small band of brilliant scientists, filmmakers, photographers, and engineers. (Marton, 2007)

An important part of the culture of learning is the sense of adventure of the members of society. A sense of adventure will encourage experimentation, a willingness to think out of the box and to take risks, and this will inevitably lead to knowledge creation. McLean, the creator of the shipping container took a huge risk when he sold of his trucking company (the first to be listed on the New York Stock Exchange) to fund his purchase of a shipping company to enable him to experiment with his new idea of shipping goods using removable containers (Levinson, 2006). A serendipitous ability to think out of the box was what enabled Art Fry identify a use for Spencer Silver's "low-tack" adhesive in "stick bookmarks", when the other inventors could not.

A city's culture also determines how diversity is viewed. In their research, Florida and Gates (2001) found that an area's success in high technology is dependent of three factors: (1) a large gay population; (2) a high concentration of bohemians (e.g., artists, movie directors, musicians and authors); and (3) a high concentration of foreign born residents. Are the people in the city able to accept a highly diverse environment? Are they sufficiently tolerant to make the city an attractive place to the types of people above?

2.2 The Framework of 13 Dimensions

Dimension 1: Geographic Proximity to Markets

This is a concept also known as geographic agglomeration and clustering (Dolfsma, 2006; Foray, 2006; Houghton & Sheehan, 2000). Much of the research into knowledge economies stress the self-reinforcing advantages of having knowledge producers, suppliers

and support services concentrate in a certain geographic area as tacit knowledge can be shared, integrated and transferred through relationships of proximity. In fact, there is a casual link between a high-tech firm's decision to situate itself in a particular location and the knowledge infrastructure already present in close geographic proximity (Dolfsma, 2006). Likewise, there is a natural advantage that accrues to members of a geographic grouping (such the European Union or ASEAN) which actively encourages cooperation and exchanges in scientific, economic and social areas. Invariably, benchmarking and learning takes place that both raises the bar as well as fixes disparities (APEC 2000; Conceicao et al. 2003; Edvinsson 2003; OECD 1996; Rodrigues 2002).

Dimension 2: Net Knowledge Inflows

This refers to the codified or tacit knowledge that enters or diffuses into a society in the course of its economic and social activities. The process of knowledge diffusion has to be expedited in order for a knowledge society to progress. UNESCO (2005) has always maintained that providing universal access to knowledge is crucial factor in the transition towards knowledge societies. Hence adequate policy efforts need be taken in order to ensure that knowledge is diffused to the greater populace. This knowledge diffusion, made possible by telecommunications networks, content industries, and the media is necessary yet costly at the same time (Dolfsma, 2006; Rodrigues, 2003). Evidence has shown that the knowledge societies with higher absorptive capacities (or the ability to assimilate knowledge so that it flows in) are those that are open to diversity. For instance, specifically successful knowledge cities are those that have positive attitudes towards immigration – a major contributory to the net inflow of human capital and tacit knowledge (Ergazakis et al., 2006). The transfer of human knowledge not only broadens the knowledge base but also promotes economic activity (Dolfsma, 2006).

Dimension 3: ICT Accessibility

Samarajiva and Gamage (2007) reaffirm the strong correlation (though they concede this does not necessarily mean causation) between the ability to communicate over distances and time using technology and economic growth. Even today only 11% of the world's population have access to the Internet and 90% of these people are about evenly from North America, Europe and East Asia (UNESCO 2005). The digital divide, while passé in its prognosis, remains a demarcation between those who have and those who have-less. As mentioned earlier, there is a greater need for policy measures to be put in place that promote a more universal access to new media technologies; Mansell (2002), among others, cautions

against the fallacies of present policy measures that tend to favour the economic or intellectual elite in the mistaken belief that it would be more impactful. The concept of ICT accessibility has to be broadened to ensure that there is greater deliberative democracy, which is essentially what is required in a knowledge society. In this sense, universal suffrage for ICT means that the cost of access to broadband Internet allows the government, organizations and individuals to presume that content and e-application are available to all who need them (Ergazakis, 2006; Paganetto 2004).

Dimension 4: Rule of Law Favourable of International Norms

The rule of law gives a transparent, impartial and accepted-by-popular-vote code of conduct that governs the relationship between individuals in any society. It is imperative for the sanctioning of knowledge creation and transfer for the purpose of commerce and industry (Conceicao et al. 2003; Kahin 2006; Rodrigues 2003). Speaking at the recent International Bar Association's Conference in Singapore on the topic of "Rule of Law", Singapore Deputy Prime Minister and Minister for Law was quoted as having remarked that an independent judiciary, the right not to be arbitrarily arrested, the conduct of a fair trial, free and fair elections, and the right to personal safety and security are the cornerstone of a society governed by the rule of law and other measures "very much depend on the balance between individual and societal rights". They also delineate the importance of having laws that favour economic deregulation in the globalisation process; for instance conforming to the norms of the World Trade Organisation. "The recent phase of globalisation is characterised by rapid increases in the flows of foreign direct investment, capital transfers other than direct investment, trade flows of goods and services, and technology transfer" state Houghton & Sheehan (2000, p.5). It is essential to preserve a common understanding of values, practices and norms upon which these activities can take place.

Dimension 5: Intellectual Property (IP) Regime

In a society where knowledge is a key asset, the Intellectual Property Rights (IPRs) regime which protects the exploitation of research so that those who invested in research may benefit commercially from their efforts to the exclusion of opportunistic bystanders, differentiates how society views innovation – as a serious business or foolish hobby. History is replete with examples of "inventors" who failed to commercialise their work because of a lack of IP protection and this discouraged further downstream inventions. It is however accepted that there is a balance between protecting creative works and inventors on one hand and the need to promote and disseminate useful knowledge for the advancement of society

(Dolfsma, 2006; Kahin, 2006; Olssen & Peters, 2005; Powell & Snellman, 2004; UNESCO, 2005). While it is commonly known that having a good IP regime helps protect trade secrets and even tacit knowledge, which in turn leads to a greater stimulation for innovation, Dolfsma (2006) also cautions against having an excessive regime: "It is possible that an excessively 'strong' intellectual property regime may actually inhibit the pace of innovation, and slow the pace of economic development. Such a conclusion hinges, of course, on the effects of developments in IPRs in terms of communication costs on innovative activity." (p.215).

Dimension 6: Political Vision & Strategy

It is also clear that the leadership that is derived from political vision and strategy are key factors that are necessary to ensure the success of a society's transition towards a knowledge economy (cf. Cheng et al. 2004; Conceicao et al., 2003; Dvir and Pasher, 2004; Ergazakis et al., 2004; Mansell, 2002; Olssen & Peters, 2005). Political vision also requires an acceptance that institutions such as a representative legislative body, an independent judicial system, a free and vibrant press are all constituents of a plural and inclusive knowledge society that thrives on knowledge creation and innovation (Cheng et al., 2004). Olssen and Peters (2005) have also acknowledged that an open and successful knowledge society also requires institutions such as a free press, transparent government, pluralism, checks and balances, toleration, freedom of thought and open public debate as political openness is essential for the success of the transformation towards a knowledge economy.

Dimension 7: Business Environment Rewarding of Innovation

The business environment and platform on which knowledge is created and exploited is another crucial aspect of successful knowledge societies, This is distinct from creating conditions for the protection of IP whilst preserving the common good. A business-friendly environment also includes fair taxation (income taxes, corporate taxes, value-added taxes, and perhaps even import duties and other levies) and the provisioning of services from these public revenues that facilitate knowledge work. For instance, it is becoming in-vogue to establish public-private partnerships (PPP) in order to enter into capital and knowledge intensive undertakings such as bio-technology, pharmaceuticals and micro-electronics as such partnerships help share access to technologies as well as markets. They spread the costs and risks associated with innovation, while benefiting from positive results and technological improvements (Ergazakis et al., 2004; Houghton & Sheehan, 2000; Soete 2006). Hence a

positive business environment would encourage more innovative firms, furthering the society's propensity for knowledge creation and dissemination.

Dimension 8: Higher Education

Historically, universities have been centers of knowledge, learning and change. Hence they form the key institution that acts as a driver in the knowledge economy, and consequently, these higher education institutions are often encouraged to create thought leadership that steps out of the shadows of "conventional wisdom" that is practiced by industry and business (Foray, 2006; Olssen & Peters, 2005). Research by UNESCO (2005) and UNDP (2007) suggests that education has been undervalued in terms of its contribution to knowledge capital, and changes have to be made in order for these higher education institutions to stimulate a greater knowledge-sharing culture in our societies (Ergazakis et al., 2004; Olssen & Peters, 2005). Universities and higher education are hence greater than the sum total of their explicit knowledge repositories. Their ability to foster and change thought within a society is perhaps equally critical. When considering higher education as one of the dimensions, it is important to distance this dimension from being tied to syntactic measures such as the number of students/graduates/researchers as a proxy measure. More meaningful measures such as the quality and finesse of the graduates and relevance of what they have studied in the universities matters much more than the sheer number of graduates.

Dimension 9: Research & Development

Research and development is required for a society to progress and regenerate. A successful knowledge society is one where there is a premium placed on extensive research and development to acquire knowledge through its research centres and learning institutions, which together enhances the city's economic development (Edvinsson 2003; Ergazakis et al., 2006). The Cha-Cha-Cha framework of discoveries is useful to understand the types of discoveries and inventions that are being made (Koshland, 2007). "Charge" inventions solve problems that are quite obvious, e.g., a cure for cancer. "Challenge" discoveries are a result of an accumulation of facts or concepts that are *unexplained by* or *incongruous with* scientific theories of the time, often resulting in "paradigm shifts". "Chance" discoveries refer to those that are serendipitous. However, serendipity is not sheer luck and involves knowledge and intelligence for recognition and application - Viagra was a failed angina drug that researchers noticed – completely by chance - resulted in penile erections. (Shah, 2006). The rest, as they say, is history.

Dimension 10: Human Rights & Freedom

In a knowledge society, the assurance of the rights of citizens – the right to access data held by public authorities, civil society participation, universal suffrage (voting) and universal access to knowledge – is fundamental to the promotion of human development and leads to a greater citizen empowerment and the sharing of information and knowledge (Ergazakis et al., 2004; Ergazakis et al., 2006; Foray, 2006; Mansell, 2002; UNESCO, 2005). It is a perennial debate on whether human rights and freedom can co-exist with rule of law. Speaking at the recent International Bar Association Conference held in Singapore, the Deputy Prime Minister and Minister for Law remarked that there must always be a will to do all that is necessary for freedom under the rule of law to flourish. Whist this may seem contradictory, there are many current examples of societies that possess one of the 2 dimensions but not the other, and yet other societies that jointly promote both after considering a careful trade-off.

Dimension 11: Role of Mass Media

The Role of Mass Media is the dissemination of public interest information as well as the accompanying discussion and debate that comes with it in order to support an open and informed society that can participate in civic decisions such as elections and referenda (Ron Rice, personal communication, 2007). As Federov (2003) notes: *Media education today is seen as the process of the personality's development with the help of and on the material of the means of mass communications (media). It is aimed at the development of the culture of the intercourse with media, creative, communicative abilities, critical thinking, perception, interpretation, analysis and evaluation of media texts, teaching different forms of self expression with media technology. Media literacy, acquired in the result of this process, helps a person to actively use the resources of the information field of TV, radio, video, cinema, press, Internet* [p 1]. The ubiquity of responsible mass media (eg. newspapers, radio, television, telephones) is always central to any discussion of development, whether economic, political, or quality of life. ICT (as indicated here, broadband) is new and important, but is too narrow conceptually given the vast prior literature on development. Media access is often correlated with political maturity and economic development and literacy. Business telecommunications access is probably the primary influence on economic development as studies in the telecommunications and development literature have repeated shown (cf. Masterman 1995 for a classic discourse). Given the increasing commercialization of mass media, what Masterman (2004) later calls the media quality gap is particularly pertinent: so it is clear that media literacy skills are essential to the democratic health of

contemporary media-saturated societies. This is not to posit a passive notion of media consumption - the audience as vulnerable victims. Skepticism about media images may be widespread, though not necessarily sharply focused, in many cultures. But it is to suggest that increasingly sophisticated techniques of information management demand a commensurate expansion in the critical consciousness of audiences. The danger to democratic values lies precisely in the gap which has opened up between the relative sophistication and power of media producers and media audiences. As Castells (2000) also cautions*: The main political arena is now the media, and the media are not politically answerable.*

Dimension 12: Shared Ba (Physical & Virtual)

The Japanese word *ba* refers not just to a physical space, but a specific time and space – "it is a concept that unifies physical space such as an office space, virtual space such as email, and mental space such as shared ideals" (Nonaka et al., 2000). Having a shared *ba* is significant in the advancement towards individual and/or collective knowledge (Dvir & Pasher, 2004) as "knowledge is created when information is put into context. When people gather in a meeting room and share their knowledge to solve a problem, they are providing a shared context to create new knowledge." (Baqir & Kathawala, 2004). However, several researchers also suggest that the quality of a virtual *ba* is not yet comparable to that of a *ba* in a physical environment. In the knowledge cities technology model, the selection of technologies is aimed at meeting the challenge of ensuring that the quality of a virtual *ba* is equivalent to the *ba* of a physical meeting place – which are defined by Baqir and Kathawala (2004) as necessary conditions for an ideal knowledge city to be modelled. The importance of *ba* in the creation of knowledge can hardly be over-emphasised. The group of French mathematicians that was known as their pseudonym Bourbaki, met frequently in cafés, tabacs, and brasseries of the Latin Quarter in Paris (such as the Capoulade's Café) in 1934–35, discussing mathematical problems and authoring mathematical treatises (Beaulieu, 1993). When the Bambergers founded the Institute for Advanced Study in Princeton, in 1930, they in fact, built an excellent *ba* which was later described as an "intellectual hotel" by the faculty members (Regis, 1987).

Dimension 13: Knowledge Sub-networks

The success of a knowledge society not only depends on the diffusion of knowledge through formal networks and links but also on the knowledge that is exchanged in such informal networks such as personal friendships and professional acquaintances, and these sub-networks can act as localized knowledge sharing and co-creation channels (Cheng et al.,

2004). Such sub-networks provide certain advantages to its members that are not available outside in the wider network, such as helping entrepreneurs identify opportunities that may be exploited in future. In the transition from the industrial era to the information era, we have witnessed how the process of globalization has been a major catalyst. This process of globalisation needs to be modified as we move towards greater knowledge societies. Hence, a myriad of international professional societies and standards bodies such as the World Congress of Cardiologists or the Internet Engineering Task Force are necessary in order to promote these necessary knowledge sub-networks. At the other end of sophistication is the age old tradition of story-telling as the glue that binds a segment of society with common beliefs and values and in so doing facilitates the transfer of learning and wisdom (Snowden 1999).

3. Empirical Research Methodology

To recapitulate, the grounded theory model derived from the research and policy literature was operationalized into dimensions – factors as well as outcomes – that contribute to the creation of successful knowledge societies. Note that factors are dimensions that contribute towards creating a knowledge society (ICT accessibility, expenditure on higher education, R&D) whereas outcomes are the results of becoming a knowledge society (eg economic wealth, quality of life, EVA etc). Though some of the dimensions may contribute to more than one of the pillars of a knowledge society, we may note that there is a predominant disposition in each of them and when listed in the order described in the previous section, there is a infrastructure, governance, talent and culture continuum to their membership.

Going forward, the research methodology was designed to be conducted over 3 stages. In the first stage, a Delphi Panel of 10 researchers in the area were consulted via e-mail for their feedback for their active critique of the model and the dimensions. They were asked for their judgements on whether the model was comprehensive and relevant. They were also specifically asked for the comments on each of the 13 dimensions – both the definitions as well as their applicability. The dimension “Role of Mass Media” was in fact a not derived from the research literature but suggested by one of the panellist to the concurrence of the others. Over 3 iterations, there was consensus among the Delphi panellists that the model well articulated the contributory factors and outcomes of knowledge societies and that the 13 dimensions were sufficiently comprehensive and parsimonious. On the strength of the grounded theory and the resulting consensus, we claim face and content validity.

During the second stage, in an attempt to derive relevance for policy-makers, a 2-hour focus group workshop with 25 senior graduate students of Knowledge Management was conducted in order

to ascertain the use of such a framework of dimensions in the field. First, the model and framework of dimensions was presented as a short seminar. Focus group participants were then asked to (subjectively) rate 3knowledge societies along the 13 dimensions on a 11-point Likert scale ranging from 0 to 10 (with 5 as the anchored mid-point). 3 well known societies (Singapore, Dubai, Los Angeles) were selected as typical of the various states, types and regions of development.

The ratings from the focus group participants were checked for large variances and if within limits, the mean values were computed. In some cases, outliers and missing values were ignored. Consistent with the approach suggested by Edvinsson (2003) or Sagasti (2004), these mean values were plotted in a Kaviat or Radar diagram in order to benchmark various societies. This is shown in Figure 5 and will be discussed in the next section. More importantly, the resulting chart was used to conduct a general knowledge policy discussion – providing support for our claim of internal consistency and usability in the field.

In the third stage, drawing on the infrastructure-governance-talent-culture framework and the operational definitions of the dimensions that were derived, the researchers searched several reputable, published sources of socio-economic indicators (such as the OECD, ITU, UNDP, UNESCO, WEF, and World Bank) for the availability of reliably collected, accurate and authoritative secondary data that could serve as proxy indicators to the dimensions. The major challenge was to match various indicators and measurements with the definitional of each dimension. Data for about 20 communities spanning various stages of knowledge development was then collected from the relevant secondary databases. We derived proxies for dimensions that could not be directly measured and in so doing hoped to capture a quantitative snapshot of knowledge societies for later analysis. Here we claim construct validity.

Table 1 recapitulates and summarises the 13 dimensions of a knowledge society, the claims of their contribution to a knowledge society with corresponding support from the literature, and proxy measures from the authoritative secondary sources. Recall that the dimensions are not suggested as comprehensive and all-encompassing. There are dimensions that have been suggested in the literature that have been omitted; for example the centrality of learning and innovation in a knowledge society (Houghton and Sheehan 2000), “failure factors” such as quality of life, arts, culture; the lack of which undermines a knowledge society (Ergazakis et al. 2006), and the participation of women, respect for human resources, and security of normative action (UNESCO 2005) as extraneous because of the frequent criticism that the interactive effects of too many independent variables causes confusion in empirical findings.

Table 1: Summary of Dimensions and Support from the Literature.

Dimension	Claim	References	Proxy Indicators
1. **Geographic Proximity to Markets**	Much of the research into knowledge economies stresses the self-reinforcing advantages of having knowledge producers, suppliers and support services concentrated in a certain geographic area as tacit knowledge can be shared, integrated and transferred through such relationships.	Cheng et al., 2004; Dolfsma, 2006; Foray, 2006; Houghton & Sheehan, 2000	GDP per Capita; Share of Trade in GDP; Global Peace Index
2. **Net Knowledge Inflows**	In an increasing global marketplace of producers and consumers, adequate means have that ensure world-class knowledge is diffused to the populace.	Dolfsma, 2006; Ergazakis et al., 2006; Rodrigues, 2002; UNESCO, 2005	Intangible Capital per Capita; FDI Stocks; Net Migration of Skills
3. **ICT Accessibility**	Successful knowledge societies are often well-connected, with broadband facilities equally accessible to organizations and individuals.	Ergazakis et al., 2006; Mansell, 2002; UNESCO, 2005	Network Readiness Index; Broadband Internet Subscribers
4. **Rule of Law favourable of International Norms**	The global knowledge marketplace is also characterised by rapid increases in the flows of foreign direct investment, capital transfers other than direct investment, trade flows of goods and services, and technology transfer and hence national laws must be harmonised.	Conceicao et al. 2003; Houghton & Sheehan, 2000; Kahin 2006; Rodrigues 2003	Government Effectiveness; Rule of Law; Global Peace Index
5. **IP Regime**	Intellectual Property Rights (IPRs) regime has to be sound and unbiased because the balance between protecting such IP rights has to be maintained carefully with the need to promote and disseminate the useful knowledge for the advancement of the society.	Dolfsma, 2006; Kahin, 2006; Olssen & Peters, 2005; Powell & Snellman, 2004; UNESCO, 2005	Patents; Share of Citations
6. **Political Vision & Strategy**	Governments' political vision and strategy for growth and development are key factors that are necessary to ensure the success of the transition towards a knowledge society.	Cheng et al. 2004; Conceicao et al., 2003; Ergazakis et al., 2004; Mansell, 2002; Olssen & Peters, 2005	Political Stability; Regulatory Quality; Control of Corruption
7. **Business Environment Rewarding of Innovation**	A positive business environment would encourage the set-up of more innovative firms, and ease the conduct of knowledge industries, thus furthering	Ergazakis et al., 2004; Houghton & Sheehan, 2000	Business Competitiveness Index; Global Competitiveness Index; Ease of Doing

	society's knowledge creation and dissemination.		Business; Index of Economic Freedoms
8. **Higher Education**	Changes have to be made in order for higher education institutions to stimulate a greater knowledge creation and sharing in societies.	Ergazakis et al., 2004; Foray, 2006; Olssen & Peters, 2005	Tertiary Attainment;
9. **Research & Development**	A successful knowledge society is one where there is extensive research and development to acquire knowledge and learning for common good and competitive advantage.	Ergazakis et al., 2006	GERD / BERD; R&D Employment per Capita
10. **Human Rights & Freedom**	The assurance of the rights of citizens – the right to access data held by public authorities, civil society participation rights, universal participation and universal access to knowledge – is fundamental to the promotion of human development and leads to a greater citizen empowerment and the sharing of information and knowledge.	Ergazakis et al., 2004; Ergazakis et al., 2006; Foray, 2006; Mansell, 2002; UNESCO, 2005	EIU Democracy Index; Voice & Accountability
11. **Role of Mass Media**	The role of a fair, open and responsible mass media cannot be understated in the creation of an informed society capable of making collective decisions in a consensual manner so that it remains inclusive of all potential within.	Masterman (1996), Rice (2007, personal communication)	Voice & Accountability; Press Freedom
12. **Shared *Ba* (Physical & Virtual)**	Knowledge is created when information is put into context … when people gather in a meeting room and share their knowledge to solve a problem, they are providing a shared context to create, validate and share new knowledge.	Baqir & Kathawala, 2004; Nonaka et al., 2000; Dvir & Pasher, 2004	Public and Household Expenditure on Civic Amenities (cultural attractions, entertainment etc)
13. **Knowledge Sub-networks**	The diffusion of knowledge through formal networks and links is augmented by exchanges in such informal networks such as friendships, and these sub-networks can act as localized knowledge repositories.	Cheng et al., 2004; Snowden 1999	Links with International Professional Bodies

One of the major challenges faced in this study was the matching of the 13 dimensions to authoritative and readily-available proxy indicators that captured the definitional and ideological construct of each dimension. We found that in many instances, there was no single proxy indicator that covered the constructs of a dimension entirely.

Hence, either several proxy indicators were necessary for a single dimension (see for example dimension 7 in Table 1 which was covered by several indicators such as Business Competitiveness Index; Global Competitiveness Index; Ease of Doing Business; and Index of Economic Freedoms – each with its own distinct but relevant nuance). As well, there were also proxy measures (for example, Voice and Accountability) that covered more than one dimensions (Human Rights and Freedoms; Role of Mass Media). The identification, selection and combination of these proxy indicators was conducted over several focus group discussions among ourselves and invited experts and was also put to the Delphi Panel for "final form" feedback. It is also worth reiterating that the relationship between the 13 dimensions and 4 axes is not one-to-one but one-to-many. That is, dimensions contribute to more than one axis on several occasions and perhaps form a less discrete order (as listed above) ranging from infrastructure, governance, talent and culture. This is an important aspect of describing and creating a knowledge society and will be alluded to in the next section where we obtain empirical support

4. Results and Discussion

While there have been numerous conceptual studies which have described models and frameworks for the creation of knowledge societies (cf. Baqir and Kathawala, 2004; Chou 2005; Cummings and Teng 2003; Ergazakis et al. 2006; Harris 2001; Kahin 2006; Mansell 2002; Sagasti 2004; Soete 2006) much fewer have involved the identification and measurement (or collection from secondary sources) of the proxy indicators (or independent variables) that together explain the constituencies of the knowledge society (cf. ITU 2007 and UNESCO 2005 for indicators of the information society; a World Bank study led by Kaufmann et al 2007 which addresses governance; an annual survey of business competitiveness by the World Economic Forum 2006; and arguably the most complete characterization of a knowledge society by UNDP 2007).

One fundamental challenge in deriving "metrics that gauge the extent to which society has become more dependent on knowledge production" (Powell and Snellman 2004) is that it is often easier to measure (non-controllable) outcomes than it is to assess the impact of policy parameters which contribute to the development of a KBE. An in-depth concerted search was conducted of the databases of several high-quality sources such as the Organisation for Economic Cooperation and Development (OECD) for socio-economic metrics, the International Telecommunications Union (ITU) for ICT metrics, the World Economic Forum (WEF) and World Bank for governance, infrastructure and competitiveness rankings, and the United Nations Education Scientific and Cultural

Organization (UNESCO) and United Nations Development Project (UNDP) for scientific and cultural data.

Drawing on the authoritative and relevant secondary sources, we compiled a best fit matching between the 13 dimensions of a knowledge society and available proxy indicators. Tables 2(a) and 2(b) show recent statistics (of the selected proxy indicators) for a representative sample of 20 knowledge societies. These 20 societies were chosen because of the availability of statistics as well as for the reason that their economies ranged across the spectrum of the development. The major sources were: ITU[1] (2007), OECD[2] (2007), World Bank[3] (2007), EIU[4] (2007), WEF[5] (2007), Vision of Humanity[6] (2007), Doing Business[7] (2007), Heritage Foundation[8] (2007), Reporters sans frontières[9] (2007). As well most of the statistics were for the year 2005 unless otherwise stated.

BCI refers to the WEF's Business Competitiveness Index and GCI refers to the WEF's Global Competitiveness Index which are derived by extensive research as well as expert opinions on a host of measures and factors that lead to the competitiveness of an economy. Voice and Accountability (V&A), Political Stability, Government Effectiveness, Regulatory Quality, Rule of Law and Control of Corruption are the five areas of Governance Indicators developed and used by the World Bank (2007) in their Annual World Bank Survey entitled Governance Matters 2007 and is derived from 33 global surveys and rankings (including expert assessments) that represent the largest publicly available resource on governance across countries. More specifically, *V&A* – measures electoral freedoms and free speech; *Political Stability* – measures perceptions of a government's stability; *Government Effectiveness* – measures quality of public services, civil service and public policies; *Regulatory Quality* – measures regulations that allow private sector growth; Rule of Law – measures confidence in laws, police and courts, and the crime rate; and Control of Corruption – measures the extent to which the government keeps corruption in check. These are by far the most used statistics on business and regulatory factors and were adopted as diverse proxy indicators.

NPL Citations refers to references to the non-patent literature. 2006 values for FDI Stocks are given in Millions of US Dollars and are defined as the Net Foreign Direct Investment Stocks derived by subtracting outward from inward flow. 2003 values for Patents refer to the number of triadic patent families. 2004 GDP Expenditure (GERD) on R&D is calculated as a percentage of GDP. Business enterprise expenditure on R&D (BERD) covers R&D activities carried out in the business sector by firms and institutes, regardless of the origin of funding. 2004 Tertiary Attainment are for the 25-64 (economically productive) age group and indicate the percentage of the population of that age group with tertiary qualifications (degree, diploma or specialist certification).

Table 2 (a) : Proxy Measures of Dimensions for 20 representative Knowledge Societies.

Country	Population[1] (*M*)	GDP per capita[1] (*US$*)	Share of Trade in GDP[2] (*%*)	Intangible Capital per capita (US$)[3]	FDI Stocks 2006 *(billion US$)*[4]	NRI[5]		Internet Subscribers[1] (*000s*)	Broadband[1] (*As % of total Internet subs.*)	Government Effectiveness[3]	Rule of Law[3]	Global Index[6]	Peace	Patents[2]	Share of NPL in citations
						Rank	Score					Rank	Score		Rank
Australia	20.16	32,512	21	288,686	28	15	5.24	5,980	35.2	1.89	1.74	25	1.664	431	22
China	1,315.84	1,732	-	4,208	556.9	59	3.68	73,232.6	51.2	-0.09	0.43	60	1.980	177	18
Canada	32.41	34,848	36	235,982	-7.5	11	5.35	7,997	80.4	1.94	1.76	8	1.481	710	28
France	60.5	35,158	26.6	403,874	-99.3	23	4.99	13,257	71.3	1.47	1.33	34	1.729	2356	17
Germany	82.69	33,877	38.1	423,323	-40.3	16	5.22	20,000	53.4	1.51	1.74	12	1.523	7111	-
Hong Kong	7.04	25,239	-	-	51.9	12	5.35	2,633.7	63	1.64	1.47	23	1.657	-	-
Italy	58.09	30,495	26.3	316,045	1.3	38	4.19	17,700	38.3	0.60	0.53	33	1.724	844	13
Indonesia	222.78	1,263	-	8,015	-0.2	62	3.59	1,500	-	-0.47	0.86	78	2.111	-	-
Japan	128.08	35,592	13.6	341,470	-285.7	14	5.27	33,883.9	44	1.16	1.35	5	1.413	13,564	8
South Korea	48.29	16,309	41.2	107,864	57.6	19	5.14	12,028.5	99.1	1.01	0.78	32	1.719	747	10
Malaysia	26	5,030	-	24,520	25.7	26	4.74	4,179.1	12	1.01	0.57	37	1.744	-	-
Mexico	107.03	7,180	30.7	34,420	189.2	49	3.91	3,934.2	47.7	0.01	0.50	79	2.125	16	-
Russia	143.5	-	-	5,900	36.7	70	3.54	-	-	-0.38	0.88	118	2.903	56	12
Singapore	4.35	26,843	-	173,595	77.2	3	5.60	2,255.1	29.5	2.15	1.81	29	1.692	-	-
South Africa	47.43	5,050	-	48,959	32.4	47	4.00	4,279.2	3.9	0.83	0.18	99	2.399	38	3
Spain	42.69	26,511	28.2	217,300	-1.1	32	4.35	5,548.7	90	1.40	1.11	21	1.633	115	11
Switzerland	7.46	49,191	44.5	542,394	-257.6	5	5.58	2,604.6	62.7	2.05	1.98	14	1.526	895	-
UAE	4.5	24,338	-	-	18.1	29	4.42	527	24.4	0.55	0.55	38	1.747	-	-
UK	59.67	37,319	28.3	346,347	-433	9	5.45	15,107.5	47.2	1.71	1.63	49	1.898	2024	23
USA	298.21	41,768	13.4	418,009	-396	7	5.54	66,823.1	42.2	1.60	1.53	96	2.317	19,222	26

Table 2 (b) : Proxy Measures of Dimensions for 20 representative Knowledge Societies.

Country	Political Stability[3]	Regulatory Quality[3]	Control of Corruption[3]	BCI Rank[5]	GCI[5]		Ease of doing business rank[7]	Index of Economic Freedom 2007[8]		Tertiary Attainment[2]	GERD % GDP 2005[2]	BERD% GDP 2005[2]	R&D Personnel (per 1000 employment)	EIU Democracy Index (out of 10)[4]	V&A[3]	Press Freedom Rank[9]	Household Expenditure on Recreation & Culture[2] (*As % of GDP*)	HDI Rank	HDI Score
					Rank	Score		Rank	Score										
Australia	0.87	1.60	1.97	13	19	5.29	9	3	82.7	30.8	1.7	0.9	12.3	9.09	1.54	28	6.9	3*	0.957
China	-0.26	-0.28	-0.68	54	54	4.24	83	119	54.0	-	1.4	0.8	1.5	2.97	-1.46	163	-	81	0.768
Canada	0.94	1.52	1.92	14	16	5.37	7	10	78.7	44.6	2.9	1.1	12.3	9.07	1.52	18	5.5	6*	0.950
France	0.43	1.06	1.40	10	18	5.31	31	45	66.1	23.9	1.4	1.3	14.1	8.07	1.49	31	5.2	16*	0.942
Germany	0.80	1.36	1.92	2	8	5.58	20	19	73.5	24.9	0.9	1.7	12.1	8.82	1.56	20	5.3	21*	0.932
Hong Kong	1.17	1.86	1.69	17	11	5.46	4	1	89.3	-	-	-	-	6.03	0.59	61	-	22*	0.927
Italy	0.29	0.88	0.41	37	42	4.46	53	60	63.4	11.4	1.1	0.5	6.7	7.73	1.06	35	4.2	17*	0.940
Indonesia	-1.29	-0.48	-0.87	59	50	4.26	123	110	55.1	-	-	-	-	6.41	-0.16	100	-	108	0.711
Japan	1.01	1.14	1.25	9	7	5.60	12	18	73.6	37.4	3.2	2.3	14.0	8.15	0.98	37	-	7*	0.949
South Korea	0.55	0.77	0.47	24	24	5.13	30	36	68.6	30.5	2.6	2.2	8.6	7.88	0.78	39	3.7	26*	0.912
Malaysia	0.47	0.49	0.25	23	26	5.11	24	48	65.8	-	0.7	-	-	5.98	-0.12	124	-	61	0.805
Mexico	-0.25	0.35	-0.40	58	58	4.18	44	49	65.8	16.4	0.4	0.2	2.0	6.67	0.19	136	-	53*	0.821
Russia	-0.98	-0.33	-0.78	70	62	4.08	106	120	54.0	-	1.3	0.8	14.1	5.02	-0.66	144	-	65	0.797
Singapore	1.15	1.80	2.25	6	5	5.63	1	2	85.7	-	2.2	1.4	11.5	5.89	0.13	141	-	25*	0.916
South Africa	-0.06	0.51	0.56	30	45	4.36	35	52	64.1	-	0.8	0.5	2.6	7.91	0.74	43	-	121	0.653
Spain	0.42	1.24	1.34	25	28	4.77	38	27	70.9	26.4	1.1	0.6	8.7	8.34	1.12	33	-	19*	0.938
Switzerland	1.34	1.47	2.13	8	1	5.81	16	9	79.1	28.2	2.6	2.1	12.5	9.02	1.61	11	4.9	9*	0.947
UAE	0.59	0.40	1.12	32	32	4.66	68	74	60.4	-	-	-	-	2.42	-0.66	65	-	49*	0.839
UK	0.33	1.55	1.94	5	10	5.54	6	6	81.6	29	1.9	1.1	-	8.08	1.49	24	7.7	18*	0.940
USA	0.04	1.48	1.57	1	6	5.61	3	4	82.0	39.1	2.6	1.8	-	8.22	1.26	48	6.4	8*	0.948

Table 4: Partial Correlations of Proxy Indicators with HDI Score as Controlled Variable.

Population	1.00																								
Share of Trade in GDP	-0.39	1.00																							
GDP per capita	0.85	0.06	1.00																						
Intangible Capital per capita	0.92	-0.61	0.75	1.00																					
FDI Stocks 2006	-0.82	0.16	-0.94	-0.86	1.00																				
NRI Score	-0.69	0.58	-0.26	-0.54	0.16	1.00																			
Internet Subscribers	0.90	-0.48	0.58	0.74	-0.48	-0.94	1.00																		
Broadband	-0.22	0.82	0.32	-0.26	-0.27	0.77	-0.54	1.00																	
Government Effectiveness	-0.64	0.60	-0.18	-0.49	0.09	1.00	-0.91	0.82	1.00																
Rule of Law	-0.62	0.59	-0.16	-0.47	0.06	0.99	-0.90	0.82	1.00	1.00															
Global Peace Index Score	0.47	-0.99	0.05	0.69	-0.27	-0.55	0.50	-0.75	-0.57	-0.56	1.00														
Patents	0.77	-0.27	0.86	0.88	-0.98	-0.11	0.41	0.22	-0.04	-0.02	0.38	1.00													
NPL Citation	-0.50	0.96	-0.01	-0.62	0.14	0.77	-0.66	0.90	0.79	0.78	-0.95	-0.21	1.00												
Political Stability	-0.89	0.72	-0.53	-0.87	0.54	0.89	-0.94	0.63	0.86	0.85	-0.75	-0.53	0.83	1.00											
Regulatory Quality	-0.90	0.65	-0.54	-0.83	0.52	0.92	-0.97	0.62	0.89	0.88	-0.67	-0.49	0.79	0.99	1.00										
Control of Corruption	-0.59	0.57	-0.14	-0.44	0.03	0.99	-0.89	0.82	1.00	1.00	-0.53	0.02	0.77	0.83	0.86	1.00									
GCI Score	-0.47	0.47	-0.02	-0.28	-0.12	0.96	-0.81	0.81	0.97	0.98	-0.42	0.18	0.68	0.72	0.77	0.98	1.00								
Index of Economic Freedom Score	-0.98	0.50	-0.73	-0.88	0.68	0.83	-0.97	0.41	0.79	0.77	-0.54	-0.63	0.63	0.96	0.97	0.75	0.65	1.00							
Tertiary Attainment	-0.68	0.86	-0.20	-0.69	0.25	0.91	-0.85	0.86	0.92	0.91	-0.85	-0.27	0.96	0.94	0.92	0.89	0.81	0.81	1.00						
GERD	-0.69	0.93	-0.24	-0.78	0.36	0.80	-0.77	0.80	0.80	0.79	-0.93	-0.41	0.97	0.93	0.89	0.77	0.66	0.78	0.97	1.00					
BERD	-0.56	0.42	-0.15	-0.34	-0.02	0.97	-0.87	0.74	0.98	0.98	-0.37	0.09	0.64	0.75	0.81	0.98	0.99	0.72	0.80	0.65	1.00				
RnD Personnel	-0.06	0.23	0.33	0.17	-0.52	0.74	-0.50	0.73	0.78	0.79	-0.13	0.59	0.43	0.35	0.42	0.81	0.90	0.26	0.53	0.33	0.86	1.00			
EIU Democracy Index	-0.90	0.68	-0.53	-0.85	0.53	0.91	-0.96	0.63	0.88	0.87	-0.71	-0.51	0.81	1.00	1.00	0.85	0.75	0.97	0.93	0.91	0.79	0.38	1.00		
V&A	0.03	0.33	0.46	0.19	-0.59	0.70	-0.42	0.81	0.75	0.76	-0.23	0.63	0.51	0.32	0.37	0.79	0.87	0.19	0.55	0.37	0.81	0.98	0.35	1.00	
Household Expenditure on Culture	-0.72	-0.04	-0.58	-0.39	0.32	0.77	-0.85	0.22	0.73	0.73	0.03	-0.18	0.21	0.63	0.72	0.73	0.73	0.77	0.48	0.33	0.81	0.56	0.68	0.41	1.00

Among the less common proxy indicators are the European Community's Migrant Integration Policy Index which uses 140 indicators to measure policies such as workplace rights, permanent residence, family reunions, and anti-racism laws; the Economist Intelligence Unit's Global Peace Index rates countries according to their internal and external conditions for peace which is correlated with income, schooling, level of regional integration; and Reporters without Borders' Press Freedom Index which assesses the plurality and lack of censorship of mass (and perhaps new) media.

Unfortunately, whereas a host of useful measures originated from OECD - such as GERD, BERD and Investment in Knowledge which is defined and calculated as the sum of expenditure on R&D, on total higher education from both public and private sources and on software – such data was limited to the scope of OECD's membership.

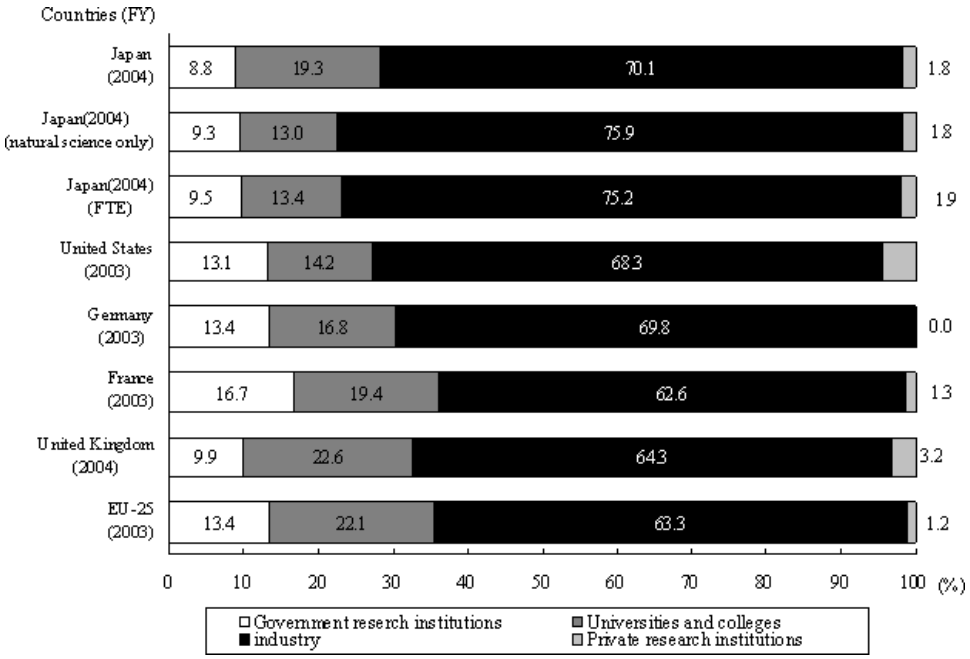
Finally, as a proxy for all 13 dimensions in composite (the so-called dependent variable), we drew from perhaps the most comprehensive field study of knowledge societies (UNDP 2007). "The human development index (HDI) is a composite index that measures the average achievements in a country in three basic dimensions of human development: a long and healthy life; access to knowledge; and a decent standard of living. These basic dimensions are measured by life expectancy at birth, adult literacy and combined gross enrolment in primary, secondary and tertiary level education, and gross domestic product (GDP) per capita in Purchasing Power Parity US dollars (PPP US$), respectively. The index is constructed from indicators that are available globally using a methodology that is simple and transparent (see Technical note 1). While the concept of human development is much broader than any single composite index can measure, the HDI offers a powerful alternative to GDP per capita as a summary measure of human well-being. It provides a useful entry point into the rich information contained in the subsequent indicator tables on different aspects of human development." (UNDP, 2007, p 225).

The HDI figures marked in Table 2 with an asterisk (*) indicate high human development as defined by the UNDP. We determined the face validity of the HDI score by observing the rankings of the 2007 report. The following were at the top of the world rankings: Iceland, Norway, Australia, Canada, Ireland, Sweden, Switzerland, Japan, Netherlands, France; while (sadly) the following were at the bottom: Congo, Chad, Central African Republic, Mozambique, Mali , Niger, Guinea-Bissau, Burkina Faso, Sierra Leone. We also determined the rigor of the exercise from the Technical Notes accompanying the report. In using HDI ranks and scores, we took particular care that the proxy indicators for the 13 dimensions did not derive from identical sources for the avoidance of pre-selection and bias.

Table 3 : Spearman Rank Correlations of Proxy Indicators with HDI.

Proxy Indicator	HDI Rank		Proxy Indicator	HDI Rank
Share of Trade in GDP	-0.46		Control of Corruption	0.70
GDP per capita	0.89		BCI Rank	0.68
Intangible Capital per capita	0.76		GCI Rank	0.69
FDI Stocks 2006	-0.63		Ease of doing business rank	0.63
NRI Rank	0.69		Index of Economic Freedom Rank	0.68
Internet Subscribers	0.38		Tertiary Attainment	0.69
Broadband	0.27		GERD	0.65
Government Effectiveness	0.72		BERD	0.45
Rule of Law	0.70		RnD Personnel	0.57
Global Peace Index Rank	-0.63		EIU Democracy Index (out of 10)	0.76
Patents	0.58		V&A	0.80
NPL Citation	0.55		Press Freedom Rank	0.74
Political Stability	0.58		Household Expenditure on Culture	0.58
Regulatory Quality	0.72			

A cursory examination of Table 2 reveals a reasonably strong match between the 13 dimensions and proxy indicators; just as the multiple and partial correlations statistics, in Table 3 and 4 respectively, reveal strong associations between the proxy indicators (and by extension, the dimensions) and HDI as a composite measure of a knowledge society. More specifically, from Table 4 it is apparent that the following proxy indicators are highly and significantly correlated with UNDP's Human Development Index: GDP per Capita; Intangible Capital per Capita; Government Effectiveness; Rule of Law; Regulatory Quality; Control of Corruption; Democracy Index; Voice and Accountability; and Index of Press Freedom. It is noteworthy that none of the dimensions nor their proxy indicators correlated poorly (<0.4) with the HDI scores. It is pointed out that the negative correlations that occur in both Tables 3 and 4 reflect inverse relations and it is interesting to note (for example) the inverse correlation between population and political stability, regulatory quality, democracy index, index of economic freedom. This is apparent because the countries with higher populations are mostly developing countries (Indonesia, Mexico) or still controlled economies (China, Russia). It bears repeating that correlation is not equivalent to causation. It is also interesting to note that with few exceptions (for example, population and V&A) there is high co-variance (or interactive effects) among the dimensions, proxy indicators or independent variables. Again, this suggests that the dimensions of a knowledge economy are synergistic and parsimonious – that is, their strengths co-exist in complementary state.



Source: http://www.mext.go.jp/english/news/2007/03/07022214/002/001.htm

Figure 4: Comparative Analysis of R&D and Innovation in Major Knowledge Societies

Whereas we had intended to validate our model (and in particular the 13 dimensions) with multiple regression analysis seeking their combined correlation with overall measures of economic and social affluence (for example the United Nation's Index of Knowledge Societies or a composite of per capita income, life expectancy, quality of life etc.), it quickly became apparent that such a multivariate analysis would gloss over the qualitatively rich discussion on the fundamental research question investigating the critical factors and outcomes of creating and sustaining a knowledge society. To illustrate, on the dimension of Research and Development, given by the proxy indicator which tracks the numbers of R&D, patents and innovation, we might conclude that the higher the better. However, as pointed out in the Japanese Government's White Paper on Science and Technology 2006, while measurements and data are critical, a pragmatic input-process-output-KPI set of measures which include R&D expenditure, research personnel, research performance, and R&D flows between creation and exploitation as verifiable outcomes of a knowledge society are even more so. The breakdown of research and innovation expenditures (also shown in Figure 4) between the various segments of the R&D community is similarly instructive in that it allows the benchmarking of major economies and perhaps explains the differentiation in their policies. There is therefore an unmistakable pattern which captures the constituent spending by government, universities, industry and private research institutes that clearly indicated the source of strength of an innovative KBE that goes beyond the total R&D expenditure. It is in fact in the dominant two thirds of the investment

from industry and the close interactions between universities and industrial R&D labs in the exploitation of results. This however is not shown in figure 4.

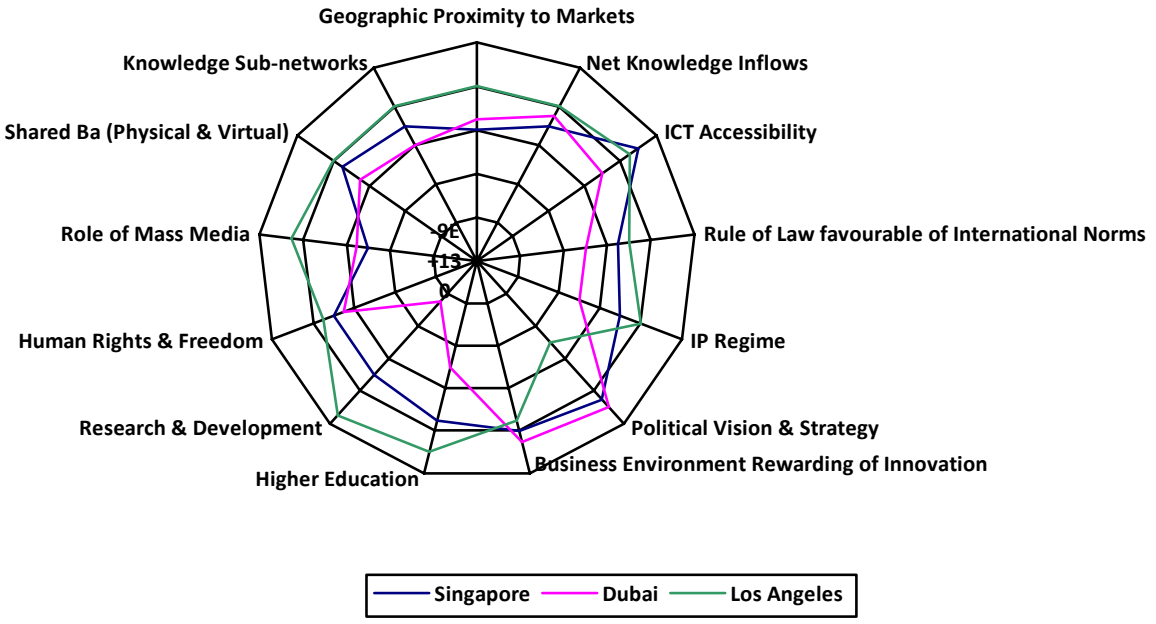


Figure 5: Policy Analysis of 3 Knowledge Societies with Radar Diagram.

One of the objectives of the present research was to develop a useable framework for policy-makers. Hence we used our framework of 13 dimensions to conduct a qualitative discussion of 3 particular knowledge societies – Dubai, Los Angeles and Singapore – as a means of evaluating the model's utility for policy researchers and decision-makers. As described in the previous section, we took the mean of focus-group participant assessments of each of the 13 dimensions (dropping outliers and missing values). The result of such an exercise was a Radar Diagram (see Figure 5) that served as a "physiognomy of a given knowledge society" used by Sagasti (2004) and others to characterize the developmental stages of various types of knowledge societies and the prescriptive policies for their sustainable growth. Such a tool has been used by the Malaysian government to benchmark its 5 yearly performance against OECD economies along 20 or so dimensions ranging from number of computers to ICT investments to expenditure on education to R&D personnel and high tech exports (UNDP 2007). For the present purpose, however, we are neither plotting a course of developmental policies nor benchmarking the 3 societies but to ascertain the construct validity of our conceptual model it terms of its usability in the field. We may conjecture that the framework developed in this study allows policy-makers the opportunity to benchmark regions, industries or perhaps the competition in an attempt to address structural deficiencies. As advocated by UNESCO, a Radar

Diagram - such as the one illustrated in Figure 5, where X, Y and Z can be regions of a country, industries within a market, or trading blocs - graphically shows the areas of strengths as well as weaknesses of the 4 pillars of knowledge societies for policy analyses.

5. Concluding Remarks

The analysis in this paper suggests that the knowledge society is indeed a desirable outcome that fosters sustainable development. The key to successful knowledge creation and sharing is complex – knowledge that is codified and imported is rarely a competitive advantage. Indeed it is readily apparent that a sustainable knowledge society places assumptions of an all pervading culture of learning, innovation, knowledge sharing, diversity of thought and industry impetus. Such is the nature of culture that it is not easily replicated and hence serves as a sustainable competitive advantage. As Houghton and Sheehan (2000) state, this "complex chain of creation, production and distribution" that characterizes a KBE requires such sophistication in the culture of its talent and governance.

One such sophisticated aspect of culture is the acceptance of the notion that knowledge (particularly science more than technology) serves as a common public good – it is in society's interest that higher education, ICT access and publicly funded basic research is universally available to society. Another aspect of this culture is the recognition of diversity as a merit and the active participation of youth and women in knowledge creation as well as governance. It is widely held that youth is the single biggest agent of change (and this change is a constant in the KBE) and therefore a catalyst for continual learning and (re-) discovery. As well, women have been held as the purveyors of knowledge and wisdom in society since ancient times and hence their involvement remains critical.

Numerous recent examples have pointed to societies which have emerged within a span of 2 or 3 decades to become economic powerhouses (eg Korea, Turkey, Brazil) – migrating from the so-called south to the north. In several of these cases, the composite of governance, talent, and culture have augmented what we believe is almost passé – infrastructure – to support such a transformation of its society to incorporate knowledge creation and distribution while focused or agriculture or industry.

As Manuel Castells (2000) suggests: *The networks themselves reflect and create distinctive cultures. Both they and the traffic they carry are largely outside national regulation. Our dependence on the new modes of informational flow gives enormous power to those in a position to control them to control us.* Castells also describes the accelerating pace of innovation and social transformation and examines the processes of globalization that threaten to make redundant whole countries and peoples excluded from informational networks. By investigating the culture, institutions, and organizations of the network enterprise and the concomitant transformation of work and employment, he points out that in the advanced, economies production is now concentrated on an educated section of the population aged between 25 and 40 and suggests that the effect of this accelerating trend may

not be mass unemployment but the extreme dexterity of work and personalisation of labor, and, in consequence, a highly segmented social structure. It would not be a tremendous leap of faith to believe that the same could emerge in the context of the north-south axis.

Indeed the World Bank's (2006) study on the wealth of nations found that a society's visible assets – land, natural resources, manufacturing facilities, machinery – are only a fraction of its total wealth, most of which are intangible – skills and know-how, social capital such as trust and among people and their ability to work together, governance dimensions such as rule of law, effective justice, property rights and functional government, and net financial assets including foreign reserves. The study showed that successful knowledge societies accumulated above 80% of their wealth in terms of intangible assets and that "human capital (measured through years of schooling) and governance (measured through a rule-of-law index) together explain 90% of the variation in intangible capital". In other words, the higher education and rule of law dimensions of a knowledge society could alone predict an overwhelming proportion (90% of 80%) of its success. It is therefore a reasonable conclusion that investing in continuing and higher education, promoting research and innovation, and preserving the cultural conditions that shore up relational capital are more potent policy instruments than the mere cultivation of natural capital and development of physical assets beyond a certain stage.

"For UNESCO, [on the other hand] the construction of knowledge societies opens the way to humanization of the process of globalization." (UNESCO, 2005, p27). Hence this report alludes to countries of the south having opportunities to evolve into knowledge societies through active education and literacy policies (citing the examples of Botswana, Kerala in India, and a Peruvian village), electronic administration for better governance, promotion of research and innovation (knowledge creation), and moving from consumption to participation in the knowledge economy. These are generally policies that encourage participatory access to knowledge and an integration of various knowledge policies (similar to what Michael Potter might have called the cluster approach to development), we conclude that the "barriers to entry" and the "existence of competitive forces" make this a formidable proposition. The idea of leapfrogging or achieving hyper-growth in transforming from an agricultural to a knowledge society is indeed appealing in its theoretical ideal of creating a less disparate world as well as in its practical goal of poverty alleviation. However, our understanding of how such societies may emerge, based on the research reported in this paper, is that such a transformation is not possible without the necessary building blocks of infrastructure, governance, talent and culture. Alas, in the foreseeable future, much of this will be strongly associated with OECD member societies.

Acknowledgements

The authors are with the Wee Kim Wee School of Communication & Information at the Nanyang Technological University in Singapore. Funding for this research came from grant RCC 6 / 2006 / SCI. The findings reported in this article are part of their on-going efforts to develop a formal understanding of knowledge management methods and policies. The authors are grateful to the participating Delphi panellists – in particular Ron Rice of UCSB – for their useful insights and feedback. Many thanks are also due to Rekha Jain of IIM-Ahmedabad and Laurent Elder of IDRC for their thoughtful review of an early draft which has led to a much improved paper.

References

Ambrosini, V. and Bowman, C. (2001). Tacit knowledge: Some suggestions for operationalization. *Journal of Management Studies*, 38(6), 811-829.

Baqir, M. N., and Kathawala, Y. (2004). Ba for knowledge cities: A futuristic technology model. *Journal of Knowledge Management, 8* (5), 83-95.

Beaulieu, L. (1993). A Parisian café and ten prote-Bourbaki meetings: 1934–35. *The Mathematical Intelligencer*, *15*(1), 27–35.

Birkinshaw, J. and Sheehan, T. (2002), "Managing the Knowledge Life Cycle", *MIT Sloan Management Review*, Fall, 75-83.

Bontis, N. (2001), "Assessing knowledge assets: a review of the models used to measure intellectual capital", International Journal of Management Reviews, 3 (1), pp. 41-60.

Bucklew, M. & Edvinsson, L. (1999), "Intellectual Capital at Skandia", Retrieved November 26, 2006, from http://www.fpm.com/cases/el3.html.

Castells, M. (2000). The Rise of the Network Society. The Information Age: Economy, Society and Culture, Volume I (2nd Edition). New York: Blackwell Publishing.

Cheng, P., Choi, C. J., Chen S., Eldomiaty, T. I., and Millar, C. C. J. M. (2004). Knowledge repositories in knowledge cities: institutions, conventions and knowledge sub-networks. *Journal of Knowledge Management, 8* (5), 96-106.

Chou Shih-Wei (2005). "Knowledge creation: absorptive capacity, organizational mechanisms, and knowledge storage/retrieval capabilities". *Journal of Information Science*, 31 (6) 453–465.

Cohen, D., and Prusak, L. (2001). In good company how social capital makes organizations work. Boston: Harvard Business School Press.

Conceicao, P., Gibson, D. V., Heitor, M. V. and Stolp, C. (2003). Knowledge and innovation for the global learning economy: Building capacity for development. In D. V. Gibson, C. Stolp, P. Conceicao, and M. V. Heitor (eds), *Systems and Policies for the Global Learning Economy* (pp. 11-43). Westport, CT: Praeger.

Connelly, C.E., & Kelloway, E.K. (2003). Predictors of employees' perceptions of knowledge sharing cultures. Leadership & Organization Development Journal, 24, 294-301.

Cummings, J. L., and Teng, B. S. (2003). Transferring R&D knowledge: The key factors affecting knowledge transfer success. *Journal of Engineering and Technology Management, 20*, 39-68.

Dolfsma, W. (2006). Knowledge, the knowledge economy and welfare theory. In W. Dolfsma, & L. Soete, *Understanding the dynamics of a knowledge economy* (pp. 201-221). Cheltenham, UK and Northampton, MA, USA: Edward Elgar.

Dvir, R., and Pasher, E. (2004). Innovation engines for knowledge cities: An innovation ecology perspective. *Journal of Knowledge Management, 8* (5), 16-27.

Dyer, J. H. and Nobeoka, K. (2000). Creating and managing a high performance knowledge sharing network: The Toyota case. Strategic Management Journal, 21, 345-367.

Edvinsson, L. (2000), "Some perspectives on intangibles and intellectual capital", Journal of Intellectual Capital, 1 (1), pp. 12 – 16.

Edvinsson, L. (2003), "The Intellectual Capital of Nations" in C.W. Holsapple, *Handbook of Knowledge Management 1 – Knowledge Matters*, Berlin: Springer.

Ergazakis, K., Metaxiotis, K. & Psarras, J. (2004). Towards knowledge cities: conceptual analysis and success stories. *Journal of Knowledge Management, 8* (5), 5-15.

Ergazakis, K., Metaxiotis, K. & Psarras, J. (2006). A coherent framework for building successful KCs in the context of the knowledge-based economy. *Knowledge Management Research & Practice, 4* (1), 56-59.

Fedorov, A. (2003). Media Education and Media Literacy: Experts' Opinions. UNESCO, Geneva.

Florida, R., & Gates, G. (2001). *Technology and tolerance: The importance of diversity to high technology growth*. Washington, D.C.: The Brookings Institution.

Foray, D. (2006). "Optimizing the use of knowledge". in B. Kahin, & D. Foray, *Advancing Knowledge and the Knowledge Economy* (pp. 9-15). Cambridge Massachusetts: MIT Press.

Gupta, Anil K. and Vijay Govindarajan. (2000). Knowledge flows within multinational corporations. *Strategic Management Journal*, 21, 473-496.

Hamdouch, A. and Moulaert, F. (2006). Knowledge infrastructure, innovation dynamics, and knowledge creation/diffusion/accumulation processes: a comparative institutional perspective. *INNOVATION*, 19 (1), 25-50.

Harris, R. G. (2001). The knowledge-based economy: intellectual origins and new economic perspectives. *International Journal of Management Reviews, 3* (1), 21-40.

Houghton, J., and Sheehan, P. (2000). A primer on the knowledge economy. Paper prepared for the National Innovation Summit, Melbourne, Australia, February 2000.

ITU (2007). Measuring the information society: ICT opportunity index and world telecommunication / ICT indicators. Geneva, Switzerland: ITU.

Kahin, B. (2006). Prospects for knowledge policy. In B. Kahin, & D. Foray, *Advancing Knowledge and the Knowledge Economy* (pp. 1-8). Cambridge Massachusetts: MIT Press.

Kaufmann, D., Kraay, A. and Mastruzzi, M. (2007). Governance Matters VI: Aggregate and individual Governance indicators 1996-2006. World Bank Policy Research Working Paper 4280, July 2007.

Koshland, D.E. (2007). The Cha-Cha-Cha Theory of scientific discovery. *Science* 317, 761–762.

Mansell, R. (2002). From digital divides to digital entitlements in knowledge societies. *Current Sociology, 50* (3), 407-426.

Marton, K. (2007). The great escape: Nine Jews who fled Hitler and changed the world. New York: Simon & Schuster.

Masterman, L. (1995). "Media Education Worldwide: Objectives, values and superhighways." *Media Development* 2, 37-51.

Matsuura, K. (2006). "Knowledge Sharing – a powerful tool in the fight against poverty", *The Straits Times* 6th December 2007, p 27.

Nahapiet, J. and Ghoshal, S. (1998). Social capital, intellectual capital and organizational advantage. Academy of Management Review, 23(2), 242-266.

Nonaka. I., Toyama, R. and Konno, N. (2000). SECI, *Ba* and Leadership: A unified model of dynamic knowledge creation. *Long Range Planning, 33*, 5-34.

OECD Factbook 2007 – Economic, Environmental and Social Statistics. Retrieved August 20, 2007 from http://lysander.sourceoecd.org/vl=10624761/cl=11/nw=1/rpsv/factbook/

Olssen, M., and Peters, M. A. (2005). Neoliberalism, higher eduction and the knowledge economy: From the free market to knowledge capitalism. *Journal of Education Policy, 20* (3) , 313-345.

Powell, W.W., and Snellman, K. (2004). The Knowledge Economy. *Annual Review of Sociology, 30*, 199-220.

Rodrigues, M. J. (2002). *The New Knowledge Economy in Europe: A Strategy for International Competitiveness and Social Cohesion.* Cheltenham, UK, Northampton, MA, USA: Edward Elgar.

Rodrigues, M. J. (2003). *European Policies for a Knowledge Economy*. Cheltenham, UK, and Northampton, MA, USA: Edward Elgar.

Regis, E. (1991). *Who got Einstein's office?: Eccentricity and genius at the Institute for Advanced Study*. Reading, MA: Addison-Wesley.

Sagasti, F. (2004). Knowledge and Information for Development. Northampton, MA, USA: Edward Elgar.

Shah, S. (2006). *The body hunters: Testing new drugs on the world's poorest patients*. New York: New Press.

Sharma, R.S. and Azura, I.M.. (2005). "Bridging the Digital Divide in Asia - Challenges and Solutions", *International Journal of Technology, Knowledge and Society, 1* (3), 15-30.

Soete, W. D. (2006). *Understanding the Dynamics of a Knowledge Economy*. Cheltenham, UK, and Northampton, MA, USA: Edward Elgar.

Samarajiva, R. and Gamage, S. (2007). “Bridging the Divide: Building Asia-Pacific Capacity for Effective Reforms”, *The Information Society* 23, 109-117.

UNESCO (2005). From the Information Society to Knowledge Societies. Paris, France: UNESCO Publishing.

UNDP. (2007). Human Development Report 2007 / 2008. Retrieved December 12, 2007 from http://hdr.undp.org/en/media/hdr_20072008_en_complete.pdf

World Bank (2006). Where is the Wealth of Nations? Measuring Capital for the 21st Century. Washington, D.C.: The International Bank for Reconstruction and Development / The World Bank.

World Economic Forum. (2006). The Global Competitiveness Report 2006-2007. Retrieved August 10, 2007 from http://www.weforum.org/en/initiatives/gcp/Global%20Competitiveness%20Report/index.htm