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A First Effort to Visualize Knowledge of a Region

– A visualization of Öresund & Shenzhen in the perspective of Knowledge Innovation Zones

Autors:
Philip Hansson
Henrik Littorin
Fredrik Svensson

Tutor:
Leif Edvinsson

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Dear Reader,

The work you have in your hand is a work of passion, joy and life. The work you have in your hand has been a great learning process; of the subject, yourself and human interactions with fellow students, tutors and Chinese bureaucracy. The work you have in your hand is also a work of frustration and anxiety. We all know how much pain and suffrage you go through when a work is constantly twisting and turning and the plan you have staked out, never seems to go your way. It has nevertheless been a fantastic journey through the landscape of knowledge. This thesis has been an extraordinary example of the latter.

We wish to thank our tutor Professor Leif Edvinsson for his contribution during our journey, and for his work putting knowledge and intangibles on the map.

Enjoy,

Philip, Henrik and Fredrik

Abstract

Title: A First Effort to Visualize Knowledge of a Region – A Visualization of Öresund and Shenzhen in the perspective of Knowledge Innovation Zones

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Authors: Hansson, Philip (philip.hansson.174@student.lu.se)
Littorin, Henrik (henrik.littorin@gmail.com)
Svensson, Fredrik (fredrik.svensson.405@student.lu.se)

Tutor: Edvinsson, Leif

Key words: Intellectual Capital, Knowledge Innovation Zone, Triple Knowledge Lens, Performance Measurements, Special Economic Zone, Öresund Region, Shenzhen

Purpose: Our purpose is to create a simplified model to measure a knowledge innovation zone (KIZ).

- How would this model look like?
- Can it be applied on the region of Öresund?
- If applied on the region of Shenzhen, would it be possible to see the differences of a special economic zone and a knowledge innovation zone?

Methodology: We have used a combination of inductive and deductive approach, collecting both qualitative and quantitative data. Through theoretical and empirical studies, we have developed a simplified model for measuring IC in a KIZ, the S-TKL.

Theoretical perspectives: Our theoretical framework is to be seen as a journey, starting with IC, prior research on measuring regions, through KIZ theory by Amidon & Davis landing in the creation of our interpreted simplified TKL; the S-TKL

Empirical foundation: Empirical findings used in this study are a combination of quantitative and qualitative data. The quantitative data were collected using our S-TKL on the two zones. The qualitative data used, originates from zone administer, prior research and interviews.

Conclusions: We have through our theoretical framework been able to create a simplified measuring tool for a KIZ; the S-TKL. We have found that the S-TKL is possible to implement on the Öresund Region but with some flaws. Even though the Öresund Region has implemented the mindset of a KIZ, accurate statistics are in some areas hard to find. We can also through our empirical findings say that it is difficult to use the S-TKL on Shenzhen. The data we have found gives a good indication of both of the regions. Together with our qualitative data we have been able to determine that Öresund Region are having problem, developing the three lenses simultaneously, but showing a significant effort in doing so. Shenzhen on the other hand lack even more triangulation. The picture shows a diversified region with areas influenced by the mindset of a KIZ, but also areas deeply rooted in the thinking of a SEZ. Due to insufficient data we were not able to see the difference between a SEZ and a KIZ using our S-TKL alone. What we did find though was a region in the transition towards a knowledge zone.

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1 Introduction

To measure assets has never been easy, and especially not when what you try to measure isn't something physical, but intangible. Is there really a point in measuring intangible assets and what implications does it bring?

"The basic economic resource – 'the means of production' to use the economist's term – is no longer capital, nor natural resources (the economist's land'), nor' labour'. It is and will be knowledge."

- Peter F. Drucker (1993:7)

Knowledge; what do these nine letters consist of, these nine letters that have caused so much drama and discussion amongst philosophers, scientists and researchers since the antiquity – What is knowledge?

According to Plato, one of the antiquity's famous philosophers, knowledge is divided into what can be regarded as secure and true knowledge, *episteme*, and knowledge that is based on opinions and beliefs, *doxa* (Gustavsson, 2002:13). One of Plato´s disciples, Aristotle, thought of this description to be too narrow, and widened the discussion by linking knowledge to a life of reflection and investigation. His view of practical knowledge was one primarily connected to handcraft and creative activities, *techne*, and one associated with a political and ethical life of mankind, *phronesis*. From the mindsets of Plato and Aristotle, three forms of knowledge derived: (1) epistme, the scientific-theoretical knowledge; (2) techne, the practical-productive knowledge; and (3) phronesis, the knowledge of practical wisdom (Gustavsson, 2002:13).

Gustavsson (2002:14) argues that we now live in a world where the most influential knowledge of today is the scientific one, and where practical knowledge has been marginalized. This is a result of the identification of knowledge as a factor of production; as a result of a new world order, where old the factors of production, capital and labour, are facing competition in a more intangible factor – knowledge.

1.1 Background

1.1.1 The knowledge Economy

"For countries in the vanguard of the world economy, the balance between knowledge and resources has shifted so far toward the former that knowledge has become perhaps the most important factor determining the standard of living – more than land, than tools, than labour."

- World Development Report 1998/99

Technological innovation, and thereby knowledge, has been the main source for change and it has had immensely big impact on how business is conducted today. Innovation is the process which turns knowledge and ideas into reality, as in products and services (Sizer, 2001). However, the importance of knowledge has only recently been accepted. For the last two hundred years, the two productivity factors of labour and capital have dominated the theories of neo-classical economics (Frederick & McIlroy, 1999). Intangible factors of production such as knowledge and intellectual capital were seen as exogenous factors, with no direct possibility to affect an economic system. New theories, brought to life by economist Paul Romer (1986, 1990), proposed a change in the neo-classical mindset by seeing technology, and the knowledge on which it originated from, as a natural part of an economic system. According to Romer (1986, 1990), knowledge is the third factor of production, in addition to capital and labour. Accumulated knowledge is the basic form of capital on which economic growth is depended. In contrast to capital and labour, knowledge strives to become a public good and as soon as it is made public, there are no costs involved in sharing it with others (Frederick & McIlroy, 1999).

Knowledge is today worldwide recognized as an asset; as a factor of growth and prosperity for organisations and companies, but also for countries and economies (Cannon, 1998). We have left the industrial era behind, and are now living our lives in a knowledge economy, where technology has made knowledge easily accessible. In this society, human capital is becoming a competitive resource, since knowledge simply flow through technology and machines, but it resides with people (Cannon, 1998).

1.1.1.1 Definition of a knowledge economy

There are two significant forces that have transformed the economies of countries, regions and cities: (1) extensive and accelerating change of technologies and innovation, leading to increased globalization and thereby (2) a better capacity to respond to change and a more profound understanding of customer needs. As a result of these forces, the success of a global economy is increasingly driven by knowledge and innovations. Today, countries are competing to attract and retain the best talents and most successful knowledge-based businesses, clusters and industries (Sizer, 2001). There has been a shift from energy-based economies with the regular factors of production, to information-based economies that are based on knowledge assets and intellectual capital

– a knowledge economy (Malhotra, 2003). In this knowledge economy, manufacturing activities are being put aside, in benefit of services; intangible investments in software, education and research are increasing, whilst traditional investments decreases (Aubert in Bounfour & Edvinsson, 2005:61*ff)*.

Cowey (2000) argues that the entrance of knowledge economy is one of the biggest changes in the history of mankind. The industrial revolution took more than 100 years to get a foothold. Changes we now see are happening within a fraction of that period, and this simultaneously all over the world. This change that was driven by the same technological factors that first brought the information era, have now generated a knowledge era.

United Kingdom Department of Trade and Industry define a knowledge economy as "a knowledge-driven economy in which the generation and exploitation of knowledge play the predominant part in the creation of wealth" (Frederick & McIlroy, 1999). The World Bank uses the following sentence to define the term; "a knowledge economy is one where organizations and people acquire, create, disseminate, and use knowledge more effectively for greater economic and social development" (www.worldbank.org).

1.1.1.2 To become a knowledge economy

A country's capacity to take advantage of the knowledge economy depends on how quickly it can become a learning economy. That is according to Frederick & McIlroy (1999) an economy where new technologies are used not only to access global knowledge, but also used to communicate with other people about innovation. It is essential for a knowledge economy that learning and knowledge-creation becomes of prime importance. Mausyama (in Bounfour & Edvinsson, 2005:167) develops these thoughts and describes five basic elements that are crucial to a knowledge-based economy and in a country's adaptation towards such a one, namely:

(i) *Efficient ICT industries and infrastructure*: Information and communication technology (ICT) forms the platform of a knowledge-based economy, and includes infrastructure, equipment and services for creating and utilizing knowledge.

(ii) *Efficient, international production networks*: Through the use of ICT, coordination and collaboration of activities is possible to a greater extent, which implies that specialized technology and know-how can be shared within networks or clusters in order to generate knowledge innovation.

(iii) *Powerful innovation systems*: Investments in the creation of knowledge and technology is a primary source of economic growth. Thereby, an economy's competitiveness is determined by the capacity of its innovation systems and belonging environment.

(iv) *Human resources*: Human resources incarnate knowledge and support the earlier mentioned elements. Knowledge workers are creative talents that are

able to maintain knowledge innovation, assist ICT infrastructure, and constantly challenge existing knowledge in order to obtain new.

(v) *Industrial and organizational renewal*: A knowledge-based economy requires renewal in processes and mindsets within organizations and industries, which can be achieved by more liberalization and deregulation. Outsourcing of non-core functions and the use of ICT to coordinate a new, flatter organization of network are some example of changes that faces actors in a knowledge-based economy.

World Bank and Aubert (www.worldbank.org; in Bounfour & Edvinsson, 2005:62) reasons even further, and defines "four pillars of knowledge economy"; four requisites that needs to be fulfilled in a country in order to fully participate and enjoy the features of knowledge-driven economies. Investments and reforms needs to be made in these following four pillars to build a knowledge economy: Education and training; information infrastructure; economic incentive and institutional regime; innovation systems.

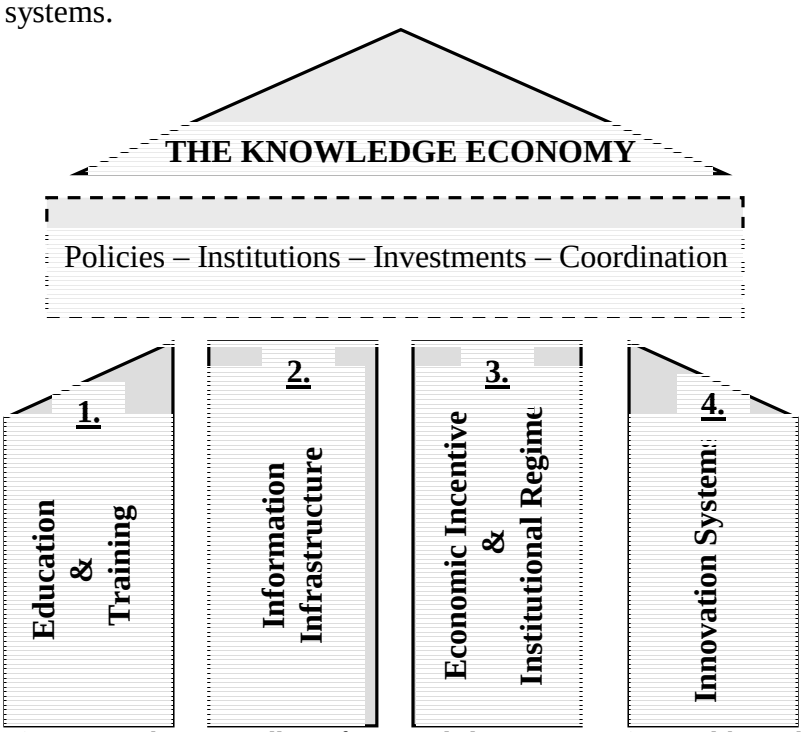


Figure 1.1 The Four Pillars of a Knowledge Economy (inspired by Aubert, in Bounfour & Edvinsson 2005:63; www.worldbank.org)

In Bounfour & Edvinsson (2005:63), Aubert explains the four pillars of knowledge economies. According to Aubert and the World Bank (Bounfour & Edvinsson, 2005:63; www.worldbank.org), (1) to be able to create, share and use knowledge, a skilled, educated and creative population is essential. Moreover (2), a dynamic information and telecommunication infrastructure is needed, which ranges from radio to internet, and facilitates the flow of knowledge through effective channels of communication. Additionally, World Bank explains that (3) an economic and institutional regime is central in a knowledge economy; a regime that enables free flow of knowledge, supports

hi-tech investments, and provides incentives for an efficient use of existing and new technology. Finally, it is fundamental to (4) have a network of universities, Science Parks, researchers, private companies and community groups that via collaboration can interact and explore global knowledge and develop new mindsets. Together, these four pillars will help countries to develop strategies for a transition to knowledge-driven economies. However, countries must develop and establish relevant policies, institutions, investments, and coordination across the four pillars to be able to effectively make use of knowledge (www.worldbank.org).

Seizer (2001) argues that a growing knowledge also implies that countries, regions or business no longer can count on its own resources. Collaborations, networks and strategic alliances, in order to develop and exploit innovation and knowledge, are vital to survive in a knowledge economy. The knowledge economy has thereby taken us from competition, via cooperation, all the way to collaboration (Amidon, 2007-05-08).

"We are creating a new economic world order based upon the flow of knowledge, (not technology), innovation (not solutions), value-systems (not chains), stakeholder success, (not satisfaction), and international collaboration (not competition)."

- Amidon (2004)

By bringing talents, companies and science together into collaborative projects, dynamic and knowledge innovation can be achieved. National governments can gain a competitive advantage from organizing its assets into regions, just as a company executive would do in order to improve market share and increase, or maintain a competitive edge (OECD, 2006).

1.1.2 Knowledge Innovation Zone

A knowledge innovation zone (KIZ) is a geographic region, economic sector or a community. In a KIZ knowledge and innovation are the new elements for economic prosperity and it is the collaboration and knowledge transfer between stakeholders in a KIZ that creates wealth (Amidon & Davis, 2006a). A KIZ have its base in three pillars; knowledge-based economy, knowledge-based society and knowledge-based infrastructure. These are to be seen as a triangulation where all are equally important and are to be developed simultaneously (Amidon, 2007-05-08). The essence lies in avoiding the "productivity paradox", where one area is developed without looking at the broad picture (e.g. IT is to no use without talented or committed people) (Amidon & Davis, 2006a). If avoiding this, knowledge can flow "from its origin to the point of highest need or opportunity" and by doing so create innovation (Amidon & Davis, 2004). In a KIZ, clusters are created which attract both talented people and investments (Edvinsson, 2005). A KIZ combine tangible and intangible assets with culture and environmentally friendly ideas to improve the quality of life for its inhabitants (Edvinsson, 2005).

To measure a KIZ Amidon & Davis (2006c) uses the three pillars of knowledge-based economy, culture and infrastructure to form a measuring tool called the Triple Knowledge Lens (TKL). The TKL is based on eleven non financial drivers which combined with intellectual capital and the three pillars form twelve indexes. With help of the TKL a KIZ can be measured and evaluated to see if all factors are developing simultaneously.

The simplified TKL (S-TKL) that we will present further on in this study is a model we have developed, using the eleven non financial drivers and the IC parameters; human capital, relationship capital and structure capital. This model is also based on prior research regarding knowledge zones and intellectual capital.

1.1.2.1 Öresund KIZ

Öresund, the strait located between the two kingdoms of Sweden and Denmark, was during a long period of time a target of fighting and political disputes. The one who controlled the area would also control of flow of international traffic in and out of the Baltic Sea. He would also gain important revenues from toll of merchants passing through. Thereby, the geographical position of Öresund made it a location where fierce and furious battles between the two kingdoms were fought during the sixteenth and seventeenth century (Berg *et al*., 2000:10; Öresundssymposium, 1998:152).

The following centuries were calm and the relationship between the countries improved. The two neighbours ended up being two of most prospering and richest countries in the western world. Former hostility was changed to friendliness and brotherhood. Plans of building a connecting link between the countries emerged, and when the bridge over Öresund was finalized and inaugurated in July 2001, a vision was realized. Two countries and their regions had been merged together in one, forming the Öresund Region, with the eastern part constituted by Skåne, Sweden, and western part located on the Danish island of Sjælland. But the vision of uniformity and collaboration had emerged many centuries before, in times of war and conquests. Today, Öresund Region has flourished to a region of peace and prosperity; a region of knowledge wealth and innovation richness; a region of collaboration and neighbourliness (OECD, 2006; Öresund University, 2006).

According to Amidon & Davis (2006b), Öresund Region can be seen as a knowledge innovation zone, where knowledge, creativity and intellect drive economic performance and social development. The region has managed to develop an environment and infrastructure that supports innovation and optimizes the flow of knowledge (Amidon & Davis, 2006b). Its prime focus is on high tech industries, and Öresund is prominent within areas such as medicine, bio-tech, IT and telecom, food industry etc (Øresund Network, 2006a; OECD, 2006). The region is working with a triple helix focus (Øresund Network, 2006b); close collaborations between universities, authorities and

business community in science clusters, in order to generate knowledge transfer and innovation.

1.1.3 Special Economic Zone

China, India and Eastern Europe have one thing in common – they are among many countries that have chosen a fast track to economic exploration, by using the concept of Special Economic Zones (SEZ). Special Economic Zones, in the literature also often referred to as Free Trade Zones, Export Processing Zones, Duty-Free Zones, Free Ports, Enterprise Free Zones, exists today in over 120 countries (Knowledge Innovation Zone Research Report, 2006; Li *et al*., 2005; Schweinberger, 2003; Haywood, 2000). There are about 3000 SEZs globally, who in total accounts for over $600 billion in exports and 50 million direct jobs (Knowledge Innovation Zone Research Report, 2006). Special economic zones can now be found in almost every part of the world, including developed, developing and transition countries (Li *et al*., 2005).

The first sign of a economic zone can according to Haywood (2000) be traced back to 300 BC at the Greek Island of Delos, in the Phoenician city of Tyre; an island which became one of the wealthiest islands in the world for over a century. By the eighteenth century and onwards, the initial free trade concepts in modern history evolved and were given the name Export Processing Zones (EPZ). They were primarily focused on initiating export-oriented industrial development in Third World nations.

According to Wong & Chu (1984), the first successful EPZ was implemented in Ireland 1956. The first countries in the developing world to adopt the concepts of an export processing zone were Puerto Rico in 1962 and India in 1965. For developing countries, this was a way to accelerate economic growth and bring industrialization to their homes. By attracting overseas companies, their capital and technology, infrastructure and jobs could be generated in the developing countries. At the same time, for political reasons it was important to keep them out of the overall governance of the country, and therefore specific areas, or ‘zones’, were created. In these zones, overseas companies could handle their businesses with as few restrictions as possible (Wong & Chu, 1984).

During the years, the term EPZ has evolved into Special Economic Zones (Wong & Chu, 1984). The first special economic zone in the world was adopted by Peoples Republic of China in late 1970s, and built on the initial ideas of an EPZ: attracting foreign investors by favourable incentives, and thereby industrialize and accelerate economic growth. However, while an EPZ is focused on manufacturing, a SEZ also embraces other economic activities such as agriculture, tourism, commerce and real estate development. Another difference between EPZ and SEZ is that the first one is typically found in countries of market economy, whereas the latter one is a product of open economic policy in a socialist country (Wong & Chu, 1984). In China, a socialist country, the SEZ have legislative, executive and sometimes judicial functions and are organised around lines of an autonomous province or state. Here, most SEZ have their

own customs service, tax collection system and department of foreign affairs (Haywood, 2000). Below in the next chapter, a short introduction of a SEZ will follow.

1.1.3.1 Shenzhen SEZ

In the 1970s, Shenzhen was just a sleepy border town located in the Guangdong province, south-east China, opposite to Hong Kong. It was housing about 20 000 inhabitants that were living of agriculture and 26 small factories in the area (Wei, 2000). By 1979 Shenzhen, was designated as one of the four initial SEZ of the country. In less than 30 years, the town has evolved into a modern city with 8,28 million inhabitants, and a GNP per captia of approximately US$ 7 162 in 2004 (Sveriges Generalkonsulat, 2005). Between 1980 and 2001, the annual GDP growth rate was 29,5%; the industrial output increased 45,4% per year; and the foreign trade rose annually with 39,1% (Wang and Meng, 2004).

The establishment of special economic zones made it possible for a plan driven economy like China to stepwise adapt the mindset of market economy, and make itself comfortable with the entry of foreign investments and international producers (Wong & Chu, 1984; Wei, 2000). The zone has acted as a laboratory for economic growth, and there have been many different economic policies on trail (Svenska Generalkonsulatet, 2005). It started out with attracting foreign investors due to its strategic location close to Hong Kong, in combination of the abundance of land and cheap labour, and most investments were made in real estate, construction and tourism (Wong & Chu, 1984). Today, with a favourable incentive package, in combination with an enhancement of infrastructure, usage of existing resources, and a shift toward higher value-adding activities, Shenzhen has experienced an extremely fast growth and is the riches city on mainland China (Wei, 2000; Svenska Generalkonsulatet, 2005). The number of foreigners investing in the Shenzhen SEZ has increased drastically, and today there are a number of Swedish companies in the area, such as ABB, Ericsson, IKEA and Tetra Pak (Wei, 2000; Svenska Generalkonsulatet, 2005).

1.2 Problem description

We are entering an era of knowledge, or in fact, we are all ready there – we have moved from capitalism to a knowledge society (Drucker, 1993:19*ff*). According to Drucker (1993:7) the creation of wealth will be based on neither labour, nor the allocation of capital, but on productivity and innovation, which is application of knowledge to work. Since knowledge always is embodied in a person, the shift to a knowledge society puts the educated human capital in focus (Drucker, 1993:191).

Similar to a manager who wants to understand and measure intellectual capital and the knowledge of his employees in order to predict future performance and generate success, leaders of large economies, countries and regions are eager to do likewise

(Bontis, 2004 ; Malhotra, 2001). This is not a coincidence. According to Bontis (2004), the intellectual capital of countries or regions includes values of institutions, enterprises, communities and individuals that are hidden, and include sources of future wealth creation. Intangible assets, such as knowledge, have become the most important factors for companies, regions and countries when creating value (Pulic, in Bounfour & Edvinsson, 2005:197*ff*). Thereby, it is important for an entity who constantly wants to develop and update itself to follow and measure the evolution of the IC development within its borders. The old financial metrics are therefore inadequate when it comes to measuring the well being of a company or a geography (Amidon & Davis, 2006b).

Debra Amidon and Bryan Davis have studied development in knowledge intensive areas around the world for over two decades (Amidon, 2007-05-08; Davis, 2007-05-18). The results of their findings are that they see new regions developing, where knowledge is used as its best potential. The implications are new societies where humans will not have more, but *be* more (Amidon 2007-05-08). Economic growth will prosper in line with culture, society and information infrastructure, and intellectual wealth is the engine (Amidon & Davis, 2006b).

Amidon and Davis (2006a) have built a measurement system for knowledge innovation zones – the Triple Knowledge Lens. This system is created to reflect an area by three different perspectives, the drivers of knowledge zones: knowledge-based economy (business), knowledge-based society (people) and knowledge-based infrastructure (organization, technology, and environment) (Amidon & Davis, 2006a). According to Amidon (2007-05-16) the theory of a KIZ is emerging and is not fully developed. It is not even sure if a KIZ could be measured with IC measurements (Amidon, 2007-05-16). Measuring intangibles could decide the future success of region. If intellectual capital and its belonging knowledge is a significant brick in the new world order, and measuring this brick is a way of gaining competitive advantage, how is it done? Is there really a way to measure IC of a region? If so, what type of data should be used, and is such data available? Further more, how would it be measured, and what type of indicators would a measurement generate?

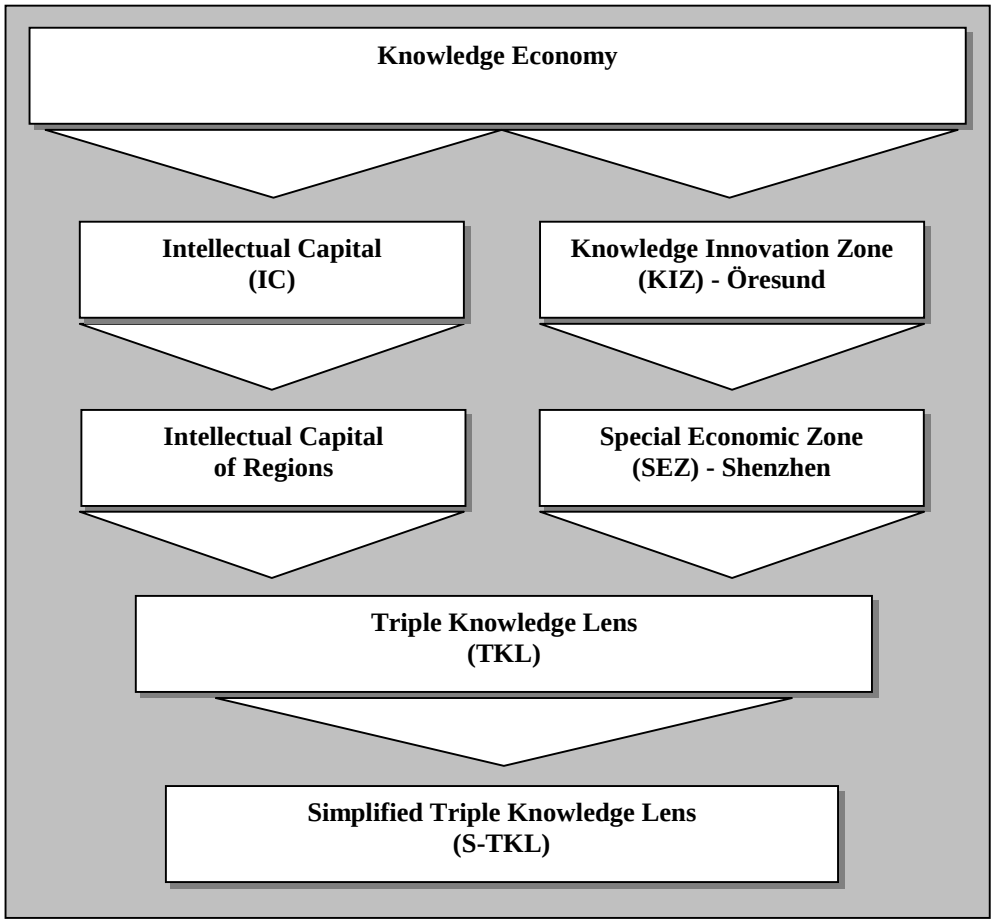


Figure 1.2 Strategic map over the foundations of this study

1.3 Purpose

Our purpose is to create a simplified model to measure a knowledge innovation zone (KIZ).

- How would this model look like?
- Can it be applied on the region of Öresund?
- If applied on the region of Shenzhen, would it be possible to see the differences of a special economic zone and a knowledge innovation zone?

1.4 Target group

Possible target group for this study are governments, regions and other decision makers that wants to develop there strengths in a knowledge based economy. This study is also suitable for university students.

1.5 Disposition

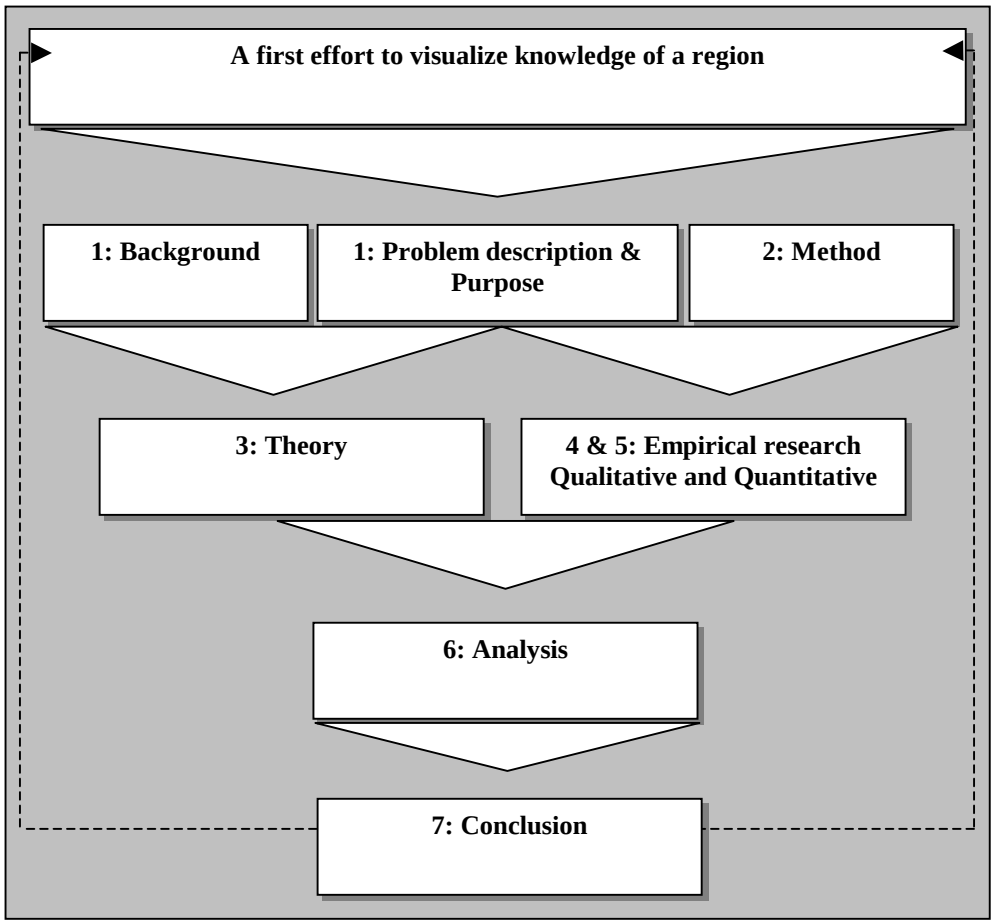


Figure 1.3 Disposition of thesis

To clarify our ideas and background to our research, we will start by explaining the theme and problem area for our study (*Chapter 1*), and then further on describe how our research has been conducted (*Chapter 2*). We will explain our different ways of collecting data; reason about the regions studied and discusses the validity and reliability of this thesis. Thereafter, we will introduce the theoretical framework which we have built our research upon (*Chapter 3*). The reader will here be acquainted with concepts such as Intellectual Capital, Special Economic Zones, Knowledge Innovation Zone and the Triple Knowledge Lens framework. We will by the end of this chapter reveal our own simplified measuring model for a knowledge innovation zone; S-TKL. Next chapter that follows will introduce the regions we have studied, the KIZ of Öresund and the SEZ of Shenzhen (*Chapter 4*). This is followed by a deeper, quantitative study of these areas, where we have used our S-TKL performance measurements in order to gain a better understanding of the characteristics of each zone (*Chapter 5*). Thereafter we will use our theory to examine the empirical findings of both regions (*Chapter 6*). A brief introduction will give the reader an idea of how we will approach our empirical data, which then will follow by an analysis of each region. Our final chapter will include discussions and subjective reflections around our analysis,

where our purpose and problem formulation will be answered (*Chapter 7*). This chapter will end with a presentation of ideas for future research.

2 Methodology

How have we conducted this study and will it be possible to do it again? What type of methods have we used, and how have we collected our data? Are our findings correct, or is there anything missing that we should have thought of in order to do a reliable study? These are all questions that the reader will be introduced to in this chapter.

2.1 Selection of Method

2.1.1 Qualitative/Quantitative

We have in this study used both qualitative and quantitative research methods. Our main purpose, to measure the regions of Öresund and Shenzhen in numbers is according to Bryman & Bell (2003) called a quantitative approach. On the other hand, the qualitative methods have been used as a way to gain knowledge and understanding about the regions and theories about intellectual capital and knowledge zones. The ways the two different methods differ are that quantitative collect and analyze data, and the qualitative pay more attention to words (Bryman & Bell, 2003).

2.1.2 Inductive /deductive

In the beginning we searched for theories on which we wanted to create a hypothesis of a KIZ and then test it on the Öresund region. Bryman & Bell (2003) calls this way of performing a study deductive. Since prior studies only had emphasised on regions not considered as KIZ, not much material was found. This put us in a situation were we had to search for empirical founding's to be able to create the theories. This was mainly done by interviewing researchers but also through literature studies. When forming our own theoretical framework on which we conduct our measurements the procedures were likewise. During our research we have combined the two methods.

2.2 Selection of Regions

2.2.1 Öresund Region and Shenzhen

The choice of the two regions was made through brainstorming between the authors and our tutor, Professor Leif Edvinsson. We wanted to write about Knowledge Innovation Zones and since Lund is situated in the Öresund region we found it interesting to study

our own society. The reason we choose Shenzhen was due to their fantastic development during the last three decades. We believe these two regions make a good field to study, compare and measure knowledge innovation.

2.3 Data and Information Collection

Data used in this thesis are both primary and secondary. The primary data was collected from interviews and the secondary from other researchers, scientific articles and published information regarding the two regions.

2.3.1 Interviews

To collect data and information needed for this thesis we choose to perform four interviews. These were made for both our theoretical and empirical framework. Our main theory, the Triple Knowledge Lens (TKL) created by Debra Amidon and Bryan Davis were still in its development phase when we started this study. Since not much had been published we needed to collect more information. This was done through three telephone interviews with the authors, two with Amidon and one with Davis. All interviews were booked in advance which enabled both us and the interviewee to be prepared. As far as we understood during the telephone interviews the interviewee's were in his/her office during the entire interview, and we therefore believe that they felt confident and secure.

Our first interview was held with Amidon. The reason for this interview was to gain knowledge and understanding of Knowledge Innovation Zones and some theoretical background of The Triple Knowledge Lens. Since Amidon lives in USA we had to have this interview by phone. The interview lasted for about two hours and the entire interview was recorded and transcribed. Since we recorded the entire interview, we were all able to focus on watching and listening to what Amidon said. To gain even more knowledge and understanding we used software that could allow us to see what was on Amidons screen and by doing so making the interview much more understandable.

We had no pre written scheme over how we wanted the interview to proceed. We choose this method believing that allowing Amidon speak freely would help us collecting more information. Bryman & Bell (2003) calls this type of unstructured interviews *qualitative interviews*. They differ from the more structured, quantitative interview in a way that they do not force the interviewee to answer a specific set of questions. The interview is in a more generality way and the interviewee can speak more freely and from his/her own mind. Another reason for this choice of method was also done due to the fact that not much was written on the subject and because some of the things that would come up were not published. Though, prior to the interview we did have some thoughts on questions to ask. Some were asked during the interview as the topic came up and some were answered without us asking the question.

Our biggest problem with the TKL prior to the interview was how the twelve different indexes related to the TKL had been created. Since our purpose with this thesis is to measure a region we needed some concrete examples. Unfortunately this was not possible since Amidons aim is to use her work with the TKL as parts of here consult business.

Our second interview was also held with Amidon. This time the interview lasted for about one and a half hour. The main purpose of this interview was to gain even more knowledge about the TKL and KIZ. This time we were able to receive information that could lead us on to the right track in creating measurements. The suggestion we got from Amidon was that she wanted us to in an exploratory way collect information from the stakeholders in the Öresund region, and from that information create our own measurements. Ms Amidon suggested that we used the same key indicators that she and Davis had used. As with the first interview the second was also done by telephone and recorded.

The third and last interview regarding our theoretical framework was held with Davis. This interview could be seen as more structured than the first ones, since we by now had a deeper understanding of the theories and we knew what information we needed. This interview was also done by telephone, since Davis lives in Canada. During this interview we wanted to further explore the thoughts about the development of Davis framework, especially around the eleven capital drivers of a KIZ. The interview lasted for about two hours and was recorded with Davis permission.

The fourth interview was held with Bengt Streifert, Director of Öresund University. The interview was held in his office in Lund and lasted two hours. The interview was part time structured and part time unstructured. We had initial questions about our measurements, but we also wanted to have a discussion about the Öresund region and get some thoughts from him about our research. Bryman & Bell (2003) calls this way of interviewing, semi structured interview. Regarding our measurements Streifert was able to help us

When each interview was done we, the authors sat down to go through the material and transcribe it. Since we did that we had a better understanding when performing the next interview. By putting the collected data together we could in a more efficient way ask the right questions the next time and avoid iteration.

2.3.2 Selection of respondents

According to Bryman & Bell (2003), when selecting respondents for a qualitative interview the importance lice in whom you interview and not in how many as with quantitative interviews. Since Amidon and Davis are the creators of some of the theories that we use the choice of respondents was not hard. When interviewing such key

persons the reliability of the information becomes much higher. We choose not to contact more respondents since we after the three interviews had a good picture of the theories used and the history lying behind.

2.3.3 Secondary Data

The secondary data used in this thesis are mainly scientific articles and books. Many of them were in a premature phase of the thesis suggested by our tutor Leif Edvinsson. The secondary data regarding KIZ and TKL were given to us by Amidon and Davis. Other secondary sources were found through electronic databases (i.e. Lovisa and Elin) available to us through Lund University. Information needed for our empirical study was partly found on websites related to the two regions (i.e. Öresund region and Shenzhen). These were found both from search engines such as Google and from tips from our tutor and representatives from the regions. During our empirical research we held multiple short telephone interviews with respondents regarding statistical information. Some of these respondents were involved in zone activities, or working with statistical data. Due to the distance and language differences some information regarding Shenzhen was hard to obtain.

2.3.4 Validity and Reliability

Bryman & Bell (2003) mentions three criteria's important for evaluating a thesis. The first is the validity of the results. The main idea with this criterion is that the theories and measurements used must have congruence with what we meant to measure. We do believe that our measurements reflect and in a right way measure a KIZ.

The second criterion that Bryman & Bell (2003) focus on is replication. Our main purpose with this thesis is to measure the regions of Öresund and Shenzhen, but we also se this thesis as a way for other regions to measure and become a KIZ. Because of that we have tried to show the necessary procedures needed for others to use our material. One problem that has emerged during this study though, is the collection of secondary data. To obtain some information we contacted organisations and institutions, related to the zones. Some of this information was given to us by persons and therefore the human factor could have affected the answers given to us. Bryman (2002) mentions another implication regarding secondary data. In the pursuit of showing that the region is doing well in the areas concerning our research some information may have been manipulated or exaggerated.

Third but not least, Bryman & Bell (2003) use the term reliability. As mentioned above we see this thesis as a base for others to use when measuring regions in becoming KIZ. It is thus in our most interest to show that this study could be done by any one else. The reliability of the theories used would have been higher if more information from Amidon and Davis had been given us. We do though believe that our own interpretation of the TKL for KIZ has been thoroughly developed. The measurements we used in collecting empirical data are well explained in chapter three. As long as other

researchers use them in the same way as we did, misunderstandings should not be a problem.

2.3.5 Criticism of Sources

During our study we interviewed three people who all are vital for the information used in this thesis. We strongly believe that the information given to us were true and correct. One important thing to remember though is that the interviewees are all biased which could affect the way the information is presented. Our interviewees are all victims of there own mindsets, which could effect our own opinion and conclusions about the topics. A large part of the theoretical framework comes from Debra Amidon and Bryan Davis. Most of there theories have not been published and have therefore not gone through any extensive reviews from critics and since they are in its early stage not fully been evaluated. They have though during the last couple of years been highly spoken about in different summits. The researchers have been invited to countries all over the world to speak and explain there theories which could be a sign of acceptance. Governments in India, China, and Venezuela etc. have all put great emphasis on their work.

Our secondary data regarding the theories used all comes from published books, well renowned articles and websites. We found this important for the reliability and credibility of the thesis. Empirical founding's coming from secondary data are in a majority from statistical institutions related to the regions. We have to assume that these are calculated in a right way, but one must always pay attention that they could have been embellished in order to boost a regions position and reputation. Another risk with statistic data is that they may not be calculated in the same way. Different institutions may use different methods when processing data. We are aware of this and will throughout this thesis examine the statistical data with critical eyes.

3 Theoretical Framework

What different theories we built our research upon? Through examine chosen theoretical framework, will we be able to create a simplified model to measure knowledge of a region? The reader will here be acquainted with concepts such as Knowledge Economy, Intellectual Capital, Special Economic Zones, Knowledge Innovation Zone and the Triple Knowledge Lens framework.

3.1 Selection of Theories

The theories we have chosen for our research are all connected to the new economy, knowledge and intangible assets. The choice of theories was made through discussion with our tutor Leif Edvinsson, as well as through our own research in prior work in the sector. The theories are selected to give the reader a better understanding of the topic and the journey of our interpretation of the triple knowledge lens framework. Below, the reader will find a model of theories used in the process:

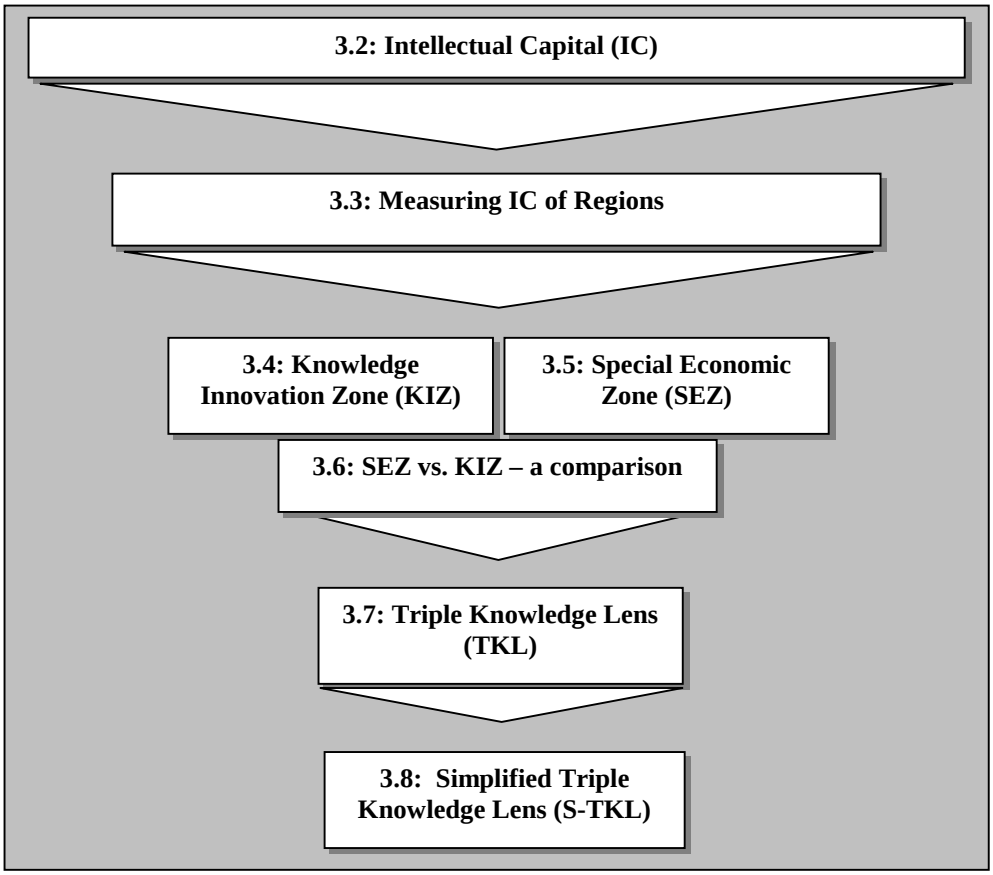


Figure 3.1 A disposition of theoretical framework

3.2 Intellectual Capital, IC

3.2.1 Knowledge economy and its intellectual capital

Frederick & McIlroy (1999) argues that in order to be able to create a knowledge-driven entity, the importance of intellectual capital (IC) needs to be taken into consideration. Intellectual capital, the value of knowledge, brainpower, know-how, processes etc., and the ability to improve these assets is an important feature to create sustainable competitive advantages in a knowledge-driven economy.

Cowey (2000) emphasizes the importance of integrating and leveraging the intellectual capital. A country's relationship with trading partners, customers and suppliers, distribution networks, intellectual property, patents, processes, image and uniqueness of doing things are all embodied in intellectual capital, and thereby needs special treatment in a knowledge era. However, according to Cowey (2000), this is not enough to become a successful knowledge economy: a country must also align its governmental and managerial processes to support a knowledge culture where knowledge can be shared, as well as investing in enhancing its intellectual capital.

Bonfour and Edvinsson (2005:xi*ff*) argue that in the knowledge economy, the value of organizations, corporations and individuals is related to their knowledge and intellectual capital. If we accept that knowledge is the main source for performance of our organizations, we have to challenge existing models and explore a new way to view our world. Intangibles are the drivers in knowledge economy and the value of corporations, organizations and individuals should therefore be measured on their knowledge and intellectual capital. This can also be extended to the public sector as to whole nations – knowledge is the main driver for competitiveness and productivity which is as important on corporate level as it is on national level.

3.2.2 The IC Value Scheme

An IC report was originally made to enlighten a company's value generating resources. These resources are the company's future earning potentialities, which are not shown in the balance sheet. The value generating resources of IC is instead shown as the market price less the book value. This mark up has earlier been called goodwill.

IC of a firm can be broken down into different segments of intellectual capital assets, i.e. a company's knowledge, experience, customer relations, competences brands etc. (Edvinsson & Grafström 1998:25*ff*) The IC tree (figure 3.3) show how these intellectual capital assets can be divided into different columns which are linked to each other, this to create a better understanding of the IC. To start with, a company's market value can be divided in two parts, its *financial capital* and its *intellectual capital*. The latter can then be divided into the *human capital* and *structural capital*. Edvinsson & Grafström (1998:27) argues that the human capital consists of the ability of employees to use their knowledge, skills and innovation to perform their duties. The human capital is also the culture, values and philosophy of the organization. The structural capital can be explained as the assets that stay within a firm when the employees leave for the day. Structural capital can thus be owned and traded by a company, which is not possible with human capital. Structural capital can further be divided into (1) *customer capital* where the value of a company's customer relations is included and (2) *organizational capital*. The organizational capital includes a company's *process capital*, which is a company's processes and technical solutions and the *innovation capital* – a company's embracing patents, legal rights (intellectual property) and other intangible assets that are hard to protect (Edvinsson & Grafström, 1998:26):

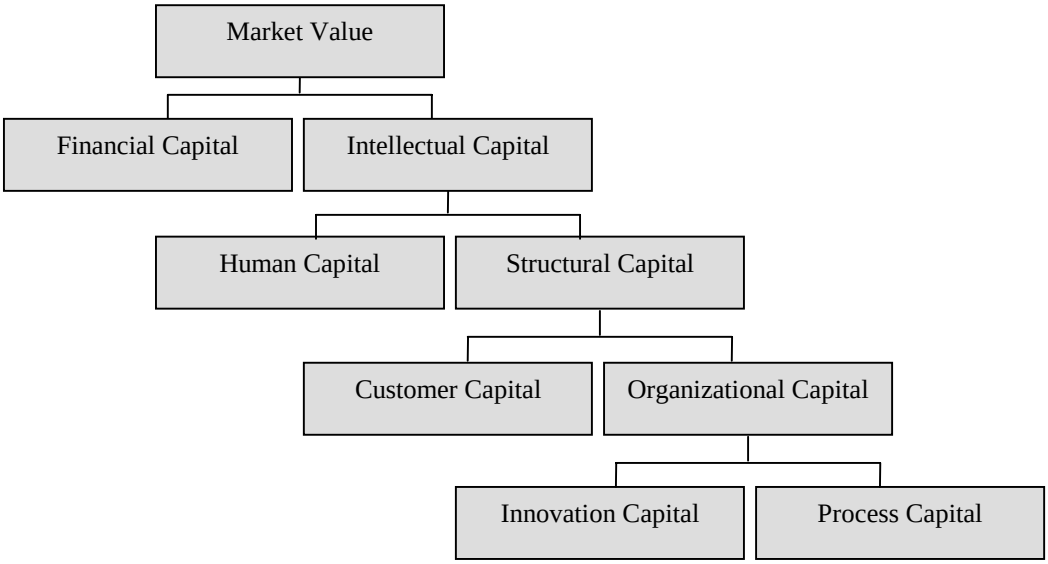


Figure 3.2 The IC value scheme (Edvinsson & Grafström, 1998:26)

3.2.3 IC Navigator

Leif Edvinsson was in 1991 the worlds first appointed director in IC at the Swedish insurance company Skandia. During his time at Skandia, Edvinsson developed the IC Navigator which was made to generate a picture of a company's both financial and intellectual capital, as well as their interdependencies. Figure 3.4 shows how each of the five value creating fields are focusing on a specific sphere of interest. According to Edvinsson & Grafström (1998:28) the *financial focus* is seen as the roof of a house, representing the past performance of the company. The *renewal and development focus* shows the direction of the company tomorrow, and is seen as the very foundation and the basement. *Customer focus* and *process focus* serve as supporting walls of the Navigator. The *human focus* is the centre that connects basement, walls and roof, and is seen as the link between the past, present and the future in a company.

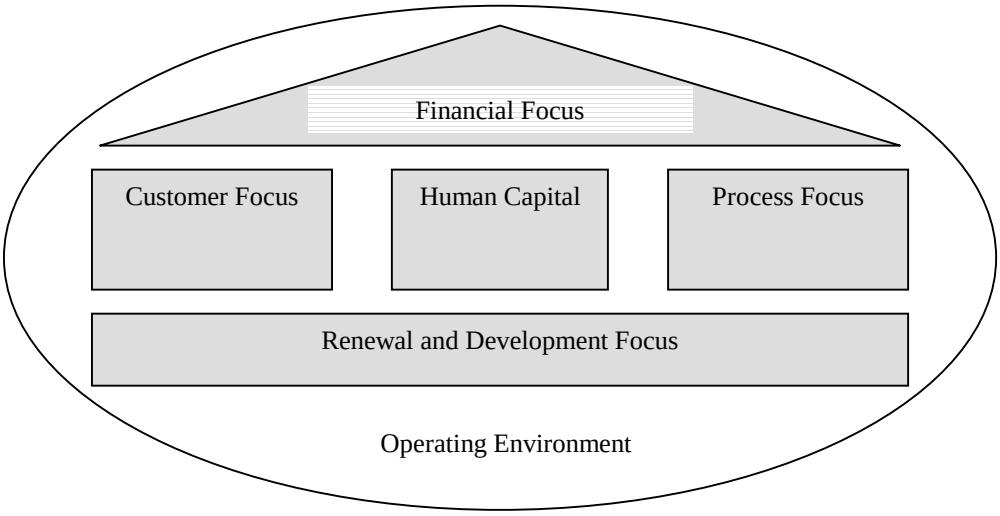


Figure 3.3 The Skandia IC Navigator (Edvinsson & Grafström, 1998:28)

According to Edvinsson & Grafström (1998:31) IC is not only a way of assessing intangible assets, but also an active process of value generation. It can be seen as a balance and a map of yesterday, but IC is also a compass for charting a company's future.

3.2.4 Measuring intellectual capital

Examples for measurements for the different Intellectual Capital groups are according to Edvinsson & Malone (1997):

(i) *Human Capital*: leadership index, employee turnover, number of female managers
(ii) *Customer Capital*: market share, days spent visiting customers, satisfied consumer index
(iii) *Process Capital*: laptops/employee, cost for errors administrative/managers revenues or contracts field without error
(iv) *Innovation Capital*: renewal expense/consumer, share of employees under the age of 40, R&D resources/total resources.

When human capital interacts with structural capital value is created in an organization. An organization should transform as much human capital into structural capital as possible. The relationship is showed in the IC multiplier made by Leif Edvinsson (Berglund *et al*., 2002).

IC Multiplier = Structural Capital / Human Capital

The idea behind the multiplier is that structural capital should always be larger than the human capital; if the opposite will occur then erosion in the company will appear. This as the organization doesn't have enough structural capital to match its human capital. A

company with low level of structural capital is taking a sever risk as its human capital may leave the company whenever they want to. The only resource left will then be the minor structural capital (Berglund *et al*., 2002).

3.3 Measuring IC of regions

This chapter is to be seen as an introduction to prior research of regions. These will be used in chapter 3.8 when we interpret the TKL and design our own simplified measuring model. These theories are meant to give a better understanding of measuring intangibles on regions and will be used as a complement to the theories of knowledge innovation zones.

According to Bontis (2004) the literature of IC is mostly coming from the last decade where the research and development of IC on a national level is still just in its starting phase.

Shortly after the first theories of IC on firms the first attempt to measure the IC on nations and regions emerged (Bontis, 2004). Much of the literature of IC spans from the last decade and the national view is still in its infancy according to Bontis (2004).

Bontis (2004) and Malhotra (2001) are explaining how leaders of large economies and countries want to be able to measure the knowledge assets of their countries to predict future performance. If it would be possible to find reliable measurements the implications would be that the leaders in the future could be able to better manage country's intangible assets which is the most important factor for economic development.

Bontis (2004) explains that the IC of a nation includes the concealed value of individuals, enterprises, institutions, communities and regions that are for the moment and the future foundation for the creation of wealth. Bontis (2004) further explains how these hidden assets are roots for nourishment and the cultivation for prosperity in the future. Therefore, Bontis (2004) continues, it is essential for a nation which wants to keep itself updated and in line with the present to carefully account and follow the evolution of such IC development.

According to Bounfour & Edvinsson (2005:xiii) there is a new "political leadership" which is emerging around the IC of nations and regions which has the focus on how to:

- Visualize the knowledge capital of nations
- Develop intelligence flows within and between knowledge capital clusters;
- Cultivate efficiency and renewal of the knowledge capital of regions; and
- Capitalize on knowledge capital by the new innovative social systems, in terms of the collective wealth of nations

3.3.1 National Intellectual Capital Index NICI ™

Nick Bontis (2004) have made an extension of the IC tree made by Edvinsson (in Edvinsson & Malone, 1997) and transformed it from firm level and applied it on a national level. Bontis (2004) theory is used to capture the national statistics to describe the constructs of the national intellectual capital which is illustrated in the modified IC tree for Nations. The changes made are that market value now is national wealth, customer capital is market capital and innovation capital has changed to renewal capital. Bontis (2004) use these four when measuring the intellectual capital on nations.

Human Capital

Human Capital is according to Bontis (2004) defined as the knowledge competencies of individuals in realizing a nation's tasks and goals. The intellectual wealth of countries citizens is its base of human capital (Bontis, 2004). The intellectual wealth can be defined as the citizen's multi faced knowledge about fact's, laws and principles but also specialized knowledge about teamwork and communications (Bontis, 2004). But these measures of human capital are not completely static and deterministic. According to Bontis (2004) it is both quality and quantity in the human capital performance measurements.

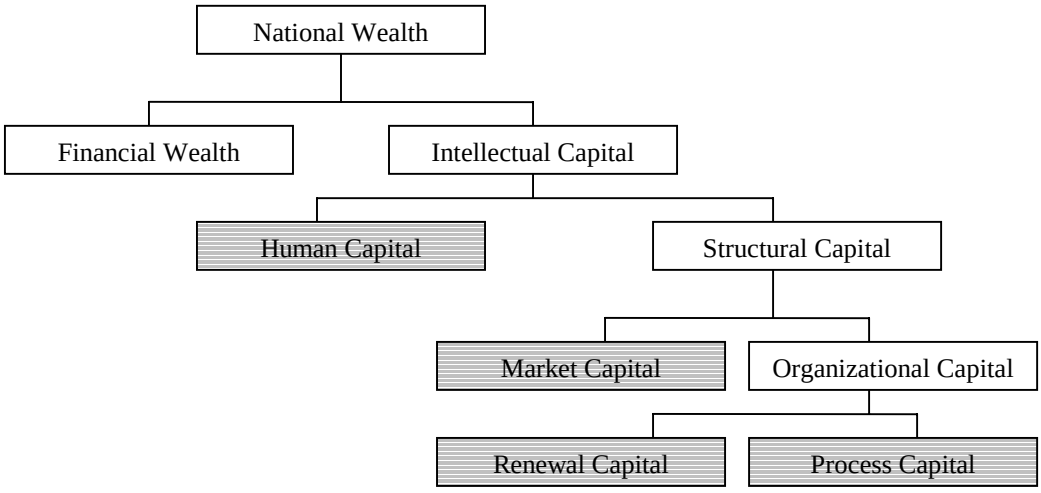


Figure 3.4 Value scheme of intellectual capital on nations and regions (Bontis, 2004)

Market Capital

Market capital can be defined as a country's intellectual capital embedded in its national intra relationships. According to Bontis (2004) the Market Capital represents "A country's capabilities and success in providing attractive, competitive solutions to the needs of its international clients, as compared with other countries". It is also a country's investment and achievements in foreign relations, coupled with its exports of quality products services which is according to Bontis (2004) a significant part of the development of market capital as the products or services are rich in intellectual capital. Additional features of Market capital is a nation's social intelligence created by laws, market institutions and social networks.

One important part of the market capital is a country's international trade but also its ability to create partnerships with other countries. Sullivan (in Bontis, 2004) means that relationships within countries increase the ability to create knowledge and also create a much better possibility to extract knowledge from a nation. The international trade brings innovative and more efficient methods and practices of making new and improved products and services. According to Bontis (2004) the World Bank in 1999 made a report which mentions how foreign investments in countries make a spill-over effect when overseas workers in the country share their knowledge. Attracting international summits and a country's ability to keep its newly graduated students in the country are vital for regions (Bontis, 2004).

Process Capital

The process capital is defined as the non human storage of knowledge's that a nation has inside its technology, information and communications system. Hardware, software databases, laboratories and organizational structures are those factors that sustain and externalize the Human Capital (Bontis, 2004).

Renewal Capital

Bontis (2004) explains this as a country's future intellectual capital. This includes its capabilities in investing in renewal for its country's sustainable competitive advantage. It includes its investments in R&D which is the main force for this measurement. Other performance measurements are the ability to produce scientific articles and patents. Bontis (2004) means that if a country have a high level of these three components (R&D, scientific articles and patents) the inhabitants are well educated that share there knowledge.

3.3.2 Value Added Intellectual Coefficient – VAIC ™

In the traditional management system, tangible assets such as physical and financial capital have been the base when measuring value creation. According to Pulic (in Bounfour & Edvinsson,2005:198) and as we have seen above intangible assets such as knowledge have become the most important factor for companies and regions when creating value. As written above knowledge is created by the people that live in a region or work for a company, and as with capital, knowledge is only an expression of power when used for creating value. This means that companies have to acknowledge that human capital can not longer be considered as cost in the balance sheet (Pulic in Bonfour & Edvinsson, 2005:199).

To be able to measure the intangible assets for a company, region or a nation a new index has been developed. Pulic (in Bounfour & Edvinsson, 2005:202) calls it the "Value Added Intellectual Coefficient Index" (VAIC). This index sees knowledge workers and there productivity as the number one must important factor for management decision making. According to Pulic (in Bounfour & Edvinsson,

2005:202), will VAIC meet the basic requirements for today's economy with where measurement systems are more and more important. With this new system of measurement, companies and regions will be able to compare and benchmark with others and by doing so be able to draw the best knowledge to its company or region. The main idea with this index is to create value buy using both financial capital and intangible assets such as intellectual capital. Pulic (in Bounfour & Edvinsson, 2005:202) means that "value added is assumed to be the most appropriate indicator for desired business results" and according to the British Ministry of Trade and Industry, is value added "the preferred measure of the wealth created by activities of a company" (Pulic in Bonfour & Edvinsson, 2005:202) When measuring value added (VA) you need two parameters. OUT= total sales and IN= cost for buying raw materials etc. The formula is showed in appendix 1.

3.3.3 Cities' Intellectual Capital Benchmarking System - CICBS

As with companies, cities have, in the past mainly considered tangible assets as the main instrument when setting up visions, objectives and goals. (Viedma, in Bounfour & Edvinsson, 2005:317) The essence of to day though is that cities leaving the industrial focus and entering the knowledge era need to have measurements that take intangible assets into consideration. This is not only important for the city itself when benchmarking but also for the national and international interests of comparing cities. According to Viedma (in Bounfour & Edvinsson, 2005:318) the way people live and work in a city have changed over time, due mostly by the effect of information and telecommunications technology. According to Edvinsson and Malone (1997) this have had the effect that people can live and work all most anywhere and as they say "still enjoy most of the fruit of life in a big city". People can interact in distant world events not having to leave their homes. The roles of workplaces have shifted and are now more portable where virtual offices can be established far from the office building. Viedma (in Bounfour & Edvinsson, 2005:318) has established due to this affect five questions that city governments have to take into consideration.

- *Which facilities must be offered by city governments if the city is to be the most attractive place in which to live?*
- *How can innovative companies be attracted to the city?*
- *How to foster entrepreneurship?*
- *Which organisational structures are required?*
- *How can the city be transformed to face new technological changes successfully?*

Viedma (in Bounfour & Edvinsson, 2005:318) bases these questions on the effect that new technology changes the way cities have to plan transportation, infrastructure and labour. In the past, technologies as for example steam forced the cities to create railroads, entice emigrants with knowledge and change the infrastructure to mass

production. The technology of today has made a shift where microprocessor-based products demand high speed internet, high educated knowledge workers that can move easily and virtual organisations as infrastructure (Viedma in Bounfour & Edvinsson, 2005:318).

As an effect of what has been said above Viedma (in Bounfour & Edvinsson, 2005:321) have come up with an index that can help cities determine there position and a way for them to benchmark towards others. He calls this index; Cities Intellectual Capital Benchmarking System (CICBS). This model is divided into two different sets. The first is called CGICM and stands for Cities General Intellectual Capital Model and is based mainly on Edvinsson's (Edvinsson & Grafström 1998) IC Navigator which we have described above. This model sees the city as built up by a set of "micro clusters" and trying to manage these under a certain IC-platform. Viedma (in Bounfour & Edvinsson, 2005:321*ff*) means that a city needs to follow four phases when establishing this platform.

- *Phase 1: Creating the vision*
  In this phase, the main idea is to, through conversation with the different fields in a city, such as business management, students, urban planners etc create a picture of where the city is now and what it wants to become.
- *Phase 2: Identifying the core activities needed to realize the vision*
  When the vision has been set, the planners need to come up with the right actions, projects etc that need to be done to realize the vision.
- *Phase 3: Identifying the core competencies needed to realize the core activities*
  In this phase one has to clarify what knowledge and IC that will be needed to realize the core activities set in phase 2.
- *Phase 4: Identifying the indicators for each core activity and each core competence*
  Simply put, this means identifying the key success factors that will be vital for the core activities and competences. When that is done Viedma (in Bounfour & Edvinsson, 2005:323) means that it is important to "identify the indicators that best reflect these key success factors".
- *Phase 5: Assembling the indicators into different IC Categories*
  When the previous phases are fulfilled the city planers need to put each indicator into the right category of the IC Navigator.

The second part of the model is called CSICM and stands for Cities Specific Intellectual Model. This model has a more longitudinal perspective and is based on Viedma's (in Bounfour & Edvinsson, 2005:324) Intellectual Capital Benchmarking System (ICBS) addressing; vision, segment demand, output, products and services, processes, core competencies and professional core competencies. If the CGICM sees all the micro-clusters as a whole, the CSICM tries to look into each of the micro-clusters. These clusters can then be dived by looking in to there customer needs, business unit's

objective, product and services, processes, company core competencies, professional competencies and company intangible infrastructure of each micro-cluster (Viedma, in Bounfour & Edvinsson, 2005:328). When that is done each cluster can be evaluated and measured by certain elements. These are: vision, demand segment, output, product and services, processes, core competencies and professional core competencies.

When the micro clusters have been chosen using the criteria's above, Viedma (in Bounfour & Edvinsson, 2005:330*ff*) suggests a set of indicator's for the clusters. These will then be put together to form the general scheme of the city. These indicators can then be used to benchmark with other cities. An example of Viedma's (in Bonfour & Edvinsson, 2005:331) way of benchmarking regions can be found in appendix 2.

Table 3.1 A summary of prior research on performance measurements for intangibles

	National Intellectual Capital Index NICI ™- Bontis	**Regional Value Creation Efficiency Index – VAIC ™ - Pulic**	**Cities' Intellectual Capital Benchmarking System (CICBS) - Viedma**	***Triple Knowledge Lens - Amidon & Davis* (presented in chapter 3.4 below)**
What is measured?	Human capital Market capital Renewal capital Structure capital	Human capital Structure capital	Financial capital Human capital Process capital Market capital Renovation capital	*Human capital* *Culture capital* *Infrastructure capital*
How is it measured?	Indices for each measurement as drivers	Value added intellectual capital	Indices in a balance sheet	*Indices in a Triple Knowledge Lens*
What is the result?	Indices for benchmarking	How well resources are being used	A balance sheet for benchmarking	*KIZ bench learning*

3.4 Knowledge Innovation Zone (KIZ)

"Every organization – not just businesses – needs one core competence: innovation. And every organization needs a way to record and appraise its innovative performance."

- Peter F. Drucker (in Entovation Presentation, 2004)

The model for KIZ is according to Amidon & Davis (2007-05-08; 2007-05-18) a vision for how our new global society is emerging. This is a society that has gone beyond the agricultural and industrial eras. Intellectual wealth is the economic engine for prosperity. According to Amidon & Davis (2006a), the flow of services and goods are the new driving elements of knowledge and innovation. Because of this new driving element, dynamics of trade flow has changed forever, where old rules do not longer apply on the new economy that is emerging (Amidon & Davis, 2006b). The rules of this new economy have yet to be understood and innovated. The model of this new society is therefore incomplete, but is emerging. Prior research of innovation initiatives has made

it possible to define key trends; evolving principles; core drivers; suggested performance measures; models of stakeholder innovation; and a blue print for architecting a viable development strategy (Amidon & Davis, 2006a).

The concepts of these KIZ are geographic regions, economic sectors or communities "of practise where knowledge flows from origin to the point of highest need or opportunity" (Amidon & Davis, 2004). These KIZ have been named under a numerous different names: Creative City, Science City, Region of the Future Media Village, High Tech Knowledge Corridor, Knowledge Commons, Smart City etc (Amidon & Davis, 2006b). To understand the success and sustainability of a KIZ, you therefore have to have an understanding of knowledge performance indicators; knowledge roles and skills; innovation processes; network structures; and collaborative technologies (Amidon & Davis, 2004).

One part of the definition of a KIZ is that there are bridges between sectors, such as the academia, government, NGO´s and businesses (Amidon & Davis, 2006b). In the new society, links are also created between science, technology, cultural parks, and stakeholder constituencies (Amidon & Davis, 2006b). According to Amidon (2007-05-08) these bridges incorporate the cultural and performing arts, and business sectors which traditionally are viewed in isolation. The forces that now appear are more powerful than the previous geopolitical behaviours and structures. According to Amidon & Davis (2006a) we are now leaving the economy where material has been scarce. Knowledge is according to them a source of abundance and because of that, intangible assets will be much more important than tangible ones. The implication is that this new mindset needs new measurements. Traditional audit and financial reports are no longer the optimal way to indicate performance (Amidon & Davis, 2006a).

3.4.1 The foundation of a KIZ

There are according to Amidon & Davis (2006b) nine core principles that drive a KIZ, that reflect an increased focus on intellectual capital, knowledge innovation and emerging global markets:

- Knowledge Purpose
- Economic Abundance
- Triple Knowledge Line Growth
- Democratic Community
- Knowledge Governance
- Infinite Intellectual Capital
- Knowledge Network Symmetry
- Knowledge Fusion
- Knowledge Enabling Grid

For a KIZ to be able to leverage knowledge and knowledge flow as primary economic

drivers, a "KIZ must have a core purpose that is something cohesive, distinctive grounded in heritage and energized with a share vision and mission" (Amidon & Davis, 2004). According to Amidon & Davis (2006b) the major mission for a KIZ is to employ creativity, knowledge and innovation as resources and inputs for growth and prosperity, and at the same time create liveable and thriving cultural communities, as well as smart organizations infrastructures and platforms. Amidon (2007-05-16) describes a KIZ as similar to a traditional economic trade zones, but with the difference that in a KIZ, intellectual capital is the commodity being commercialised, traded and exchanged. This "commodity" is much more linked to the society and its environment than traditional tangible assets are. This linkage is important since it is the interaction and collaboration that creates and develop the innovation process. The interaction and collaboration become bench learning tools and are to be used instead of bench marking (Amidon, 2007-05-08).

To be able to create and share knowledge in a KIZ, it needs to have the right combination of intangible and physical capital. The *human capital* is one of the pillars. It has to consist of highly educated people that can share their knowledge and generate innovation. At the same time there has to be a mix of people in a KIZ; everything from artists to entrepreneurs in order to achieve dynamics and reach a broad knowledge. A KIZ also need *intellectual capital (IC)* as presented earlier in this chapter. The IC stands for a new way of thinking and acting, both in companies and in the region as a whole (Amidon & Davis, 2004). For the knowledge and IC to be shared between the human capital, the infrastructure must be well developed, *infrastructure capital*. The infrastructure implies universities, laboratories, broadband etc. As with diversity among the human capital the KIZ also need diversified cultural entities, *social capital*. Theatres, exhibitions etc. are vital elements for innovation and creation according to Amidon & Davis (2004). Finally, according to Amidon & Davis, *relationship capital* and *network capital* are important for a KIZ. Collaborations between the elements in a KIZ are created through partnerships, knowledge exchange programs etc. (Amidon & Davis, 2004). Dvir & Pasher (2004) points out institutions in a city that works like engines for creating innovation. Some of these are cafés, big events, Science Parks and the capital market. According to Dvir & Pasher (2004) these places are engines for brainstorming, provocations and assemblies, where researchers can share their thoughts. Dvir & Pasher (2004) also mentions future outlooks as important engines for a city or region. Here stakeholders can experiment with the future, create scenarios and identify emerging trends (Dvir & Pasher, 2004).

Both Amidon (2007-05-16) and Dvir & Pasher (2004) talks about a KIZ as an "ecosystem". This means that all the criterions mentioned above; infrastructure, culture etc. have to be developed simultaneously. There is according to Amidon & Davis (2004) regions that in their pursuit in creating a KIZ, fail due to the fact that they do not create this "ecosystem". Amidon & Davis (2004) describes this as the "productivity paradox". This was first mentioned in the 1980's when some companies did not succeed, even

though they had made huge investments in IT. The problem the "productivity paradox" enlightens is that i.e. IT when implemented needs, to be surrounded by qualified and committed personnel, sound organisation etc. The same apply to regions. To solve this problem, Amidon & Davis (2005; 2004) have created three laws, applied on a KIZ:

> 1st Law – *"Knowledge multiples when it is shared. Knowledge is a limitless and expandable source of economic wealth. Intellectual assets – effectively exploited through innovation – are the most valuable resource to manage."*
>
> 2nd Law – *"Value is created when knowledge moves from the point of origin to the point of highest need or opportunity. Innovation encompasses the full spectrum, from idea creation to commercialisation, and successful innovation involves converting knowledge flows into marketable good and services".*
>
> 3rd Law – *"Collaboration for mutual leverage provides optimal utilisation of tangible and intangible resources within and across boundaries. Collaboration replaces the competitive (win/lose) paradigm prevalent today. Win /Win benefits are based on pooling and leveraging competencies: knowledge, know how and skills. "*

Initiatives of KIZ can according to Amidon & Davis (2006b) be categorized in five different phases or areas. They all depend on where and how a KIZ is created. Since not all regions are created from scratch, they all have different historical background that will have an effect on their development. Some KIZ are former SEZ or have had heavy industries as their comparative advantage. These different sets of initiatives are (Amidon & Davis, 2006b):

- *Green fields* – i.e. initiatives built from scratch in undeveloped territory
- *Brown fields* – i.e. redevelopment of previous smokestack industries´ knowledge based initiatives
- *Hybrid Projects* – i.e. redevelopments integrating expansion as well as repurposing of previous industrial sites
- *Enterprise or Campus projects* – i.e. creation of new knowledge campuses by academic and or corporate learning environment spaces
- *Virtual Community Projects* – i.e. networks collaborating in cyberspace

As mentioned above, it is the mix of stakeholders and the collaboration between them that matters in a KIZ. Amidon & Davis (2007-05-16; 2006b) has through their work created a seven steps program that government, city planers etc. can use when creating a

KIZ. She calls this program "the 7p blueprint". The blueprint is divided in three phases: *design phase*, *development phase* and *deployment phase*.

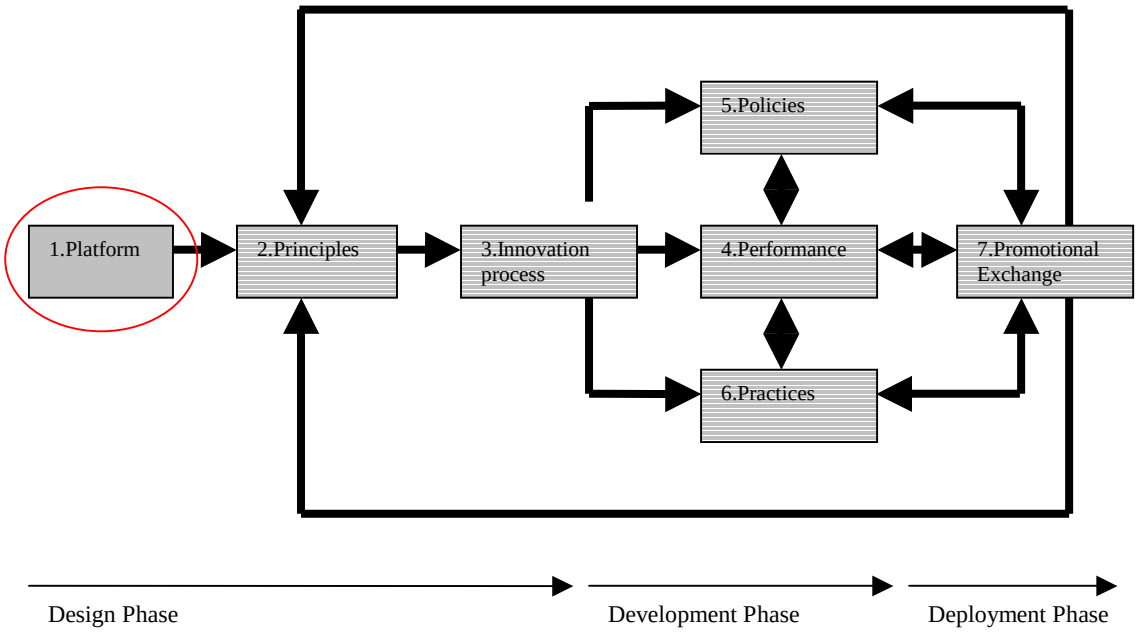


Figure 3.5 7P Blueprint for effective KIZ (Amidon & Davis, 2006b)

The design phase creates the foundation of a KIZ. This is the foundation that will attract investments to the region. The first "p" in the design phase, platform, is a starting point called the Triple Knowledge Lens. This is a way to be able to understand and measure the potential and performances for a KIZ. This lens is based upon three main areas a company/region must acknowledge when becoming a KIZ. According to Amidon (2007-05-08) these are *knowledge based economy* (business and commerce), the *knowledge based society* (people, community and culture), the *knowledge based infrastructure* (organization, technology and environment). This will be further examined in chapter 3.7.

In the development phase, new systems of governing emerge where new practices, policies and management are set in action (Amidon & Davis, 2006a).

Finally, in the deployment phase all results are mapped together. Amidon & Davis (2006b) stresses that the 7P Blueprint is not to be seen as a value chain, but rather as a part of the total KIZ value system. Feedback is important and works as a tool to improve the entire KIZ.

3.4.2 The creation of a KIZ

Amidon & Davis (2007-05-08; 2007-05-18) points out 13 drivers that can be used as a "checklist" for regions in the design phase. These were one of the first ground pillars in their research. Through these, more streamlined indicators and measurements have been

created. These are used later in the design phase as tools in establishing the TKL (Amidon, 2007-05-08). The 13 drivers of a KIZ according to Amidon & Davis (2007-05-08; 2007-05-18) are:

1. "Replacement of obsolete industries and processes, and revitalize old areas with viable alternatives".
2. "Attract investment in new knowledge-based and creative industries".
3. "Increase the research and development, productivity and innovation in a region or area".
4. "Attract highly skilled creative talent to the community".
5. "Ensure the creation of employment for highly skilled workforce".
6. "Assure the area's competitiveness ranked against similar KIZ's world-wide".
7. "Create a healthy, safe and secure, and environmentally friendly community".
8. "Provide a liveable community environment with access to affordable services and an amenity-rich quality of life such as shopping, entertainment, and sports".
9. "Provide educational opportunities for life long learning and high achievement".
10. "Provide access to the most modern facilities and high-technology infrastructure".
11. "Create a positive social and business climate where there is confidence, optimism, trust, effective leadership, and good governance".
12. "Plan and manage so as to avoid or mitigate various risks".
13. "Create a preferred tourism destination for/with cultural and educational opportunities".

As stated earlier, tangible assets are no longer the most important factor for companies; companies have understood that they are dependent of innovations that not only come from physical R&D (Amidon 2007-05-16). These companies have understood that they play an important role in the world we live in and have a big impact on its social environment (Amidon 2007-05-16). This also has an effect on their accounting, where they can not only show their financial results, but must also show their intangible assets. The financial parameters are not enough when one want to show the health and social environment in a company or a region (Amidon, 2007-05-08). This has given the companies and regions the insight that knowledge is of great importance and the availability of it to be spread. According to Amidon (2006a), this is a natural step in the reformation of regions dating back to the eighties when governments created zones of industry and technology. In the nineties the big topic was science and technology parks to stimulate entrepreneurship and digital cities with a main thriving force to optimize how information can flow. The topic of the 21st century is that we now leave the information era and enter an era of knowledge, with a higher degree of stakeholder interaction and sustainability. As seen in the figure below, this means building KIZ (Amidon & Davis, 2006a).

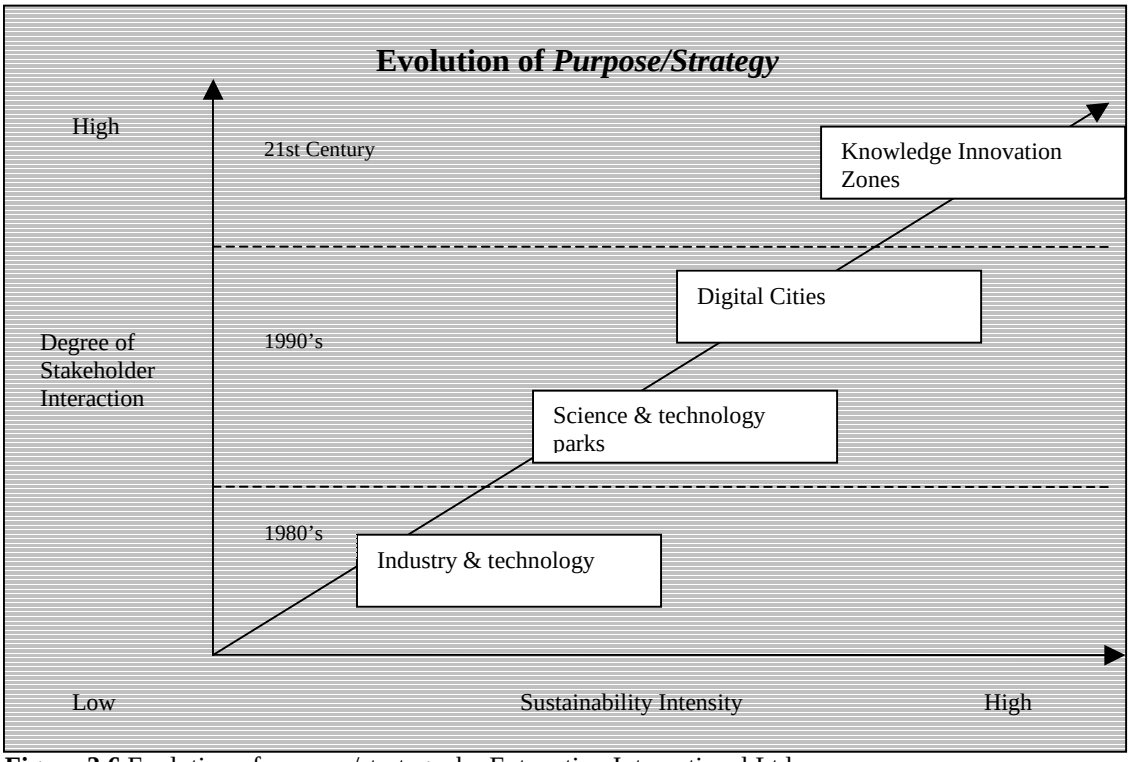


Figure 3.6 Evolution of purpose/strategy, by Entovation International Ltd

3.4.3 Trends for knowledge innovation zones

During their studies of KIZ, Amidon & Davis (2004) have found a set of trends, which all are having effects on businesses, the cultural and social spectrum, and the technological development:

Increasing pervasiveness of networks – New networks are being created, both in business and communities. These networks become in many ways "the business". *Growing Velocity of Change* – The new management in the region is more flexible, open to change and more willing to change old rules. Innovation becomes the engine for the new management. *The next generation of internet* – The e-economy has arrived. Communities are created and marketplaces shift from being physical to virtual. *Pioneering of new business models* – New business models are being rewarded. Patents get praised for their innovativeness and originality. *Quest for the best talent* – A marketplace for know-how leads to more experienced workforce and expertise. This leads to better customer relation. *Virtualization of creative and knowledge markets* – When knowledge flows more freely the electronic markets grows even faster. Communities and other virtual organisations are spread in a faster pace to stakeholders in the KIZ. *Cultural balance of local needs and globalization* – Globalisation make distance a less important factor. M&A's create ever larger companies, and performance metrics are intangibles and interaction. *Increasing open source around the sharing of ideas* – Even though securing intellectual property rights becomes more frequent, open source software's is a symbol for the inhabitants demand for openness in the governance of the KIZ. *Growth in the value of intangibles* – Reporting now demands intangible assets to be shown and it is the innovativeness, creativity, brand and diversity that

becomes engines and currency in the zone. *Shift from industrial to digital design economy* – The economy shifts from being focused on tangibles to intangibles, such as knowledge and creative ideas. *Opportunity to better leverage visualization* – Through visualization stakeholders in a zone can model and simulate situations before acting. New technologies for visualization are created and developed. *Clustering of talent, techniques, teams and technology* – Clusters in a zone are emerging, which concentrates the intelligence and innovation. Innovation and collaboration in these cluster leads to commercialisation, and new forms of enterprises are established.

3.5 Special Economic Zone (SEZ)

3.5.1 Objectives of a zone

Special economic zones have been adopted by many countries around the world, mostly in the Asian regions, as a mean to foster and stimulate economic development (Wei, 2000). Wong & Chu (1984) are stating 6 more specific objectives of a special economic zone:

(i) Attract foreign investment
(ii) Expand export and promote foreign exchange earning
(iii) Provide employment opportunities
(iv) Attain a transfer of technology and management skills
(v) More efficiently utilise domestic material resources and create linkages with the domestic sector
(vi) Stimulate economic growth in less developed regions of the country.

There is hereby a deeper meaning of the objectives for countries using the zone methodology. It is not only about the true economic factors, as making money for the country, but also social aspects such as welfare are important too (Wong & Chu, 1984).

According to Wong & Chu (1984), attracting foreign capital seems to be the main objective of most zones. One way to attract foreign companies and investors is to allow 100% ownership of zone enterprises. Other means of investment, such as joint venture, cooperative production, intermediate processing and compensation trade, are also being practised to increase foreign capital. Different incentives, preferential terms and available resources make the zones highly interesting to foreign investors. However, if the country itself is unstable or has an uncertain future, the lack of will to invest is clear (Wong & Chu, 1984).

When it comes to increase export, the zone methodology did not first show any greater success. The zones around the world didn’t contribute at any greater extent to the countries export growth, and were only responsible of a small proportion of the total export of a country. Today it is different. Research made by Haywood (2000) shows that the growth rate of total export to EU and US 1993-1996 for countries with free zones

increased substantially, especially for lower middle income countries and upper middle income countries. Upper middle income countries (GNP/Capita $3035-9384) with zones increased their export with 62%, whereas countries without just increased their level of foreign export with 33%. For lower middle income countries (GNP/Capita $765-3034), the figures are even more astonishing; countries with zones increased their export to US and EU with 72%, when countries without zones only had an export growth rate of 1% (Appendix 3).

Research has shown (Wong & Chu, 1984) that in terms of employment, the zones have indeed created jobs, especially in the initial and formative stage. However, these job opportunities have not always been long-term. In the early stages, labour-intensive industries such as garment and electronics were very common and demanded no skilled or semiskilled labourers who settled with low wage levels. Mostly young, mobile, female workers have been employed, which has generated a high labour turnover and unstable employment structure. Research made by Wong & Chu (1984) shows that zones are very sensitive to the changes of the world and local economy. The workers at the assembly plants of a zone are often the first to be suspended when a transnational corporation faces production cutbacks because of a declining world demand. Wong & Chu (1984) have also shown that when wages begin to rise as a result of the zone reaching a more mature stage, foreign enterprises either move out and relocate to areas with cheap female labour, or shift to automatic production and more sophisticated technology. Therefore may the employment curve of a mature zone take a downward trend due to high wages and shift from labour-intensive to non labour-intensive production.

In order to achieve sustainable economic growth it is vital to have technically skilled workers, who are able to use more sophisticated production methods, as well as scientific management methods. To secure the flow of such technology, production and management methods, zone administrations are encouraging the establishment of more technology-intensive production units (Wong & Chu, 1984). In order to create skilled workers, transfer of technology needs to be made, which demands both time and patience. This involves according to Wong & Chu (1984) technical cooperation between foreign zone enterprises and domestic firms. Thereafter foreign expatriates can be replaced with local technicians and local production and management. Making knowledge and science a part of the zone is an important step to transfer technology and management, and therefore many zones have introduced science-based industrial parks within the zone (Wong & Chu, 1984).

Stimulate economic growth in less developed parts of the country has become a major consideration for some governments using the zone policies (Wong & Chu, 1984). The achievement of this has been limited in some cases, and the reason for this is that locating a zone in more remote areas includes the lack of sufficient infrastructure, supporting facilities, trained manpower and access to international ports and airports.

Foreign companies have a will to invest in a zone where all of the above is already existent. Therefore governments tend to reject such areas and build zones close to metropolitan areas to avoid the cost of setting up roads, airports and other facilities. In China however, the government has done completely different (Wong & Chu, 1984). Here, even the largest special economic zone has evolved from a small town. This has been done not in order to foster regional economic development, but rather for control and experimental reasons. Since the Chinese economic policies are very different from the more westernized policies of a zone, areas located far away from major population centres are used to not cause any disturbance of the social and economic life in the rest of the country and for a better control of movement in and out of the zone.

3.5.2 Incentives of a zone

For countries making the use of free trade systems such as an economic processing zone, there is as we have seen above a will to create as favourable incentives as possible in order to attract foreign and domestic investments. Wong & Chu (1984) says that types of incentive widely differ depending on country, but these four categories of incentives have been found during research:

1. Preferential treatment
    a. Duties/tax – exemption from customs duties for import of material and export of products; reduced profit tax; extended period of tax exemption, etc.
    b. Land utility cost – rents low but lease period long
    c. Others – accelerated depreciation rat on fixed assets; financial assistance (loans, preferential credit), etc.

2. Freedom given to investors
    a. 100% foreign ownership allowed
    b. Freedom to repatriate and remit profits
    c. No foreign exchange control

3. Local advantage and provisions
    a. Cheap labour cost
    b. Provision of infrastructure and utilities
    c. Provision of standard factories with services at reasonable rate
    d. Provision of housing and various amenities; warehousing and supporting services

4. Administration
    a. Centralised administration to simplify and unify administrative procedures regarding investment and operation in the zone
    b. Anti-strike laws, etc.

Similar research made by Rondinelli (1987) have found that important incentives could be favourable geographical locations to international trade, freedom from custom regulations, first-class sea and airport facilities, infrastructure, cheap sources of energy and water. It could also be prepared industrial plants, warehouse facilities, suitable housing and services for foreign management. More than physical facilities, the most lucrative incentives for entrepreneurs according to Rondinelli (1987) are the availability of low-wage workers, tax reductions or total exemptions, elimination of import quotas, and foreign control of the specific zone. Due to this foreign control, the zone experiences efficient administration and freedom from bureaucracy, delays or corruption, which is what makes a free zone successful. Multinational companies also tend to favour zones with stable economic and political climate, as well as the lack of aggressive labour unions where the risk of strikes are totally eliminated or at least controlled (Rondinelli, 1987).

3.5.3 Types of zones

According to Haywood (2000) there are 4 specific types of zones, all with different characteristics. The four types are; Small Zone, Wide Area Zone, Industry Specific Zone and Performance Specific Zone.

Table 3.2 Types of Zones, with Examples and Representative Countries (Haywood, 2000)

Type of Zone	**Small Zone**	**Wide Area Zone**	**Industry Specific Zone**	**Performance Specific Zone**
Zone Characteristics	Commercial Industrial Mixed Export Processing Service Enterprise/Urban	Special Economic Zones Multi-industry Resident Populations Retail/Hotel	Banking Insurance Gambling Tourism Textile Gems	Technology Based Incubation Centres Export Factories Employment Based Investment Based
Representative Countries	Dominican Republic, United States, Egypt, Kenya, Europe etc.	China, Eastern Europe, Central Asia, Russia, Sudan, North Korea	New York, Bangladesh, India, Cayman Islands, Bermuda, etc.	Mexico, Sri Lanka, Tunisia, parts of India, etc.

Small Zones are typically small scale wise, around 50-500 hectare, and is according to Haywood (2000) the typical economic zone. It has an industrial focus and involves a mix of different assembly and simple processing activities from various industries.

A special economic zone is a typical Wide Area Zones (Haywood, 2000). These zones usually covers around 31.000 km^2 and do often have resident population living inside

the zone. One zone may nest smaller special purpose zones inside itself, and therefore the product mix can include any sector. The Chinese SEZ's, from the late 1970s, were some of the first wide area zones ever established and have been very successful (Haywood, 2000).

Industry Specific Zones are mostly known to its lucrative policies when it comes to financial services (Haywood 2000). Tax havens as Bermuda or the Cayman Islands are Industry Specific Zones, as well as places know for gambling, i.e. Monaco, Macao and Las Vegas. These zones are specified in one special area or industry, and create own rules, regulations and policies in order to generate economic wealth.

According to Haywood (2000), a Performance Specific Zone contains individual factories that have been granted the benefits of a free zone, provided they meet certain conditions. Such conditions have in the past included export requirements or use of local material, but more recently technical skill levels and employment commitments have been introduced.

3.5.4 Zones of today

A successful zone has everything an unsuccessful doesn't: favourable location, political and economic stability, governmental understanding, supporting infrastructure such as housing, telecommunication, electricity and water, etc. (Johansson and Nilsson, 1997; Wong & Chu, 1984). According to Entovation Knowledge Innovation Zone Research Report 2006, zones have evolved from only being assembly and simple processing oriented, to include Science Parks, finance zones and tourist resorts. They have moved from the main industries textile, clothing and electronics, to a much broader product mix that includes almost any sector. There is also a trend of private foreign developers establishing and developing zones, instead of nations.

Haywood (2000) means that zones of today have moved from labour-intensive production to capital and skill intensive research and development centres, global logistics centres and corporate headquarters. Instead of focusing on the incentives, such as preferential treatments, modern zones have reshaped their existence to provide an internationally competitive business environment. The competitive advantage of a zone today is the possibility to provide sophisticated communication, reliable power, infrastructure, well educated workers and efficient zone administration. As seen, zones are changing to high technology logistic hubs, and the future of the zone is going to be on service; providing a continuing service of the tenants (Haywood, 2004). The old free zone phrase was often described as static, labour-intensive, incentive-driven, exploiting. The new zone paradigm should be seen as a dynamic, investment-intensive, management-driven, enabling and integrated tool for economic development (Haywood, 2000).

3.6 Knowledge Innovation Zone vs. Special Economic Zone – a comparison

In the Knowledge Innovation Zone Research Report (2006), Entovation and the Kaieteur Institute are making a comparison between a SEZ and KIZ. By using 8 dimensions, an understanding of differences and similarities can be achieved.

Time dimension
SEZ and KIZ are concepts that evolved from two different époques:

a. *SEZ*: SEZ is a concept that emerged around 1970 and is still present today. However, the end of SEZ era will be around year 2010.
b. *KIZ*: the concept of KIZ is already present. It started to emerge around year 2000, and is predicted to be the leading concept until at least year 2050 or further.

Alternate Concepts
Both SEZ and KIZ concepts have other alternate concepts that are very similar:

a. *SEZ*: Free Economic Zones, Free Trade Zones, Enterprise Free Zones, Enterprise Trade Zones, Export Processing Zones, Free Ports, Foreign Trade Zones, etc.
b. *KIZ*: City of Knowledge, Knowledge Port, Knowledge Park, Learning City, Smart Community, Intelligent City, Knowledge Ring, Ideapolis, Technopolis, etc.

Variable Geography
The two concepts not only exist in different time sphere, but also in a different geographical context:

a. *SEZ*: The SEZ is seen as a trading hub or commerce marketplace. A SEZ can be either situated in a small area, a wide area, be industry specific or performance specific.
b. *KIZ*: a KIZ is the hub for knowledge and knowledge economy. It can be either located geographically as a knowledge park, in a village, cities, capital. KIZ can also be in a wider area, such as a region, corridor or a country. The main difference between the two concepts would be that a KIZ also can be stretched across borders and exist virtually, using the Internet.

Growth & Development
Since the period of existence differs from the two concepts, growth and development has also been different:

a. *SEZ*: In the beginning of the SEZ era, about thirty years ago, 80 special economic zones in 30 countries existed. Together, these countries employed about 1 million people and counted for a total export of barely US$6 billion. Year 2006, there are about 3000 SEZ in 120 countries worldwide. SEZ of today generates US$600 billion of exports and creates 50 million direct job opportunities.
b. *KIZ*: Since KIZ is a new concept, there is no data available on either development or growth.

Changes over time & future trends
Zones do evolve over time in terms of production, focus and future strategies:

a. *SEZ*: Over the years, SEZ have shifted industry focus from initial assembly and simple processing to more high tech industries. Initially, textile and clothing were main activities, whereas today the product mix includes many different sectors. Zones have evolved from being low-cost labour intensive to be more science intensive. There is a future trend towards private development of zones, and this often by foreign investors.
b. *KIZ*: The future trend is that KIZ will shift the focus away from commodities to knowledge based higher value added products and services. This will optimize the use of knowledge as the source of innovation, R&D, business methods, intangible assets, technology and creative thinking.

Economic & Business Objectives
The objectives in terms of business differ between the two zones:

a. *SEZ*: The economic objective of a SEZ is to foster a steady and sustainable growth. To achieve this, the creation of a profitable business arena is needed, that simplifies business start-up, creates employment, increases economic trade and export, attract foreign investments and incite competitiveness. To attract investors, a minimization of taxes, rules and regulations, policies and other incentives are required.
b. *KIZ*: The economic objective of a KIZ is to support knowledge-based and creative industries, businesses and economies, where knowledge can lead to balanced and sustainable economic growth and development. Objectives are also to accelerate the creation of knowledge-driven ventures through entrepreneurship and incubation, where knowledge-based products and services can be developed. The idea is to produce knowledge-based wealth and an economy of infinite potential abundance.

Social, Community & Cultural Objectives
The objectives in terms of social life and culture differ between the two zones:

a. *SEZ*: A special economic zone is less focused on social, cultural or community aspects. In a SEZ, exploitation of low-cost labourers is a fact and workers are trained whenever they are needed. A SEZ does not have any long term interest in nurturing culture or social welfare.
b. *KIZ*: The knowledge innovation zone, in contrast to a SEZ, supports the enlightened advanced knowledge society and its knowledge citizens. Smart communities are established where social knowledge networks breeds culture and welfare. Good governance foster social responsibility and the elimination of poverty.

Organizational, Technological & Environmental Objectives
The objectives in terms of high tech, organization and environmental attitude differ between the two zones:

a. *SEZ*: In order to attract foreign capital, efficient communication systems, banking and financial services, logistics, distribution and supply chain processes, as well as modern real estate facilities needs to be established. Also, sufficient transportation infrastructure and access to stable, modern high tech infrastructure is important to sustainable economic growth. A SEZ has low or no concerns about environmental pollution, degradation, and costs.
b. *KIZ*: The knowledge innovation zone is a flatter, more adaptive and responsive area with networked organizations. Work is done in knowledge networks, communities or project teams, operating both in reality and virtually. High tech infrastructure, with access to technology and internet, and knowledge flow enables innovation and creative thinking. A KIZ focus on a clean, safe and green environment that stimulates knowledge workers and the creative class.

Table 3.3 A comparison between SEZ and KIZ (Knowledge Innovation Zone Research Report, 2006)

	Special Economic Zone (SEZ)	**Knowledge Innovation Zone (KIZ)**
Key words	Economic growth through free trade, tax reduction or exemption, trade friendly policies and export possibilities.	Economic growth via the creation of a knowledge society with a suitable infrastructure that facilitates the flow of information from its origin to the highest point of necessity.
Innovation of what?	Product innovation - Textile and clothing - Electronic equipment - Today; a mix of different industries	Knowledge Innovation - Intangible assets such as brands, business methods, thoughts - R&D, theories & analysis

Objectives	Generate value for the zone and create economic growth through the establishment of new companies & increased production → increase foreign capital investments	Generate value for the zone through the creation of a knowledge flow; knowledge is used where most needed. The flow of knowledge increases creative thinking & innovation → establish new mindsets, visions and leading theories

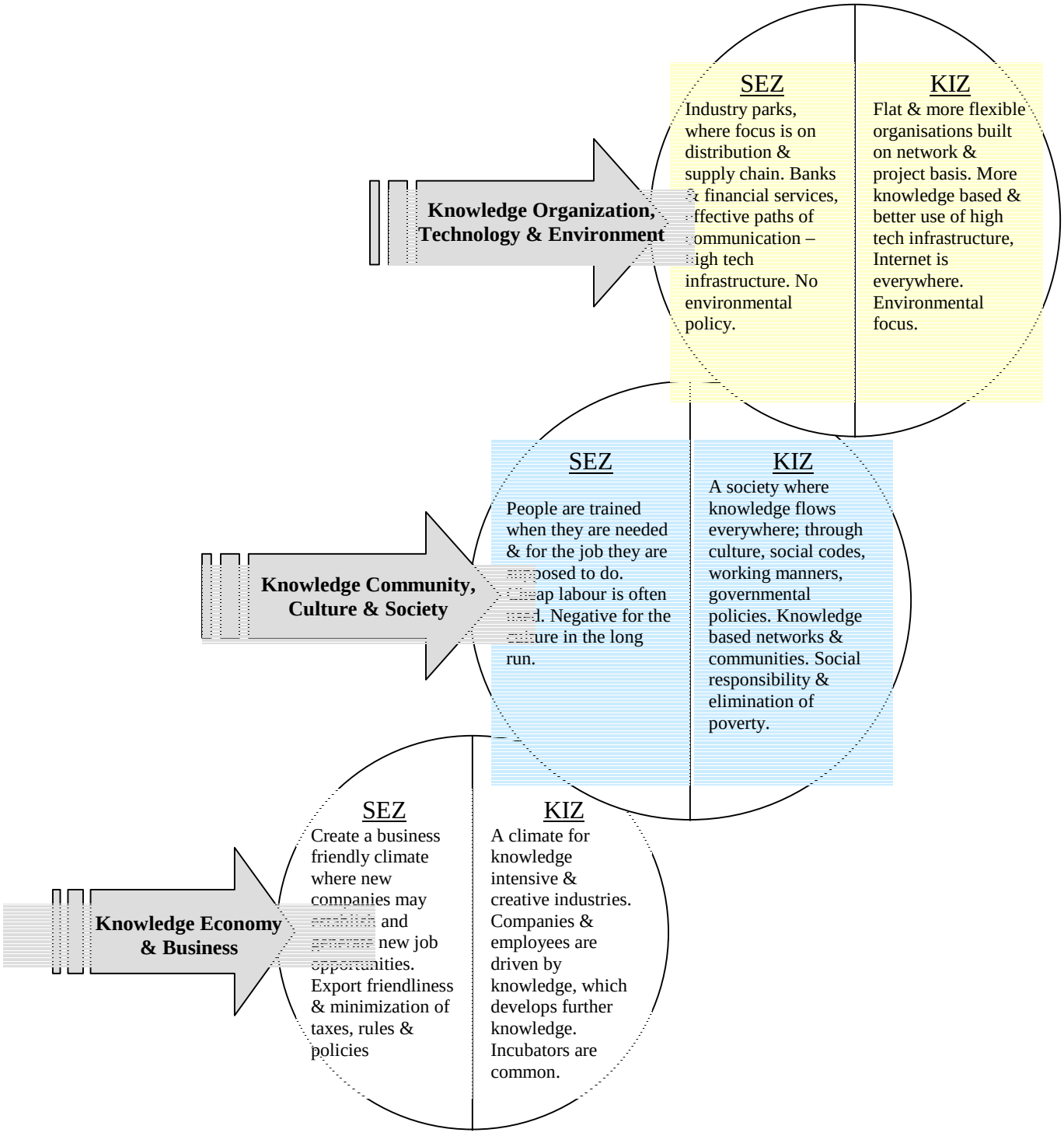


Figure 3.7 Special Economic Zones (SEZ) and Knowledge Innovation Zones (KIZ) seen in the perspective of a Triple Knowledge Lens (inspired by Knowledge Innovation Zone Research Report, 2006)

3.7 The Triple Knowledge Lens (TKL)

Regions that uses the "checklist" as a guide to become a KIZ, needs to be measured. Amidon & Davis (2006a; 2006b) points out eleven non financial drivers for a KIZ. With the help of these, the measuring tool called the Triple Knowledge Lens (TKL) has been created (Amidon, 2007-05-08). The TKL will be explained more thoroughly later in this chapter. The eleven drivers for a KIZ are:

1. Reputation Capital
2. Leadership Capital
3. Innovation Capital
4. Diversity Capital
5. Brand Capital
6. Network Capital
7. Cultural Capital
8. Technological Capital
9. Organizational Capital
10. Strategic Capital
11. Knowledge Capital

It is according to Amidon (2007-05-08) not enough to just measure the infrastructure in a region, and not taking its environmental effects in to consideration. At the same time she means that there is no point in measuring the business climate, if you do not at the same time consider the importance of cultural entities for the inhabitants. The point is to create a big picture of a region to be able to understand its potential (Amidon, 2007-05-08). With the new measurement indexes, a region can not longer just rely on old measurements, such as GDP or number of patents, says Amidon (2007-05-16). She means that there is no point in just measuring how many patents a region create. What they must do instead is to realise that the importance lies within measuring how many that gets realised and commercialised, and thereby creating value. The idea with a TKL is also to show that in order to progress you need to have a symbiosis between all sectors of the zone. She uses the metaphor with a kaleidoscope. If you just change on bit in one area the entire picture changes. She means that a zone has to work with the three lenses parallel for it to thrive (Amidon, 2007-05-08).

As we have seen above, special economic zones were and still are established as an effect of globalisation. Scarcities of products, raw materials, labour and economic factors as scale and scope have been the thriving forces for these zones. In the new knowledge driven era, these factors are no longer important (Amidon, 2007-05-08). During the industrial era, companies competed for market shares and considered that to be the way to play the game. Reporting was considered to be a tool for controlling, both companies and people. And what you delivered to the market was a product. Amidon & Davis (2006a) use these three parameters (product, control, competition) as part of

eleven, trying to explain how companies could show their accounting, connecting financial, social and environmental values. Amidon & Davis (2006a) call this way of accounting during the industrial era the *single bottom line*. When the information era began during the nineties, the roles changed. Cooperation became more important than competition and reporting systems became more important as a balance tool. Products were changed to solution and the entire bottom line accounting shifted to the *triple bottom line* (Amidon & Davis, 2006a). What Amidon & Davis (2006a) now talks about is taking this one step further. The knowledge era, consisting of KIZ created with the TKL, has changed the parameters once again. Collaboration is now the right tool for markets. Reporting systems will be of best help in learning, and what the companies/regions will deliver is innovation.

The three factors mentioned above, knowledge based economy, culture and infrastructure all connect to IC and intangibles, forming a symbiosis. They do not stand alone, but rather integrate with each other to form the "ecosystem" for a KIZ (Amidon, 2007-05-16).

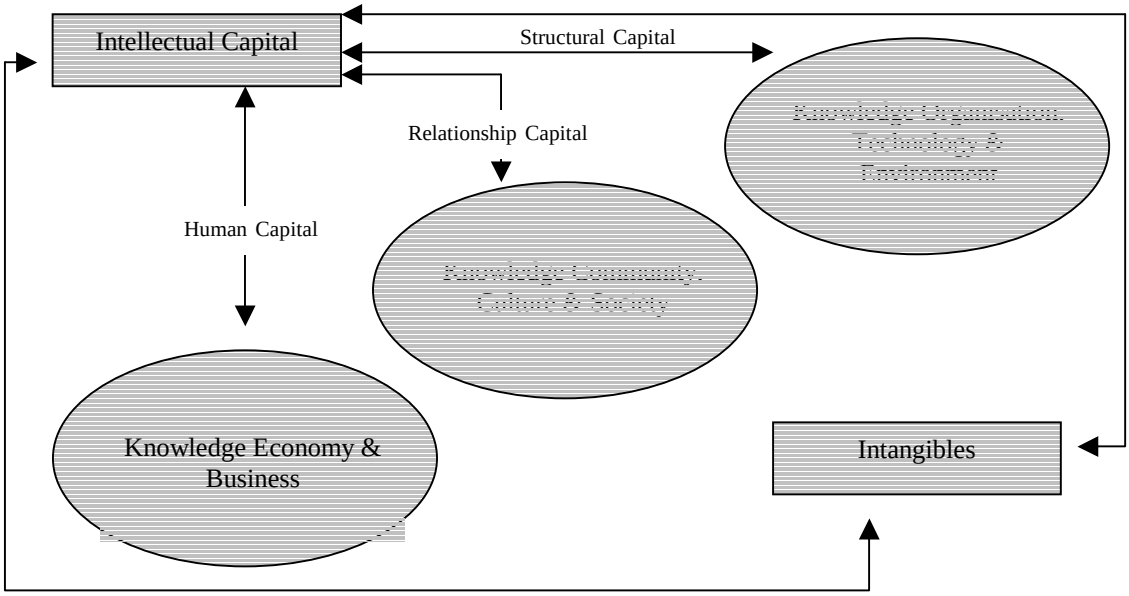


Figure 3.8 The Triple Knowledge Lens Model (Amidon & Davis, 2006a)

3.7.1.1 The different bricks of a TKL – Knowledge Based Economy

When measuring **knowledge based economy**, the common factor to use is according to Amidon & Davis (2006a) intellectual capital and four different indexes: (1) *Wealth in human capital index* (WHCI); (2) *Knowledge-based economy strength index* (KBESI); (3) *knowledge markets maturity index* (KMMI); and (4) *knowledge based business innovation index* (KBBII). Amidon & Davis (2006a) raise four different concerns for a knowledge-based economy. These are to be taken into consideration for the planers of a KIZ and to be a part of the "platform":

- *Fulfilling the promise*
  Factors involving businesses are expected to live up to their vision. Will they do that and be realized? Will they only raise revenue for the company, or will they improve the political and social life of the zone?

- *The attractiveness challenge*
  How will the zone be able to attract investors and people with talent? What will be the important parts in positioning the zone against other similar zones, to raise more funds?

- *Models of knowledge exchange*
  How will knowledge be traded? How can the zone be sure of leveraging human talent that will be vital in taking a product or service creation to commercialization?

- *Foresight – future readiness*
  Since the globalisation is generating change much faster than before, zones must create strategic plans that secure them for the future.

3.7.1.2 The different bricks of a TKL – Knowledge Based Society

The second area in the Triple knowledge Lens model is four indexes for measuring the **knowledge based society**. These indexes are according to Amidon & Davis (2006a): (1) *Wealth in Relationship Capital Index* (WRCI); (2) *Population Knowledge Motivation Index* (PKMI); (3) *Creative Affinity Index* (CAI); and finally (4) *Knowledge Stakeholder Interactions Innovations Index* (KSIII). As with knowledge-based economy, Amidon and Davis (2006a) raise four concerns for the knowledge-based society.

- *Change and adaptation*
  People and organizations must change and adapt to new technologies. They must also adapt new realities in their world. How will the zone be able to create measurements that can help and stimulate these changes and adaptations?

- *Internalizing a continuous innovation culture & mindset*
  How can a KIZ establish a system that makes them not inventing the wheel again, but rather learn and take advantage of new knowledge. How can the zone strategize itself to continuously create knowledge innovation?

- *Political risk*
  How can a KIZ make sure that the policies are accepted by the inhabitants? How will new changes affect old structures? And how can a KIZ get support from all parts of the social spectrum?

- *Knowledge leadership challenge*

How will a KIZ be able to attract leadership that has the experience to take the zone through its vision and at the same time understand the difference between industrial economic and the new knowledge based economy?

3.7.1.3 The different bricks of a TKL – Knowledge Based Infrastructure

The third parameter is how to measure **knowledge-based infrastructure**. To be able to measure the infrastructure Amidon & Davis (2006a) suggests following indexes: (1) *Wealth in Structural Capital Index* (WSCI); (2) *Knowledge Enabling Technology Index* (KETI); (3) *Knowledge Ecologies Index* (KEI); and last the (4) *4p Innovation Index* (Principles, *Policies, Practices and Processes).* The concerns regarding knowledge-based infrastructure are according to Amidon & Davis (2006a):

- *The digital divide*
  How can a KIZ create a digital infrastructure, including internet, telephones etc. that will foster the businesses, as well as culture and demography? How will it make sure that it affects all parts of the population?

- *Intellectual property rights*
  How will the legal system be incorporated in protecting intellectual property?

- *Technology forecasting and assessment*
  How will the KIZ make sure that their strategic decisions and investments comprehend with new technology?

Table 3.4 TKL index matrix, a summary of indexes and belonging lenses (Amidon & Davis, 2006b)

Indexes	Knowledge Economy and Business	Knowledge Society, Community and Culture	Knowledge Infrastructure, Organisation, Technology & Environment
Wealth in intellectual Capital index			
Wealth in Human Capital index			
Knowledge based Economy Strength index			
Knowledge Markets Maturity index			
Knowledge based Business innovations index			
Wealth in Relationship Capital index			
Population knowledge Motivation Index			
Creativity Affinity index			
Knowledge Stakeholders interaction innovation index			
Wealth in Structural Capital index			
Knowledge Enabling Technology index			
Knowledge Ecologies Index			
Principles, Policies, Practices, Processes Innovations index			

3.8 The simplified Triple Knowledge Lens: S-TKL

Using the theories presented above in this chapter, we have developed 24 performance measurements. These are based on theories of Amidon and Davis; knowledge

innovation zones and its belonging triple knowledge lens. Combined with prior research on intellectual capital for regions (Bontis, Videma, Pulic etc.), they form the foundation of our simplified Triple Knowledge Lens (S-TKL). Our aim is to apply these 24 performance measurements on our two regions. If the reader would like further explanations, please see appendix 4.

Table 3.5 The Simplified TKL (S-TKL) and its performance measurements

Three Lenses/Capital Drivers	**Human Capital** → Knowledge Economy & Business	**Relationship Capital** → Knowledge Community, Culture & Society	**Structural Capital** → Knowledge Organization, Technology & Environment
Leadership Capital & Diversity Capital	Ethnical groups in the zone	% of highly skilled professionals with higher education, originating from abroad	No. of published scientific papers
Knowledge Capital	No. of exchange students as a % of total amount of students	No. of municipal and district library books per inhabitant	No. of available PH.D. placements
Organizational Capital & Strategic Capital	Employment in high tech sector as a % of total workforce	No. of foreign investments made in the zone	No. of companies incubated in Science Parks
Network Capital	DOI Index	No. of projects between industry and university	No. of hotspots
Innovation Capital & Technological Capital	% of patents leading to commercialisation	Industry spending on R&D as a % of GDP	% of zone GDP spent on DOI infrastructure
Cultural Capital	Cultural and literary professionals per one million inhabitants	% of urban areas covered in greenery	Total subsidies for cultural entities
Ecology Capital	CO^2 emission per capita	No. of companies with ISO14000EMS accreditation	% of consumed kWh produced from renewable resources
Reputation Capital & Brand Capital	Inhabitants turn-over	No. of international summits	% of total zone administrative budget spent on branding/marketing activities

4 Description of Regions

What are the characteristics of the two zones we have studied, the KIZ of Öresund and the SEZ of Shenzhen? What is their historical background and which are the factors of success. After this chapter, the reader will have obtained a better understanding of the geographic regions in our study.

4.1 The Öresund Region

4.1.1 Bridge over troubled waters

"With the building of the bridge between Copenhagen, Denmark, and Malmö, Sweden, water ceased to be a barrier. Sjælland and Skåne are linked. New opportunities are opened. Two countries are brought together in one region. Öresund is born."

- The Birth of a Region, 1999 (in Berg *et al*., 2000)

According to Berg *et al*. (2000:10), discussions of building a bridge across Öresund to connect the kingdoms of Sweden and Denmark first aroused in the late nineteenth century, but the idea was soon forgotten. At the end of 20th century, ideas of a connecting link between the countries started to thrive again. But the idea of a bridge and a unified region was neither supported by the industry, nor by politicians. "Copenhagen was not more than a shabby city and focus was on the rapidly growing industrial developments in Jutland, whilst Skåne was only fields and some tourists. Malmö was a ragged stop-over for people going to Denmark" says Bengt Streijffert (07-06-25), Director of Öresund University. Both Malmö and Copenhagen were facing great economic difficulties, due to the disappearance of heavy industry, such as ship building, automobile assembly plants, textile factories etc., which used to employ a severe part of the population (Öresund University, 2006).

According to Berg *et al*. (2000), some people started to see the possibility of the bridge as an economic stimulant of southern part of Sweden, heavily affected by this high unemployment and an aging industrial structure. A link would also give Copenhagen, threatened by the growing importance of Jutland, a better position as a national commercial and industrial centre. There were other possibilities of linking the two regions together; companies had seen the success regions such as Silicon Valley, and started to see regions as a way of building competitive advantages and gain visibility. At

the same time, EU noticed the opportunities with regional thinking, and called for action. The timing of establishing a crossing link couldn't have been better.

In 1991, a mutual decision of building a fixed link from Malmö to Copenhagen was taken, and the vision started to become reality. The sea channel would no longer be a barrier to greater interaction between the countries. The 1rst of July 2001, the Öresund opened for public use after an outlay of $ 1.9 billion and nine years of construction (www.economist.com). It is today the longest cable stayed bridge for road and rail transport in the world and since the opening. Traffic across the strait increased by 34% immediately after opening, and today about 75 million persons have crossed the bridge. (www.oresundsregionen.org; OECD, 2006).

4.1.2 Öresund today

What implications did the fixed link have for Öresund as a region? First of all, the Öresund Link is according to Olshov (2000) so much more that just a highway, covering a stretch of 16 kilometres. It is in fact the first connection between Denmark and Sweden since the Ice Age 7000, as well as a catalyst for cooperation and convergence.

Osborne (2006) describes the bridge not only as a symbol of growth in cooperation between areas, but that it de facto facilitates geographical mobility, which is vital to deeper interaction. According to him, the overall goal of the Öresund collaboration is to generate a fully functional region that can compete with other regions. Öresund University (2006) declares two main visions that were fulfilled when the bridge finally came to place. First, the bridge was a part of a greater thought of trade, where the fixed link as infrastructure played an important role in giving Swedish industries an access to European markets. Second, the bridge was about creating a region that could compete with other large cities such as Helsinki, Berlin, Stockholm, Hamburg and Amsterdam.

Further on, Matthiessen (2004) portrays a south Scandinavian region that has experienced a fundamental change due to the opening of a fixed link. The result is a reduced time distance between the two nations, an elimination of land-sea barrier and bottleneck, as well as a merging of two rich concentrations of population and production.

Cities like Malmö that during a long period has been a depressed area, is now the fastest-expanding city in the country. In the region, small firms are flourishing, bigger international companies are moving into the area and many new jobs have been created (www.economist.com).

Öresund Region today consists of 3,5 million inhabitants, with about two thirds living on the Danish side, and remaining one third on the Swedish side; a total of 27% of Sweden's and Denmark's population. The greater part of the populations tend to live in the urban areas close to the Öresund strait, while more provincial areas are found in the

hinterlands. Total area of Öresund Region is 20,859 km^2, and compromises on the Danish side Sjælland, Lolland-Falster, Mon and Bornholm, and Skåne on the Swedish side. Largest city is Copenhagen, with about 1,5 million inhabitants, and thereafter Malmö, housing about 260,000. The region as a whole has an unemployment rate of 6,4% (2005), which is considered relatively low (OECD, 2006; Öresund University, 2006).

Figure 4.1 Öresund Region (Öresund University, 2006)

Gross Regional Product (GRP) of Öresund equalled year 2004 about 104 billion Euro and a GRP per capita of 29 052 Euro. Since 1995, there has been an increase of both GRP and GRP per capita in the whole of the region. In Denmark, the GRP/capita exceeds the national GDP/capita, but in Sweden these scenario is reversed (www.orestat.scb.se):

Table 4.1 GRP/capita (in Euro) in the Öresund Region, Denmark and Sweden (Source: www.orestat.scb.se)

	1995	**1998**	**2002**	**2004**
Total Öresund Region, DK+SE	20 523	23 400	27 358	29 052
Öresund Region DK	22 068	25 200	29 148	30 787
Öresund Region SE	17 267	19 576	23 599	25 403
Denmark	19 941	23 045	27 021	28 862
Sweden	18 886	21 243	25 319	27 745

In terms of gross regional product, Copenhagen is ranked 19th of the European cities. However, combined with Malmö/Lund, they together moves up to an 11th place (Hansen and Hansen, 2006).

Mobility in the region is high, both within and to the region (Öresund University, 2006). Danes immigrating to Sweden have quadrupled since the opening of the in 2000. But most Danes choose to keep his or her employment in Denmark, and commutes over the bridge on a daily basis. The reason for this is lower costs for housing and cars. Combined with higher wages in Denmark, the quality of life improves increasingly. The number of commuters is now up to 10,000 people per day. According to Bengt Streijffert (07-06-25), Copenhagen is experiences inflow of manpower, but the Swedish part of Öresund has more difficulties in retaining its talents. Especially graduating students seems to be a group that is hard to keep. Either they move over the strait to Copenhagen, or they move out of the region, abroad or to other regions such as Stockholm. This brain drain is negative for the region as a whole according to Streijffert (07-06-25).

Interesting enough, the Öresund Region is a cross-border region, including two different countries. This implies that there are in fact great cultural, lingual, political and social differences, irrespective of the close distance. Öresund region does not have any administrative zone government, coordinating activities such as investments, marketing, education or future planning. Instead, Öresund consists of many smaller bodies that are collaborating over the strait and who work with the development of the region in various ways. Political decisions are still taken by each country, either on regional or national level, but the collaborating organisations of Öresund are often influential enough to affect the politics in the region. Regardless of national belonging, the bodies are working in the same direction, driven by the same interests; to be a part of the new knowledge region that is created (Streijffert, 2007-05-25). Bengt Streijffert says that the thought of creating regions is a way of surviving in the new game field the knowledge economy has brought upon us.

In an international perspective, the Öresund Region illustrates two countries, known for efficiency, competitiveness and transparency, that are brought together to combine welfare and economic growth, creating a secure and equal society. But this is not the truth everywhere in the region; “There are two parts of this knowledge region”, says Bengt Streijffert (07-06-25), “on the one hand, Öresund Region have development, growth and the positive part of knowledge exchange, which is a project for the elites, including about one third of the population. On the other hand, there are ghettos with high unemployment and the lowest education level in the countries. And they can hardly be counted as a part of the knowledge region”. Urban areas are wealthier than rural areas, and the region includes both some of the most advanced and most depressed areas in Denmark and Sweden. This gap has according to OECD (2006) increased due to the draining of population, industries and services from rural areas to cities. This negative backwash effect of growth tends to outweigh the positive effects in these peripheral areas.

4.1.3 Öresund – The Human Capital of Scandinavia

"It's no wonder that the Øresund Region is doing so well. While others are building walls, the Øresund Region is building bridges"

- Øresund – Two countries, One Region (Øresund Network, 2006b)

Heavy investments have been made in the Öresund Region to put the area on the map (OECD, 2006). Öresund wants to be communicated as the human capital of Scandinavia, where everything is measured in human terms and the greatest asset and competitive advantage is the human capital. In communication, slogans as "Two Countires - One Region", "Øresund – Technology with a human touch", "Øresund – Where Human Capital Grows", "Øresund – The Nordic Main Gate" and "Øresund – Quality of Life" is used to stress the message of a knowledge region – a region where human capital is at its best and live a joyful life (Øresund Network, 2006a; Wolff, 2003). Further on, two main core values should according to Øresund Network (www.oresundnetwork.com) pervade all communication: (1) Cross-border region and (2) humanity. Cross-border region refers to the fact that two nations are collaborating over the borders, but also to collaboration between high tech, research and development, science, architecture, business etc. Humanity refers to the importance of the human capital which is what makes the region successful and attractive. (www.oresundnetwork.com).

Considerable investments in infrastructure, urban development and restructuring have been made to facilitate for investors and inhabitants, such as the Copenhagen International Airport and Copenhagen Metro. Streijffert (07-06-25), Öresund University, points out the importance of a having good, accessible airport, saying that "if you just have an airport, everything else will work out fine". Copenhagen airport is the tenth busiest passenger airport and the sixth busiest cargo airport in Europe (OECD, 2006). Investments as the Öresund Link have turned the region into a major logistic hub in Europe and increased the accessibility within the region drastically. Copenhagen is today among the worlds 5 best big cities to live in, and both countries has been ranked as the most tolerant and open societies in the world (Øresund Network, 2006b). Other example of infrastructure investment is Ørestad, a science city, located within the Greater Copenhagen Region, which has been planned to integrate Science Parks, universities and labs with residential areas, companies, restaurants and hotels to tens of thousands of people. Similar to Ørestad, in the Swedish part of the region, investments in development have been made. In Malmö, the former dock area has been transformed to a whole new town, including Malmö University, incubators, attractive living and interesting architecture (OECD, 2006).

Key industries in the Öresund are biotechnology; pharmaceuticals and health; information technology and communications; food; tourism, culture and recreation; transport; building construction; and business and financial services (OECD, 2006).

Even though collaboration seems to be happening on daily basis, there is generally a lack of civil society organisations involved in cross-border activities. Collaboration is happening mostly via businesses and public organisations, and civil society is rarely initiating such cross-Öresund initiatives (OECD, 2003 in OECD, 2006).

4.1.4 A Region of Knowledge

The Öresund Region is today prominent when it comes to science, technology, research and development. An OECD report from 2003 (OECD, 2006) describes four knowledge-intensive activities that the region has developed significant strength in: (1) medical, pharmaceutical and bio-technology industries, (2) certain segments of information and communication technology industries, (3) the food processing industry, and (4) environmental technologies. This knowledge creation and innovation is pointed out by experts and politicians to be sources of future economic growth for Öresund.

There are six fields that officially represent the high tech industry of Öresund (Øresund Network, 2006a):

Table 4.2 The five areas of high tech industry in Öresund (Source: Øresund Network, 2006a)

Target Areas	Facts
Medicine/bio-tech	The Öresund Region has the largest pharmaceutical and bio-tech nucleus in Scandinavia, includes i.e. the science cluster "Medicon Valley". In this field, the region is ranked 3rd in Europe, after the triangle of Oxford-Cambridge-London in Great Britain, and the French capital of Paris.
IT/Telecoms	This sector provides employment for around 104,000 people in the region and constitutes the largest concentration of IT competence in Scandinavia.
Food Industry	The food and drink industry in the region is export-oriented and ranges from multinationals to niche developments companies, focusing on functional food.
Environment	The region is working to become a world leading environmental cluster, where research is conducted on aquatic and marine environment as well as energy and policy planning.
Logistics	Geographically, the Öresund Region is a gateway to the Baltic and a hub in Northern Europe, which has made the region to a logistic centre.
Design	The region is a producer of design which is exported worldwide, such as furniture, computer games and porcelain.

In order to create a better understanding between the five different sectors, organisations for one of each of the areas have been established. These together form the strategic

alliance of Øresund Science Region, where the aim is to promote growth through collaboration (Øresund Network, 2006a). It also aims to establish state of the art scientific clusters, and thereby make Öresund internationally known as a high tech region (Osborne, 2006). Within Øresund Science Region, there are different networks, or clusters, depending on scientific area. One of these clusters is the biomedical cluster "Medicon Valley", that in a report from 2002, conducted by The Boston Consulting Group, was stated as among the strongest biomedical clusters in the world (Wolff, 2003). Other research networks are Öresund IT Academy, Öresund Food Network and Öresund Environment Academy (Osborne, 2006).

In addition to these research networks, the region has developed Science Parks; an area set aside for business and institutions focused on R&D. They are linked to universities and hosts start-ups as well as bigger companies. Science Parks, as Ideon in Lund and Symbion in Copenhagen, are established to bring together research and companies to generate innovation and business prospects (Osborne, 2006).

As mentioned above, Öresund consists of many hi-tech industries, research parks and science clusters, where scientific collaboration, research and development happen on daily basis. High tech services are located around large town and cities, such as Malmö/Lund and Copenhagen. Between year 1997-2002, the high tech sector experienced strong growth of 20%, when the growth rates for total employment was not more than 4,6%. The share of the high tech sector in total employment in the Öresund Region year 2002 was 7,2 %, where Sjælland dominates the region in both high tech manufacturing and high tech services. (Hansen & Serin, 2005:114).

According to Hansen & Serin (2005:111), this gives Öresund a seventh position in the EU when it comes to high tech manufacturing and knowledge intensive services, and a ninth position in terms of high tech services. German regions are considered to be in the front, which according to Hansen & Serin (2005:111) is not a coincidence since it is the largest economy in Europe.

Education is another important part of the region. According to OECD (2006), there are 20 higher education institutions in the Öresund area. Twelve of them are connected together in a voluntary consortium called Öresund University, which aim to create the greatest transnational university collaboration in Europe by increasing the co-operation and exchange of knowledge within the consortium, as well as with international universities. In total, Öresund University includes more than 150 000 students and 14 000 researchers (www.uni.oresund.org; www.orestat.scb.se). Collaboration takes place mostly at faculty and department levels, and consists of joint courses, creation of research and joint networks etc. By building networks and partnerships, Öresund University wants to develop the human capital of the region, as well as its research. Measured in scientific output, Copenhagen is positioned 21rst in Europe, and Malmö/Lund just within the top 30. Combined together, these two areas are ranked 5th

in Europe (Matthiessen, 1999; Matthiessen and Schwarz, 1999; in Hansen and Hansen, 2006).

4.1.5 Success of the region

The fast development and increasing growth in the Öresund Region is according to Bengt Streijffert (07-06-25) due to a few specific factors. First, the lack of territorial thinking or protecting one's reserves has created empty fields where new ideas can flourish and grow. Second, the lack of a strong political rule has made it possible for projects to grow unreservedly. Initiatives are driven by regional public bodies without an overall political or bureaucratic level of administration. Bengt Streijffert (07-06-25): "In the region, projects have been established via bottom-up thinking, and these are projects that never could have aroused via political planning". Third, the bridge is according to Streijffert (07-06-25) another important factor: "The bridge has made us open our minds for the other side of the strait, bringing both possibilities and needs. Collaboration as we see it today could have happened without the fixed link, but it would have taken a serious amount of time. The bridge has acted as a facilitator as well as a catalyst for integration". Fourth, the cross-border relationship has brought new thoughts and ideas to the region, where everyone is working in the same direction, with successful ventures in areas such as medicine/bio-tech as a result. Fifth, Streijffert (07-06-25) says, the close collaboration between universities, authorities and business community in science clusters – the triple helix model – has been appointed as a model for other European regions. Another important part of the success is according to Streijffert (07-06-25) the fact that Öresund Region has developed its society according to the new world order: the knowledge economy and everything it represents.

When it comes to the future, Bengt Streijffert (07-06-25) is not sure where Öresund will be: "What is happening now in our region is happening all over Europe, i.e. German regions are growing at a very fast pace". Streijffert (07-06-25) continues: "In 10 years we have either been passed by regions as Stockholm, Uppsala, Berlin or St Petersburg. If not, the region will have the same position as today". The competition is fierce and it is getting worse. According to Bengt Streijffert (07-06-25) the strategy for Öresund Region is to keep having everyone working in the same direction and strengthen the region in order to attract more talents, collaborations and foreign investments. He believes that internal competition will stimulate regional actors to work harder, as well as it will foster the pioneer spirit in the region and keep Öresund competitive.

4.2 Shenzhen

4.2.1 Political background of the development of Shenzhen SEZ

In 1949 when Mao Tsetung came to power in China and founded the People's Republic (PRC), he began to close all trade connections with the world. Even though Mao himself wasn't in charge of exchanges between China and foreign countries, he had

made recommendations of minimizing such co-operations. According to Mao (1977:102pp), each country should do its best to be self-reliant and work independently to the greatest extent possible and thereby making a principle out of not relying on others. Import of goods should only be made after several attempts have been made to produce them locally, and exports should only occur when local need of a product has been satisfied.

"The correct method is each doing the utmost for itself as a means towards self-reliance for new growth, working independently to the greatest possible extent, making a reliance out of not relying on others…"

- Mao Tsetung (1977:103)

Mao's recommendations were clearly followed by his comrades. However, Mao who had inherited an economy torn by years of war and fighting understood that the PRC needed an ally. Because of the anti-communist ambiance created by American policies, he turned to the Soviet Union for economic and military aid. This relationship was short-lived, and in 1960 the Soviet Union withdraw all aid and the People's Republic was standing alone. During the Great Proletarian Cultural Revolution that followed in 1966, self-reliance once again became the keyword. By this time, self-reliance turned out to be more of a self-isolation, as China broke its diplomatic relations with one country after another (Wong & Chu, 1985, p.27).

The death of Chairman Mao in 1976 led to a downfall of the left wing fraction, and made way for a new, refreshing ideological thought of mind. Deng Xiaoping, one of Mao's closest comrades, returned to power after earlier being forced to retire all his political offices, and steered China towards a more relaxed and flexible approach to self-reliance and interdependence. His official post was only Chairman of the State and Communist party Central Military Commissions, but he was actually far more influential than other comrades of the party. Deng started to rebuild on the foreign connections and launched a programme for social, political and economic change. With the Four Modernizations, Deng wanted to modernize agriculture, military, science and technology, and industry in order to create a powerful, modern socialist country before the end of the century. This he called "socialism with Chinese characteristics" and the economic reforms became known as "socialist market economy" (www.wikipedia.org). The new paradigm was as a long term goal that only could be achieved by importation of factors of production, such as technology, capital and management expertise from developed countries (Wong & Chu, 1985, p.28).

By reinterpret Mao's self-reliance, Deng made it clear that foreign trade must be achieved to be able to modernize. In 1979 Deng choose four areas in the country and designated them as laboratories for experimentation of the frameworks of market economy and foreign direct investments (FDI)[1]. The Four Special Economic Zones

[1] Foreign Direct Investment (FDI) is an investment involving a long-term relationship and reflecting a lasting interest of a resident entity in one economy (direct investor) in an entity resident in an economy

(SEZ) established was Shenzhen SEZ, Zhuhai SEZ, Xiamen SEZ and Shantou SEZ (Wei, 2000; Wong & Chu, 1984; Wong & Chu, 1985, pp.42)

Table 4.3 The original four SEZs established 1979; name, geographic location and area (Wong & Chu, 1985).

Name of SEZ	**Geographic location**	**Area by the time of establishment (sq km)**
Shenzhen SEZ	Next to Hong Kong	327,5 sq km
Zhuhai SEZ	Next to Macao	6,8 sq km
Xiamen SEZ	Opposite Taiwan	2,5 sq km
Shantou SEZ	Opposite Taiwan	1,6 sq km

The reason for establishing these economic zones was to minimizing foreign participation in the national economy, and thereby minimizing the conflict with existing political, economic and social systems. The freedom and autonomy that foreign companies were given was only available inside the designated SEZ. The objective for these SEZs were to foster and stimulate economic development by attracting foreign investment, expanding exports and increasing technology imports (Wei, 2000).

4.2.2 The Shenzhen SEZ

Before the idea of establishing an economic zone emerged in the Guangdong province, Shenzhen was a small town with a population of 20,000 inhabitants working either with agriculture or in one of the 26 factories. These factories counted for a total industrial output of less than US$10,000, which would categorize them as very small sized production factories (Wei, 2000).

Figure 4.2 Shenzhen (www.wikipedia.org)

other than of the investor. The direct investor's purpose is to exert a significant degree of influence on the management of the enterprise resident in the other economy. FDI involves both the initial transaction between the two entities and all subsequent transactions between them and among affiliated enterprises, both incorporated and unincorporated. FDI may be undertaken by individuals, as well as business entities (UNCTAD, United Nations Conference on Trade and Development).

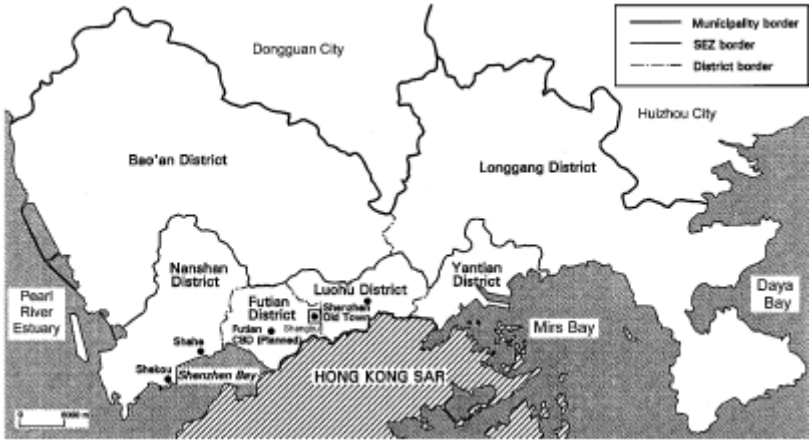


Figure 4.3 Districts in Shenzhen (Ng, 2003)

According to Wei (2000), the Shenzhen SEZ was in the early days an economic zone lacking in capital and access to international market. Therefore, attracting foreign investments and overseas technology was given top priority. In 1979, an incentive package was put together, including the following tools of persuasion (Wei, 2000):

Table 4.4 Incentive package for the Shenzhen SEZ, 1979 (Wei, 2000)

Incentives
- Streamlined administrative control
- Relative independence for local planning authorities
- Direct access to provincial and central level planning units
- Access to tax breaks
- Free or low duties on imported equipment and production materials
- Free or low-rent business accommodation
- Flexibility in hiring and firing workers
- Deprecation allowances
- Negotiated access to the domestic Chinese market for goods produced within the SEZs
- Residence and work permits and income tax exemptions for foreigners working within SEZs

After presenting this incentive package to foreign companies, foreign direct investments started to roll in. In 1998, less than 20 years after the launch of the Shenzhen SEZ, more than US$12 billion had been invested into different businesses.

According to Wei (2000), there are three main reasons why Shenzhen succeeded to fund such a large amount of FDI. (1) First, the surplus of cheap labour decreased the foreign companies cost, i.e. the average wage of a Chinese worker was about one-tenth of the average in Hong Kong. (2) Second, the preferential packages made it more profitable to invest in the Shenzhen SEZ than other Asian regions. (3) Thirdly, the close geographical distance to Hong Kong, a truly global city with similar cultural background, language and communication, made it even more convenient to invest in Shenzhen. Social and ethnic ties were very important. By the time of the Shenzhen SEZ establishment, Hong Kong was already a vibrant trade city, with a GNP per capita of over US$4,000 in 1980 (Wong & Chu, 1985, pp.42). These commercial ties with the rest of the world made a great difference to Shenzhen in comparison with the three other SEZs established at the same time. Hong Kong, who at this time still remained a British colony, had excellent port facilities and many foreign investment groups had branches here due to its strategic location in Asia. Therefore it was natural for Hong Kong agents to suggest investments in the newly built SEZ just across the Shenzhen River.

4.2.3 The evolution of Shenzhen SEZ

In contrast of other economic zones in Asia, the Shenzhen SEZ was set up to embrace tourism, agricultural production, manufacturing, commercial and real estate development. The early SEZ was to include everything from electronic industry, building materials, textiles and clothing, to food processing, petrochemical industry, metal and machinery (Wong & Chu, 1985, pp. 57). Especially high-technology companies were welcome, since the government was keen on adapting new technology in order increase the pace of development. This however became to complex, and the government left their high-technology strategy to focus on labour-intensive industries instead, which transferred a less amount of technology knowledge (Wei, 2000).

According to Wei (2000), it is possible to divide the evolution of Shenzhen SEZ into three phases; formative phase, labour-intensive phase and technology-intensive phase:

Stage 1: Formative phase of development
In this early stage of development, 1981, most of the FDI made in Shenzhen SEZ went to tourism activities and real estate. The lack of sufficient infrastructure resulted in that only a small percentage was made into manufacturing activities. Investments in manufacturing also demands greater capital outlay that i.e. real estate. The authorities in Shenzhen soon realized this problem and spent great sums on establishing adequate infrastructure, such as communication links, water, electricity and housing. At the same time, it became clear that the administrative process as well as financial system was very inefficient and restrained many investors. A sufficient infrastructure but inefficient

administrative system wouldn't attract any FDI. Therefore zone authorities started to reform governmental structure, issue legal regulations and cut down on bureaucracy in order to make Shenzhen an interesting choice for foreign investors (Wei, 2000).

Stage 2: Labour-intensive phase of development

Due to improved infrastructure and business-friendly Chinese government, by the end of 1982 foreign investments in manufacturing industry began to increase. Initially, most manufacturing investors came from Hong Kong, and brought with them the technology needed, while China offered the labour force. This was according to Wei (2006) a fruitful relationship, since Shenzhen SEZ lacked technology and marketing capabilities and funds, while Hong Kong lacked the semi-skilled and unskilled low paid labour. In one example, a Hong Kong based investor was the dominant partner, who provided capital, equipment, management skills and technology. The Shenzhen SEZ partner was responsible of labour and land in exchange for learning opportunities. But China didn't have any intention of becoming a neo-colonial manufacturing centre for foreign enterprises (James, 2000). After two years of partnership, when the Shenzhen partner had gained enough experience and skills, the two would establish an equal relationship, such as a joint venture. With this kind of partnerships, Shenzhen SEZ could channel necessary knowledge for its own development. Other types of foreign capital participation used were i.e. co-operation production and wholly foreign-owned companies.

According to Wei 2006), during the period 1980-1990, key industries were labour intensive and light processing industries such as toys, shoes, clothing, packaging and bicycles. Output increased for both domestic and overseas markets. In the domestic markets, the competitive advantage was the product novelty and quality of the products and in the overseas market the competitive advantage was the low cost as a result of cheap labour.

Stage 3: Technology-intensive phase of development

By the end of 1980s, Shenzhen authorities realized that they needed to change their business model (Wei, 2000). The surplus of low cost labour did not work as a competitive advantage anymore, due to two main reasons that threatened further development of the SEZ. First, the cost of land had risen extremely during a short period of time, which meant that Shenzhen was no longer a suitable place for labour intensive manufacturing activities that needs large land areas. Second, the competition from inland China had risen increasingly. Other municipalities in China had started to build on the preferential investment incentives, which at first were exclusive for Shenzhen. These regions could offer even better benefits that Shenzhen had and labour intensive production now faced fierce competition. Therefore, Shenzhen SEZ authorities decided to shift back their focus to their initial idea; technological-intensive industries (Wei, 2000).

A program was put together in order to increase the benefits for technological-intensive firms, and thereby transfer their skills to Chinese partners. This included special allowances and incentives such as tax exemptions and entrance to the domestic Chinese market if a project was qualified as "technologically advanced". Also, Shenzhen SEZ government established services as quality support, productivity enhancements and intellectual property rights for technological zone companies that needed help or information (Wei, 2000).

According to Wei (2000), this all together resulted in a transformation of Shenzhen SEZ from a labour-intensive zone to a high-tech centre with a steadily increasing amount of highly educated workers, such as scientists and engineers, both from inland China and abroad.

The different phases all had their characteristics when it comes to comparative advantage, main product, source of technology and role of Chinese government. The differences can be summarized in the following table:

Table 4.5 A summary of the three phases of development for Shenzhen SEZ (Wei, 2000)

	Formative phase	**Labour-intensive phase**	**Technology-intensive phase**
Comparative advantage	Incentive package for FDI; Location-specific advantages	Low-cost labour surplus; Huge domestic market; Incentive package for FDI; Incentive package for FDI; Location-specific advantages	Low-cost highly educated labour; Accumulated skills and capital; Huge domestic market
Main product	Tourism and real estate development	Toys, clothes, shoes, packaging, bicycles, etc.	Computers, switches, etc.
Source of technology		Hong Kong	Developed countries
Role of government	Infrastructure building; Institutional reforms	Help firms find employees nationwide in order to keep the competitive position, threatened by other low-cost competitors	Technology infrastructure building; protection of intellectual property, etc.

4.2.4 Success factors of Shenzhen SEZ

In less than three decades, Shenzhen managed to become the most rapidly evolving city in the world. It is an implication that SEZ do tend to have positive effects in large continental economies.

Research made by Wei (2000) shows that there are three important factors why this massive development have taken place:

(i) *Infrastructure enhancement*: By developing and enhancing the infrastructure and institutional framework, an industrial base can be formed and foreign investors are attracted.

(ii) *Building on resources*: Fast development should be built on the comparative advantages given by the very nature of the zone. In the case of Shenzhen SEZ, surplus of cheap labour, land and geographical advantages had a particular important role in the evolving phase.

(iii) *Shift toward higher value-adding activities*: When realizing the problem with labour-intensive industries, SEZ authorities of Shenzhen choose to restructure their business model. When the cost of production factories, such as land and labour, and the competition increased, Shenzhen SEZ chooses to focus on the high-tech industry, which meant more value-adding activities that increased foreign investments. In order to create a lasting well-performing special economic zone, the transition of technological knowledge from investors to host country is immense. Governmental policies and outside competition drives this process. Competition reduces profit, which creates financial pressure that forces policy changes to a shift toward higher value adding activities.

Haywood (2000) states another important factor to the success of Shenzhen SEZ: independence. The Chinese government has given their zones a greater independence than many other Asian countries. This implies that Chinese SEZs many times can act as autonomous states within the country, with their own legislation, execution rights and judicial functions. Because of the autonomy, Shenzhen authorities have been able to react on changing markets, fierce competition, customer demands, and develop the zone into what it is today.

4.2.5 Shenzhen SEZ today

The establishment of special economic zones has created deregulations and an entry of foreign producers, which have given China the chance to gradually make itself comfortable with market economy (Wei 2000). Today, high-technology is the main industry in Shenzhen SEZ. In 1998, high-tech accounted for nearly 40 percent of the total industrial output, and in 2004 it had increased to almost 60 percent (Wei 2000; Shenzhen Government Online).

Shenzhen is today the city which has the highest export of all cities in the Chinese mainland. The city has the 4th largest GDP in the country and with a population of 8, 28 million. The SEZ advantages that Shenzhen has of tax reforms and preferred policies for investors are still intact for the zone and will keep attracting investors in the future. (Enright & Edith, 2005)

Table 4.6 Shenzhen GDP 2005 (Enright & Edith, 2005)

Year 2005	**US$ Billion**	**Percentage**
Total GDP	60,16	100%
GDP primary sector	0,12	0,2%
GDP secondary sector	31,51	52%
GDP tertiary sector	28,53	47,8%

Primary sector includes farming, forestry, animal husbandry, fisheries, natural resource extraction, and other similar industries. *Secondary sector* includes manufacturing, construction, mining, water supply, electricity supply, gas supply, steam supply, and hot water supply. *Tertiary sector* compromises all other sectors which includes logistics; data transmission; wholesale and retail trade; tourism; financial services; real estate; business services; scientific research and technical services; geological prospecting; environmental and public facility management; education; health care, social security and social welfare; culture, sports and recreation; public administration and social organizations; and international organizations'. As seen in table 4.7, the biggest industrial sector in Shenzhen is the secondary one, closely followed by the tertiary.

According to Shenzhen Government Online, the city has since the mid-1990s focused its economy on seven major industries, including computer software; IT; microelectronics and components; video and audio products; electro mechanical integration; and key projects of light industry and energy. Other industries such as pharmaceuticals, medical equipment, biotechnology and new materials have rapidly grown. Telecommunications equipment, computers and other electronics counted in 2004 for the larger part of the manufacturing gross industrial output, $US 47 billion, followed by electric equipment and machinery, only counting for about $US 4,5 billion (table 4.7).

Table 4.7 Shenzhen top manufacturing industries by gross industrial output, US$ billion, 2004 (Enright & Edith, 2005)

Manufacturing Industry	**US$ Billion**
1. Telecommunications equipment, computers, and other electronics	47
2. Electric equipment and machinery	4,49
:	
10. Special purpose equipment	0,81

Regarding the service industry, transportation, storage, post and telecommunications are the biggest industries in terms of gross industrial output, US$ 3,15 billion, closely followed by the Finance and insurance sector, US$ 3,10 billion (Table 4.8).

Table 4.8 Shenzhen top service industries by gross industrial output, US$ billion, 2004 (Enright & Edith, 2005)

Service Industry	US$ Billion
1. Transportation, storage, post and telecommunications	3,15
2. Finance and insurance	3,10
:	
4. Real estate trade	2,87

4.2.6 The Four Pillar Industries of Shenzhen

According to Shenzhen Government Online, Shenzhen industry consists of four key sectors: High tech, logistics, finance and culture.

4.2.6.1 High technology

According to Shenzhen Government Online, high tech industry is the base in Shenzhen economy, and its output volume has grown with a rate of 46,5% per year since 1992. Shenzhen is the leading city regarding technology production in China. Shenzhen develops 50% of all software which is exported from China and 25% of its integrated circuit design business. (Enright & Edith, 2005)

The city's strategy for research and development is up to 90% done by private owned enterprises, meanwhile domestic colleges, universities and institutes are backing up behind. About 18,8% of registered private high technology enterprises are involved in high technology product research and development. In Shenzhen there are 87 foreign invested research centers with a total of US$ 1,77 billion invested. The result of the R&D is that Shenzhen in 2004 had 14, 914 patent applications, 20,7% more than previous year. (Shenzhen Government Online)

To push the technological development, Shenzhen has adopted a "park driven strategy". This implies that industries with the same high technology base are situated in same area. There are today 11 high technology industrial parks which all have a different focus, from telecom to oceanic tourism. (Shenzhen Government Online)

According to Shenzhen Government Online, the high tech industry was by 2004 providing 610 000 professional technology experts with work, where around 10% came from overseas. The government is promoting its high technology sector through China Hi-Tech fair, established in 1999. The 6th high tech fair was held 2004 in the then newly built Shenzhen Exhibition Center. At the fair there were a total of 115 delegations from 42 regions and nations, 62 multinational companies were represented, with 4041 exhibitors, 9674 projects and 1882 investors attended the fair. (Shenzhen Government Online)

4.2.6.2 Finance

According to the government of Shenzhen (Shenzhen Government Online), the city has together with other financial institutions set up a complete and sound financial system with banking, securities and insurance as the main business. Shenzhen has been in the forefront of developing the finance market of mainland China. The were the first city to have a foreign invested bank, first securities company, first foreign exchange regulation center and first electronic financial settlement center. All domestic banks are presented in Shenzhen and over 50 foreign invested financial institutions have settled up branches in Shenzhen. Shenzhen is home of one of two stock exchanges on mainland China. (Shenzhen Government Online)

4.2.6.3 Logistics

Shenzhen's geographical location makes it the only city in China with air, land and sea ports. It has the worlds 4th largest port in terms of containers shipped, and therefore leading Chinese logistic industry is emerging (Enright & Edith, 2005). Shenzhen Bao An international airport has 95 domestic routes and 14 international, which makes it the 4th largest airport in China. Shenzhen has an extensive road and train network which links Shenzhen with other cities in the region and to Hong Kong and Macao in the south. The airports of Shenzhen, Zhuan Hai, Macao, Guangzhou and Hong Kong can all be reached within a 90 minutes drive (Shenzhen Government Online).

4.2.6.4 Culture

The forth pillar in Shenzhen industry is culture, which includes industries such as printing; broadcasting; news and publishing; advertising; travel; cultural and recreation; and cultural products manufacturing industry. The cultural industry of Shenzhen can be divided into three parts:

(i) Media
(ii) Design
(iii) Tourism and public event related activities

In the media industry, there are Press Publications; Printing; and Broadcasting Television and Film. The Design part consists of Animation; Artists and Painters. The third group is based on cultural events in the city. Shenzhen hosts many Culture Festivals which have both domestic and international focus. The city has an International Culture Industry Fair, and through out the city there are 5000 Cultural Venues for singing and dancing. (Shenzhen Government Online)

According to Shenzhen Government Online, Shenzhen has started to implement a strategy of "building a culture based city", where they wish to create a city of "high-quality culture". The initiative has according to the government boosted the culture industry with 20.76% from 2003 to 2004 and was by 2004 accounting for 4.77% of the city's total GDP. Government officials says that the development of the cultural

industry in Shenzhen will be based on innovative culture, and eight new advantageous industries will be developed, including: media industry; publishing industry; creative design industry; printing industry; audio and visual industry; recreation industry and travel industry (Shenzhen Government Online).

4.2.7 Society, Community and Environment

The average population age in Shenzhen is less than 30 years old and the population is polarized among two extremes; (a) densely populated professionals with high level of education and (b) migrant workers with poor education. The less educated have a minimum salary of $US 86 a month inside the special economic zone and $US 57 in the areas outside. A social welfare system is being built with Social Insurance, Social Welfare and Legal Aid. To be granted legal aid you have to be a permanent citizen in Shenzhen, have to live in the city for over a year, and to be able to state that you cannot fund the aid the by yourself. (Shenzhen Government Online)

Shenzhen has had big environmental problems where there have been no or very few restrictions on toxic waste from its thousands of manufacturing plants. The government has realized the problem, and in 2004 the officials pledged that 3% of Shenzhen's total GDP shall be put into environmental protection, a huge investment of $US 421 million (News Guangdong).

4.2.7.1 Education

The citizens of Shenzhen are the most educated in the whole of China (Enright & Edith, 2005). The government invested $US 1,35 billion in 2004 in the education system. Between the ages of 3 to 6 years old, 98% went to school. Nine years of school is compulsory. For the higher education, Shenzhen has 11 colleges and universities with a total enrolment of 41 300 students. (Shenzhen Government Online)
The park driven strategy, mention above, is used also for tertiary education. Shenzhen has a university town which in the first phase covers an area of 3, 8 sqkm, in which famous domestic Chinese universities such as Qinghua University, Peking University, Harbin Institute of Technology are situated. The town has six national level key labs which are established to generate a multi functional, comprehensive and modern University Park, integrating manufacturing, study and research. (Shenzhen Government Online)

Shenzhen has five international schools, and three additional for Hong Kong children and one for Taiwanese children. Shenzhen has 8 public libraries and 385 community libraries with a goal of achieving one community library for every 15 000 people. (Shenzhen Government Online)

The talent structure of the city consists of more than 600 000 professionals, where there are about 32 000 citizens with master degrees and 2300 with doctorate degrees. The

communist party and municipal organs of Shenzhen has about 20 000 employed, where 35% has a bachelor degree and 7.5% a master degree. (Shenzhen Government Online)

4.2.8 Future Goals

In 2005 the government of Shenzhen announced their new strategy for the next 5 coming years (Shenzhen Government Online). The city shall adopt the "scientific development perspective" where the goal is to build an effective and harmonious Shenzhen. The GDP shall double, it wants to boost social causes and improve the living standard for its citizens during the coming five year period. Another goal is to enhance the city's competitiveness to lay a solid foundation to become "a modern city metropolis"

According to the government of Shenzhen, the rapid development shall be maintained but a new industry structure shall emerge, with focus on high technology manufacturing and high territory industries; a structure which shall be developed through increasing investments in high technology research (Shenzhen Government Online). Shenzhen shall create a recycle economy for a green economy and increase the investment in talent to provide the city with a more profound knowledge. The traditional industry technology shall be upgraded, support the industries of new material and new energy. The rapid evolving service industries like tourism, trade, exhibition, conventions and sport industry shall be more promoted, and financial services and logistics shall be strengthen. The city will try to attract more big multinational companies to use the city as a logistic hub or procurement headquarters. The rapid development has created problems though (Ng, 2003; Sveriges Generalkonsulat, 2005). In Shenzhen, there is a shortage of land resources, and because of to the hilly surroundings new areas around the city are difficult to exploit. There is also a lack of highly-skilled professionals that are needed in the Shenzhen SEZ, where high-tech industry is becoming more important.

According to Enright & Edith (2005) the city center of Shenzhen are now developing a central business district which will provide a base point for the commerce of finance, trade, information and cultural services. The Shenzhen Science & Industry Park is fully occupied with world renowned companies like IBM, Compaq and TCL. The area will now expand to create a so called "high tech industry corridor".

According to Shenzhen Government Online, future city planning is focused on developing different industries in special areas. High technology shall be based in the southern part of the city whereas heavy industry in the northern part. New metropolitan high tech value added industrial areas shall be built with focus on development of finance, logistics and high tech research, software and trade. Tourism and harbor shall be concentrated to the western and eastern parts of the city.

5 Empirical Data

As a reader, you have been introduced to our S-TKL, followed by a quantitative geographical description of both Shenzhen and Öresund. In this chapter, the reader will be introduced to the reality. Will our visualization show any differences between the two regions?

5.1 Synthesized data for the two regions, Öresund and Shenzhen

In table 5.2 below, a further development of table 3.5 has been made, including the synthesized empirical data for both regions, mapped into the the S-TKL model. Number in bracket indicates figure that is modified and doesn't fully represent conditions of Öresund or Shenzhen. If the reader would like some for further explanations and fully see our empirical findings, please see appendix 5.

Table 5.1 Empirical data for the regions of Öresund and Shenzhen visualized together in the S-TKL

Three Lenses/Capital Drivers		**Human Capital** → Knowledge Economy & Business		**Relationship Capital** → Knowledge Community, Culture & Society		**Structural Capital** → Knowledge Organization, Technology & Environment	
Öresund region	**Shenzhen**						
Leadership Capital & Diversity Capital		Ethnical groups in the zone		% of highly skilled professionals with higher education, originating from abroad		No. of published scientific papers	
		171	**54**	**1,57%**	**min 1%**	**29 002**	**(35 000)**
Knowledge Capital		No. of exchange students as a % of total amount of students		No. of municipal and district library books per inhabitant		No. of available PH.D. placements	
		6%	**(min 2,4%)**	**6,19**	**0,91**	**9255**	**NA**
Organizational Capital & Strategic Capital		Employment in high tech sector as a % of total workforce		No. of foreign investments made in the zone		No. of companies incubated in Science Parks	
		7,2%	**11%**	**85**	**41 000**	**590**	**300**
Network Capital		DOI Index		No. of projects between industry and university		No. of hotspots	
		(0,76/0,71)	**(0,7/0,69/0,45)**	**(9,66/8,71)**	**(7,59)**	**842**	**6**
Innovation Capital & Technological Capital		% of patents leading to commercialisation		Industry spending on R&D as a % of GDP		% of zone GDP spent on DOI infrastructure	
		NA	**NA**	**2,6%**	**NA**	**NA**	**NA**
Cultural Capital		Cultural and literary professionals per one million inhabitants		% of urban areas covered in greenery		Total subsidies for culture entities	
		7 790	**362**	**13%**	**45%**	**€227,2M**	**NA**
Ecology Capital		CO^2emission per capita		No. of companies with ISO14000EMS accreditation		% of consumed kWh produced from renewable resources	
		5904kg	**NA**	**(446/39)**	**80**	**(26%/15%)**	**NA**
Reputation Capital & Brand Capital		Inhabitants turn-over		No. of international summits		% of total zone administrative budget spent on branding /marketing activities	
		0,37	**3,2**	**(66/62)**	**(95/5/129)**	**min. €17,63M**	**NA**

6 Analysis

We have developed a simplified model to measure intellectual capital of knowledge zones. In this chapter we will via the theoretical framework and S-TKL analyze our empirical research. What did the S-TKL show? Were there any differences between the regions? If so why were there differences? These are some of the questions we will answer in this chapter. A brief introduction will give the reader an idea of how we will approach our empirical findings, which then will be followed by an analysis of the data for each region.

6.1 Introduction

The purpose of this thesis is to try to design a simplified model to measure a KIZ. We have in chapter three explained what this model, the S-TKL, consist of and the theories behind its evolution. In chapter four and five we have presented empirical results for the KIZ of Öresund and the SEZ of Shenzhen. We will in this chapter analyze our findings for both quantitative and qualitative data, through the S-TKL model combined with the theories of IC and knowledge zones.

Each chapter will be divided by each of the lenses, starting with Human Capital, followed by Relationship Capital, and finally Structural Capital. This is done in order to create a better alignment between different performance measurements. With each lens, the eleven capital drivers, and its belonging performance measurements for the particular lens, will be presented and analyzed.

Table 6.1 Disposition of S-TKL analysis; data is analysed by each lens, with its including capital drivers

Three Lenses/Capital Drivers	**Human Capital** → Knowledge Economy & Business	**Relationship Capital** → Knowledge Community, Culture & Society	**Structural Capital** → Knowledge Organization, Technology & Environment
Leadership Capital & Diversity Capital	Ethnical groups in the zone	% of [illegible] profe[illegible] highe[illegible] origi[illegible]	No. of [illegible] scien[illegible]
Knowledge Capital	No. of exchange stude[illegible] total amount of [illegible]	No. of [illegible] and distri[illegible] libraries per inhab[illegible]	No. of available Ph.D. place[illegible]
Organizational Capital & Strategic Capital	Employment in high tech[illegible] total [illegible]	No. of foreign inve[illegible] in the zone	No. of companies incu[illegible] Science Park[illegible]
	Chapter 6.2	Chapter 6.3	Chapter 6.4

:

6.2 Generalization index

We start our analysis with a presentation of a generalization index. The reason for this is to show similarities and differences in a country, as well as between countries. As the reader can see in table 6.2, we have chosen three parameters to show the possibility of using data for a country and further on apply it on a region. With this index, we wish to show the possibility of using statistical findings for nation, in cases where data for regions aren't available.

(i) *Gini index*: "The Gini coefficient is a measure of inequality of a distribution of income". (Wikipedia, 2007). This index shows if a country have a high or low difference in income among its citizens. The Gini index spreads from 0- perfect income equality to 1- perfect inequality (www.wikipedia.org). In table 6.2, the reader can find that Denmark and Sweden are similar when it comes to income distribution, whilst China has a higher Gini index, and thereby bigger gaps.

(ii) *Public spending on education as % of GDP*: This parameter has the implication of showing the equality among citizens in attending school, and by that having the same opportunity to educate them selves. Number shown in %

(iii) *Political stability*: This parameter shows the political stability in a country. This has the implication that the higher the stability is the smaller the differences within the country. This number is shown as "normalized on a scale of zero to ten relative to other countries in the comparison group[2]". (www.worldbank.org)

Table 6.2 Gini index, public spending, political stability by nations (World Bank, UN Gini Index; Wikipedia, 2007)

	Gini Index		**Public spending on education as % of GDP**	**Political stability**
Sweden	,247	(2000)	8,76	9,39
Denmark	,25	(1997)	9,82	8,56
China	,447	(2001)	0,44	4,55

The conclusion would be that we can generalize data when it comes to Sweden and Denmark, but not with China. Due to their low results in table 6.2, a generalization for China would not be possible. It also shows that Sweden and Denmark are similar and therefore enabling us to draw conclusions for the Öresund Region. We are aware of that

[2] 132 other countries

we can not draw any statistical conclusions using this index. It is rather to be seen as a tool in our analysis for measurements where numbers for the regions are not available.

6.3 Human Capital – Knowledge Economy & Business

1. Ethnical groups in the zone
Öresund: 171
Shenzhen: 54

The first of the three lenses presented in the S-TKL framework is the human capital. We can through our empirical findings state several indicators on the human capital of the Öresund Region and Shenzhen. We started out by examining the *Leadership & Diversity Capital*. Through our empirical research we found that there are 171 different ethnical groups in the Öresund region. This shows that the diversity of human capital is large. Through all these different groups, new knowledge can be spread and thereby increase the total knowledge of the region. In Shenzhen we found 54 different ethnical groups. That is less than half as many as in the Öresund region, but one must take into consideration that Shenzhen has not been as open as Öresund in the last century. Shenzhen were not far ago a rather small village and has therefore not been the obvious choice for personal establishment. However, it is likely that everyone in the ethnical groups of Öresund isn't here due to their knowledge contribution some might be refugees that are in the Öresund area for other reasons than employment. But it is not only knowledge that these groups stand for, but also new cultures. The more diversified the country is the more open-minded the inhabitants become and through that increase the overall knowledge.

2. No. of exchange student as a % of total amount of students
Öresund: 6%
Shenzhen: min. 2,4%

We have also in this study found data on the combination *Knowledge Capital* and Human Capital. Our research has found that there are about 10 000 foreign exchange students in the Öresund region. They stand for 6 % of the total population of students. There is nothing in the theory that say that 6% is high or low but this will rather be used in a comparison with other regions. Öresund University, the voluntary consortium, combines 12 universities in the region, which implies that the sum of exchange students should increase. The same figure for Shenzhen is *at least* 2,4%, which is a figure for one of eleven universities in this region, and indicates that there are exchange students present. Shenzhen Government states that their goal is to have at least 20% foreigners

attending their universities in the future. This shows a willingness to exchange knowledge and collaboration.

When interpreting KIZ theory, we can state that Shenzhen is related to what Amidon and Davis in KIZ methodology would call a Greenfield, meaning that they do not have the same historical background as Öresund and are building their zone from scratch. In Öresund Region, universities are institutionalized, and have for a long time been able to build relations with other countries.

The exchange students bring new knowledge, and the more they are the more it shows of collaborations between universities outside the region. We also believe that this collaboration is good for the region in the longer perspective. Students in the region increase their network with other parts of the world, which eventually will increase the knowledge interaction in the region.

3. Employment in high tech sector as % of total workforce

Öresund: 7,2%
Shenzhen: 11%

Next in line on the Human Capital lens was to study the *Organizational Capital & Strategic Capital*. We chose to do that by examining the percentage of the total workforce that work in the high-tech sector, where a higher number would indicate a higher degree of innovation in the region. The high-tech sector also attracts highly educated people that through knowledge sharing increase innovation activities. High technological industries are rich in intellectual capital as they are having a high degree of R&D and require a high degree of highly educated persons. These industries are also dependent on innovation to be able to compete in the fierce competitive market. The number is thus an indicator on how much of the economy is based in industries with high degree of IC and with a focus on innovation. In the Öresund region 7,2 % of the employed population works in the high-tech sector, while the same measurement for Shenzhen indicates a figure of 11%. Since the 1990's, Shenzhen has focused on developing its high tech industry, which this figure signify. However, it is hard to say if this part of the workforce is involved in assembling or R&D, where the latter one would indicate knowledge sharing to a greater extent, thereby generating innovation.

4. DOI Index:

Öresund: 0,76 (Denmark), 0,71 (Sweden)
Shenzhen: 0,7 (Hong Kong), 0,69 (Macao), 0,45 (China)

As seen in previous chapters, we are today living in a knowledge economy. For knowledge to thrive, it has to be shared (Amidon & Davis, 2006a; 2006b). Therefore

we tried to measure the *Network Capital* by examining the ability of the zone inhabitants to communicate with each other. The DOI index is one way of measuring this. There are however not been any studies conducted on the two regions alone, but what have been measured so far is countries. Both Sweden and Denmark are ranking high in this index (3rd and 9th place). Through our generalization index we are fairly confident in transforming these data on to the Öresund Region even though it is not statistically correct. We can show that the inhabitants are in the top of the world in the ability to communicate with each other and thus sharing knowledge. A figure for Shenzhen on the other hand is more difficult. We have found three different DOI indexes; one for the entire China, one for Hong Kong, and one for Macao. The figure for China is low and we can not through our generalization index say that this also includes Shenzhen. The differences are too big in China to statistically generalize. Nevertheless, measurements for Hong Kong and Macau would be more related to Shenzhen than the entire China. Both are large cities close to Shenzhen with many similarities. Both show figures close to Sweden and Denmark and it could be an indicator showing that there are small differences between the two regions. A sever part of the human capital for both zones have the opportunity to use electronic infrastructure to establish virtual networks and share their knowledge.

5. % of patents leading to commercialisation

Öresund: NA
Shenzhen: NA

The next measurement in our TKL framework is to se to what extent knowledge is being shared and used in a business context. This is done by studying the capital driver, *Innovation Capital & Technological Capital*. We chose to do that by measuring how many patents that actually leads to commercialization. According to Amidon (2007-05-08), the number of patents doesn't say anything of how innovative a region is. One should focus on the output of knowledge instead, i.e. commercialized patents. We wanted to find out how much of the innovative progress in companies that actually lead to knowledge for the society. This has unfortunately not been measured in any of the regions or countries, but is a performance measurement we believe is most important. Showing the human capital to create useful innovations and put them to work is an important issue for knowledge zones.

6. Cultural and literary professionals per one million inhabitants

Öresund: 7 790
Shenzhen: 362

Leaving the industry and academia, we also want to capture a broader perspective, showing the Triple Line Growth of the regions. By examining the Human Capital aspect

on *Cultural Capital*, we have found that there are about 3000 cultural and literary professionals in Shenzhen. Divided by 8.28 million inhabitants equals a number of 362 professionals per million. This could sound as very few compared to how many inhabitants there are in Shenzhen, but one thing must be taken into consideration; Shenzhen as it is today is fairly young and have in the last decades put all its focus on activities related to SEZ, such as providing cheap labour, land and assembly plants. When comparing one region to another, the number of cultural and literary professionals will show which region has the human capital working in these professions. It will also give an indication on where it is easier to make a living on your profession. In Öresund Region, 7 790 persons per million inhabitants are involved in cultural activities as a profession. This figure is higher than Shenzhen, which we believe is a result of the heritage of Öresund, a cultural arena which Shenzhen has not yet have been able to establish.

7. CO2 emission per capita

Öresund: 5904 kg
Shenzhen: NA

The next Capital Driver being measured is *Ecology Capital*. On a human capital level we wanted to show how much CO^2 emissions per capita the region has. This gives an indication of what kind of industries, amount of traffic, environmental policies, environmental awareness etc. a region has. We found that the average emission in the Öresund region is 5904 kg. The lower the figure is the more it shows that the region is thinking of its surrounding from an environmental point of view, but also on the effects it has of the inhabitants and the possibility to attract more human capital. In KIZ theory, this is a part of the attractiveness challenge, i.e. attracting investors and people, where low CO^2 emissions and a good quality of life is one way of facing this challenge.

8. Inhabitants turn-over

Öresund: 0,37
Shenzhen: 3,2

Last but not least, we want to measure the overall picture of the zone on a Human Capital level. This is done through the capital drivers *Reputation Capital and Brand Capital.* We believe that inhabitant turn-over is a good way of showing if the above mentioned drivers are successful or not. A good reputation and brand recognition would indicate a positive figure, since more people are moving in than out of the zone. It is of course hard to say if the people moving in contribute with knowledge, and the people moving out are not an effect of “brain drain”. This is hard to measure and we have to see it in a broader picture. We believe that in the long run a positive turn-over is good and regions have to work to continue attracting people. A positive turnover also

increases the regions total knowledge, especially as knowledge multiplies when shared. We can through our study show that the Öresund region has a positive turnover, indicating that the region is successful in attracting knowledge. Shenzhen has an even higher turn-over, and would thereby be even better in attracting human capital. This could be a result of the rapid growth of the city during the last three decades. Even though Öresund experiences an increasing growth, it is low in comparison with the journey of Shenzhen.

6.4 Relationship Capital- Knowledge Community, Culture & Society

In our theoretical framework we have stated that knowledge is multiplied when shared, and how a development for an economy is dependent on its collaboration between the society's different knowledge stakeholders.

9. % of highly skilled professionals with higher education, originating from abroad
Öresund: 1,57%
Shenzhen: min. 1%

A measurement of how well a zone is able to attract talent from abroad is the percentage of the skilled professionals with higher education that originates from abroad. It is also an indicator of the diversity within the zone. These immigrants can share their knowledge, which thereby will multiply according to one of the three laws of a KIZ.

We have not found a correct measurement for Shenzhen but our quantitative study indicates that about 6500 foreigners have been employed in the high technology sector. The quantitative study also shows how the city has 600 000 professionals. If we assume that all foreigners that are considered as highly skilled professionals in the high tech sector have a minimum of Bachelor degree, they would thus represent a number around 1% of total professionals in the zone.

The high tech industry stands for about half of the total Shenzhen GDP and as we do not have any indicators of how many people is employed in other industries, it is very hard to speculate the correct number. It could be as many as for the high tech industry which thus would lead to a number of 2% of highly skilled professionals originating from abroad, a number higher than the Oresund region, but as we do not have any indicators we can only state there is a minimum of 1%. The gap between the Shenzhen 1% compared to Oresund region of 1.57% is nothing which we see as a very critical difference.

The salary levels in Shenzhen show that a low skilled worker gains about US$80 per month and an engineer around US$670. There are not many expatriate workers who are willing to move to a country, even if the cost of living is much lower, earning only 20% of their home country salary or maybe even 10%. The 1% of foreign work force in the high-tech business is either working at a very low salary comparing to their home country, or at same salary base as home and should thus have high positions in the companies. The economy in China is rapidly evolving. If the development keeps its pace, the salaries curve for the whole workforce will also increase. The salaries at lower management level and low engineer level will be more competitive with western standard and it should attract much more workforce from the city's international companies. This could probably increase the number of foreigners' professionals even more.

10. No. municipal and district library books per inhabitant

Öresund: 6,9
Shenzhen: 0,91

This measurement will show the ability the inhabitants have in the region to increase their knowledge. There is here in this measurement a great difference between the regions; Almost 7 books per inhabitant for Öresund and less than 1 per inhabitant in Shenzhen. It is of course hard for Shenzhen to compare with regions that have had universities for over 300 years to catch up with in 30 years. There is of course a big amount of accumulated books from all these years that the Öresund Region has collected. All these accumulated books may not be contributing to the knowledge innovation today, but are having a value as a cultural heritage and for historical research. Moreover, the books in the Shenzhen libraries could be of more recent years, and the question would be what books contribute to the evolution of knowledge – new or old books? In the figure for Öresund, there might be a possibility that the great amount of books per inhabitant consist of a large population of old books, which might not contribute to new wisdom. If we choose to subtract this population of old books, the numbers between the two zones could be more equal. To refine the measurement it could be possible to study how many recent science & technology literature books there are available per citizen.

11. No. of foreign investments made in the zone

Öresund: 85
Shenzhen: 41 000

The measurement is made to show how global the economy is in the region; if there are many foreign investments, there is also an inflow of knowledge into the economy. Foreign companies establishing in a zone, are brining mindsets, R&D, management

knowledge, theoretical practices etc. Here the Öresund Region has an extremely low rate compared to Shenzhen. However, Öresund Region has already many international companies, trading globally, meaning that the results might not be that bad. At the same time, theory stresses the importance of attracting foreign investments for a zone to be able to grow. Therefore it is something the Öresund Region should have in mind. What are companies looking for before investing in a zone, is Öresund fulfilling their needs, and what is Öresund able to offer? The results indicate that Shenzhen in the future will have a higher knowledge from different management cultures, R&D practices and diversity.

12. No. of projects between industry and university

Öresund: 8,71 (Denmark), 9,66 (Sweden)
Shenzhen: 7,59 (China)

Collaboration is one of the key words for a knowledge zone, and as knowledge is multiplied when shared, number of projects between industry and university gives an indicator of how good academia and business sector are at combining their strengths and spread their knowledge. In a ranking of 10 possible and 0 the lowest Sweden and Denmark are showing top scores. China is lacking behind but the difference is not that thrilling. Both Shenzhen and Öresund have been prominent in building clusters where science and business can meet, interact and collaborate and by doing so minimizing the risk of reinventing the wheel. It is in these contexts where knowledge is truly shared, and the flow of knowledge goes from its origin to the highest need.

13. Industry spending on R&D as a % of GDP

Öresund: 2,6%
Shenzhen: NA

We use this measurement to show how to what extent zone industries are focusing on creating innovation. Generating innovation is one of the key issues for a knowledge zone, since it is innovation that keeps it at a front position. In Öresund, industry spending on R&D constitutes of 2,6% of the total GDP. To be able to draw any conclusion about this number, we need to have something to compare with. There are however no measurements for Shenzhen at the moment. But we have seen from the quantitative study that Shenzhen Government are planning for a massive increase in high tech sectors, which could indicate that the industry spending on R&D should be at least as high as in Öresund, if not higher.

14. % of urban areas covered in greenery

Öresund: 13%

Shenzhen: 45%

According to knowledge zone theories, the quality of life is one important aspect to attract talents. One thing that increases the quality of life is greenery areas, i.e. parks, where zone inhabitants can take their time to relax and enjoy themselves at a close distance. The numbers for Öresund KIZ is lower than it is for Shenzhen SEZ, 13% to 45%. One implication could be that Shenzhen is a younger zone, which has given them the opportunity to plan the urban areas of the region. It could also be a geographic reason, since Shenzhen is surrounded by green hilly mountains, whilst many parts of Öresund consist of farmland and water.

15. No. of companies with ISO14000EMS accreditation

Öresund: 446 (Skåne), 39 (Copenhagen)
Shenzhen: 80

Numbers of ISO14000EMS companies are a measurement of how serious government and companies believe the development of an environmental friendly economy is. There are 80 certified companies in Shenzhen, which could be seen as a step towards environmental thinking. Öresund has more than 450 companies. Figures are in line with the theory of KIZ vs. SEZ (Knowledge Innovation Zone Research Report, 2006), where a KIZ is more environmental focused than a SEZ. The difference can clearly be seen in the case of Öresund KIZ and Shenzhen SEZ, 485 vs. 80. However, the theory of a KIZ is highly stressing environmental thinking, and therefore the number of accredited companies in a KIZ should be 100% or close. This is not the case for Öresund, and we believe a better environmental focus in the region should be more in line with the ongoing debate about our planet.

16. No. of international summits

Öresund: 62 (Sweden, Stockholm excluded), 66 (Copenhagen) (2005)
Shenzhen: 95 (Hong Kong), 5 (Macao), 129 (China) (2005)

This measurement is an indicator of how the outside world sees the zone as a place for knowledge sharing in terms of meetings. At international summits, participants from different parts of the world are able to meet, discuss and resolve issues. Ideas, visions, methods and knowledge can be exchanged and brought back to their home countries. It is also an indicator of how important a zone believes it is to be seen in these contexts, where they are able to advertise their advantages. There were no data available for nor Öresund, neither Shenzhen. For that reason we choose to look the data we have found for Sweden, Copenhagen, Hong Kong, Macao and China. As mentioned above, the generalization index makes it possible to draw the conclusion that Sweden and Denmark are fairly similar. We are therefore saying that the number of international

summits in the Öresund Region during 2005 were around 62 to 66. During our empirical study, we have seen that in prominent science clusters as Medicon Valley, there is a high activity of international conferences. We are not able to say anything specifically about Shenzhen, but we can see that there have been international summits close to the zone, 95 in Hong Kong and 5 in Macao, and that there are international summits in the country, 129.

6.5 Structural Capital – Knowledge Organization, Technology & Environment

The last group in our S-TKL framework is the Structural Capital. For a knowledge zone to thrive, structural capital is an important factor. It is enabling knowledge to flow in the zone and makes in available for every citizen. Structural capital works as a meeting place and foundation for enabling knowledge and innovation. The structural part can also be measured and compared using the IC multiplicator. Regions have to have a steady base of structural capital to be able to handle the human capital.

17. No. of published scientific papers

Öresund:	29 002	(2002-2004)
Shenzhen:	35 000 (China)	(2001)

We choose number of published scientific articles as a measurement on how well organized the university system is. This measurement also shows the level of thought leadership, since the number or published articles could indicate how well knowledge is being used in the creation of new scientific mindsets. A thought leadership is important for a knowledge zone, as it is with new mindsets innovation can be generated. Knowledge is then being spread, not kept behind the walls of an office. We can not say that a KIZ need to have an exact number of published articles but we can use it when comparing with other regions. Öresund Region published 29 002 scientific articles in 2002-2004, and is ranked 5th in Europe. There are no data available for Shenzhen specifically, but China published 35 000 articles in 2001. This is about 6000 more than Öresund, but one must understand that this figure is for the whole country. Shenzhen itself could probably not contribute to all of them. Thus we can establish the fact that Öresund Region is publishing more scientific articles than Shenzhen, even though we don't have any number for the latter zone.

18. No. of available PH.D. placements

Öresund:	9 255 (2006)
Shenzhen:	NA

If published articles signify the level of actual knowledge spreading and thought leadership, number of available PH.D. placements show the readiness for research and how well established research is in a region. For articles to be published there need to be researchers. There is no point in having a highly educated human capital if there is not enough structural capital for them to work in. The knowledge will not increase and the human capital will seek other regions where their competences are acknowledged. This measurement of *knowledge capital* was only found for Öresund Region, 9 255, but were not available for Shenzhen and we can therefore not draw any conclusions.

19. Number of companies incubated in Science Parks

Öresund: 590 (2007)
Shenzhen: 300 (2004)

Organizational Capital & Strategic Capital show the future vision and organizational planning for a region. The future for a region is its knowledge and the innovations that will enhance not only the financial sector, but also the cultural and social life of its inhabitants. To show this in the lens of structural capital we have studied Science Parks in both regions. Number of companies stationed in Science Parks show new ideas in a region and how they can be commercialized through the network, collaboration and infrastructure the Science Parks offer. There are 590 companies incubated in Science Parks in the Öresund Region. The same number in Shenzhen is 300 companies. We can not say anything about the size of the companies and how many innovations each of them will realize. One large company could produce more innovations that ten smaller ones. We do yet believe that the amount of companies give a good indication of the innovation climate in a region.

20. No. of hotspots

Öresund: 842 (2007)
Shenzhen: 6 (2007)

As mentioned before, knowledge multiplies when shared. The ability to share knowledge is thereby important. People have to be able to communicate with each other. Internet and telecommunication has developed a lot in the last decade, and the ability of this new technology for the inhabitants was previously shown in the DOI index. When applying it on the structural capital of the region, we chose to use number of hotspots available. A hotspot is a place that enables Internet usage, and could be seen as an important factor of a knowledge society, as it is a channel where knowledge can be shared and reach a large population easily. There are 842 different hotspots in the Öresund Region and Shenzhen has six. We argue that this means that the accessibility

for different inhabitants to interact with each other and the rest of the world is larger in Öresund Region that it is in Shenzhen SEZ.

21. % of zone GDP spent on DOI infrastructure

Öresund: NA
Shenzhen: NA

Since the technological development of DOI infrastructure increases each year, a region has to make investments to keep up. New technology enables people to communicate and share knowledge in new ways. Percentage of GDP spent on DOI infrastructure is therefore according to us a good way of studying the *Innovation Capital & Technological Capital*. The more percent spent, the more it shows how important the region thinks of DOI infrastructure. Data for the any of the two regions were not available.

22. Total subsidies for cultural entities

Öresund: €227,2M (2006)
Shenzhen: NA

Amidon is stressing the importance of improving all parts of a zone simultaneously, and not leaving anything behind (2007-05-16). Culture is one of the things that have not been given much space in former region constellations' such as a SEZ. According to the theory about KIZ vs. SEZ, a special economic zone can have a negative impact for culture in the long run. But for a region to become a KIZ, culture is as important as anything (Amidon, 2007-05-16). In our study of the structural capital in a region, we chose the total sum of subsidies the government is spending on cultural entities as measurement of *Cultural Capital*. This measure gives an indication of how important the ruling government believes culture is. Total sum of subsidies for cultural entities in 2006 was €227,2M, but with no data available for Shenzhen, we can not with this figure draw any conclusions. Our qualitative empirical studies shows however that both regions understand the importance of being able to offer cultural activities to the zone inhabitants, and are willing to invest in this part of the society.

23. % of consumed kWh produced from renewable recourses

Öresund: 15% (Denmark), 26% (Sweden) (2005)
Shenzhen: NA

As with culture mentioned above, environment is of great importance for a region. The *Ecology Capital* shows everything from life quality of a zone and pollutions, to the degree of research in environment friendly fuels. To measure the structural capital in a

region we chose to study the energy market and how large part of the electricity consummation that originates from renewable recourses (i.e. wind, water etc). We were not able to find figures for the Öresund Region, but we found figures from Denmark and Sweden. We are quite confident to use these data on the Öresund Region due to our generalization index and the way the energy market is constructed in the countries (see appendix 6). We found that 26% of used KWh in Sweden originates from renewable recourses. In Denmark this number is 15%. If this is high or low for a KIZ is hard to tell, and will be valued first when comparing with other zones. We chose this measurement when studying the structural capital due to the fact that inhabitants them self can not to any greater extent decide from where their electricity should originate. When measuring over time it will show the regions work in improving the environment they live and act in. There were no figures available for the Shenzhen SEZ.

24. % of total zone administrative budget spent on branding/marketing activities

Öresund: min. €17,63M
Shenzhen: NA

If inhabitant turnover show the human capital level of Reputation Capital & Brand Capital and number of international summits show the relationship capital, percentage of zone administrative budget spent on branding and marketing activities show the structural capital. This measurement indicates how much capital that the zone is spending on attracting talents, investments and collaborations. The capital drivers mentioned above are all parts of what the region can use in branding or marketing. For that reason they have to constantly be improved for the branding to succeed. The Öresund Region does not have an overall administration like Shenzhen. It is therefore hard to define what constitutes of an administrative budget. Because of this, we have studied each of the organizations connected to the marketing and branding of the Öresund Region. We have found that at least €17M was spent budgeted for marketing and branding activities in the region of Öresund. There were no comparative figures available for the Shenzhen SEZ.

6.6 Summary of qualitative findings

Of the 16 measurements where results were found for both regions, Öresund Region scores the highest results on 12 of the 16 performance measurements. When examined in a more detailed perspective we see how the results show diversified picture.

There are six measurements where Öresund Region shows extraordinary numbers ahead of Shenzhen: ethnical groups in the region, municipal and district library books per inhabitant, number of companies stationed in Science Parks, cultural and literary

professionals, number of companies with ISO 14000EMS accreditation and number of Hot Spots.

There are three measurements where the Öresund Region and Shenzhen are at very close: DOI Index, % of highly skilled professionals with higher education, originating from abroad and number of projects between industry and university. Of the three measurements, Öresund Region is showing a just slightly more positive result.

There are three measurements where Shenzhen are having a much greater result than the region of Öresund: inhabitants turn over, number of foreign investments made in the zone, available greenery as a % of City area and employment in the high tech sector as a % of total workforce.

Three of the measurements are hard to state the differences between the regions, due to that the figures are not measured the same way: number of scientific papers for Shenzhen showing figures for the entire Chine, number of international summits where figures show numbers from China, Macao and Hong Kong and number of exchange students where the figure for Shenzhen only shows exchange students from one university.

We can see that the Öresund Region shows high scores compared to Shenzhen on the majority of the measurements but there are a few which are very low. How and why these figures have emerged, and what they actually alert is hard to analyze. The same goes for Shenzhen which has similar results to Öresund Region on some measurements and others showing a great difference. Shenzhen seems to be at some points a KIZ but on others far below standard.

7 Conclusion

Our purpose was to create a simplified model to measure a knowledge innovation zone. Where we able to do that? Was it possible to apply it on the Öresund Region? Can we through applying it on Shenzhen show any differences between a KIZ and a SEZ?

7.1 Discussion of results: A visualization of knowledge and triple line growth

The difficulty in measuring knowledge is that one doesn't know what to look for. We were not able to find all data needed for nor Öresund, neither Shenzhen. This raises the concern about validity and reliability of our results, which we are well aware of. When data wasn't available, we tried to find information that could give an indication of the situation. When no such information was available, we simply had to let it go. Due to this we are aware of that our study has flaws, and that information had to be interpreted. However, we hope that our study raises awareness of the importance, as well as the difficulties, in measuring an intangible, such as knowledge. But due to the full spectra of the S-TKL, we still believe that the visualization of how the two zones differ and how knowledge is rooted in three lenses of business, society and infrastructure would be something to think about for regions that are looking for new ways of coping with an ever changing world.

How would this model look like?

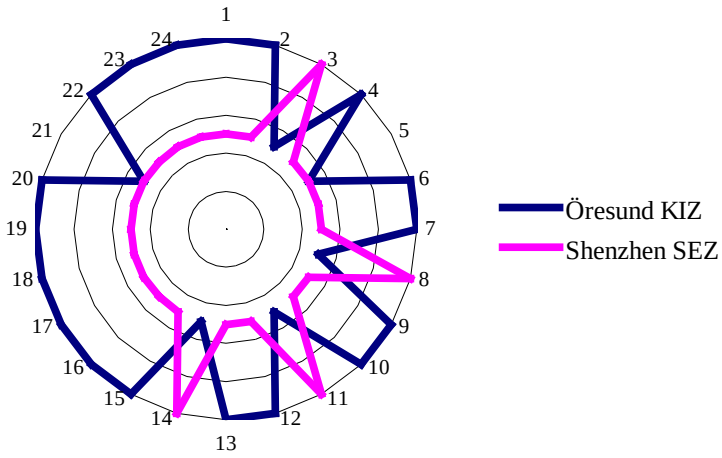
This was the first question we asked us – how would such a model look like, what type of variables are needed in order to measure an intangible such as knowledge of a region? During our theoretical research, we learned that old performance measurement such as GDP or the number of patents was not sufficient anymore in an era of knowledge. A KIZ needs other performance measurements, more closely linked to the foundation of a knowledge economy. Through our theoretical findings, we developed a model based on the theories of knowledge zones and intellectual capital for regions. The result was the simplified Triple Knowledge Lens, the S-TKL. It consists of the three lenses of human capital, relationship capital and structural capital, and eleven capital drivers (table 3.5). We developed this model in order to measure knowledge of the Öresund KIZ and Shenzhen SEZ.

Can it be applied on the region of Öresund?

Would we be able to apply the newly formed S-TKL on the Öresund Region? Through empirical studies, combined with our theoretical framework, we hoped to measure the knowledge of Öresund Region. Via both a qualitative and a quantitative study of the region, we found that our model would be able to indicate to what extent Öresund Region actually is a knowledge zone. Thereby the S-TKL fulfilled one of its purposes. According to prior research, Öresund Region can be stated as a KIZ. But our interpretation of the visualization is that there is still work to be done. In an ideal world, Öresund would be ranked high on all of our 24 performance measurements, which is not completely the case today. As figure 7.1 shows, the region do not fully develop all three lenses simultaneously, and thereby is facing a risk of being caught up in the productivity paradox. They are doing fine today, but to be prepared for the battle of talents, investments and collaboration they need to be better. Öresund scores high on many important aspects such as DOI index, library books per inhabitant, published research papers, number of hotspots, but should become better in attracting foreign investments. Öresund is a region that during a long time has had a lot of the mindset for a KIZ. With highly developed education system which reaches hundreds of years back in time, Science Parks developed centuries ago and excellent collaboration rankings between businesses and universities. In the economic upswing that the region now undergoes, companies are having trouble in finding talents. Öresund is however not the only region in the world with this problem, but it might affect its possibilities to grow. Without enough educated manpower, foreign investments in the zone will also decrease. It is therefore vital for Öresund to retain its most valuable asset – the human capital

If applied on the region of Shenzhen, would it be possible to see the differences of a special economic zone and a knowledge innovation zone?

Below you will find a visualization of the two regions; Öresund and Shenzhen. The 24 measurements are plotted to show the region with the highest KIZ ranking. Since this is the first attempt to visualise knowledge of a region, statements of what is high vs. low has not been done. The KIZ theory is rather meant to be used as what Amidon and Davis calls a benchlearning tool. Since these are the two first regions being measured using the S-TKL, the region that scored the highest number in comparison to another is considered high, and the other one low. Measurements that were NA are considered low. On measurements where none of the two regions had figures, both are considered low.



The aim for a KIZ is to be as close to the outer circle as possible, forming a complete circle. The figure 7.1 also show if a region is developing the three lenses simultaneously as KIZ theory suggests. Since there only are two zones visualized in the graph below, we can not use it is a single tool in determining if a zone is developing simultaneously. The problem with only using two regions is that they could in reality be very close to each other, but the graph showing great differences. To be able to draw such conclusions more zones has to me incorporated in the study. An example on how such a graph could look like is shown in figure appendix 7.

According to theory, there are distinct differences between a KIZ and SEZ. When comparing our results, one can see that Shenzhen is not really a SEZ, but not fully a KIZ. Shenzhen scores high on important features such as employment in high tech sector, the number of foreign investments and areas covered in greenery. On the other hand, Shenzhen still scores low on key factors as environmental thinking.

In our empirical part for future goals of Shenzhen we see how the city has adopted many of the most important parts of the KIZ theory. The city mentions how it shall adopt a “scientific development perspective” with more investment in high technology research; the city shall have a high level of international technology application, adopt a green economy and create an international metropolis society. Shenzhen wants to have a society and community which prosper not only economically but also culturally and socially. We believe these are not empty words stated from the government.

At the same time as Shenzhen shows great development towards the direction of a KIZ, it has many roots of an SEZ. Half of the economy is still based in manufacturing. The lowest monthly salary in the zone is US$85, far from western standards. The government mentions how the population is polarized among two extremes, one wealthy educated part of the population and on the other side are poor migrant workers with no education. The gap is also shown in the city’s planning where the heavy industry shall be located on the northern part of the peninsula towards the mainland meanwhile the planned and existing high tech and metropolitan area of finance, logistic and research shall be in the south facing the waterfront and Hong Kong.

Our quantitative study of Shenzhen might have left questions due to the fact that some performance measurements were not available. But in combination with the qualitative observation, we draw the conclusion that the three lenses in Shenzhen are evolving in the right direction. They might not evolve simultaneously, but they are evolving, which we see as indicators of a zone in change. We can state that the S-TKL did not fully show the differences between a KIZ and a SEZ. What we however did find, was a zone in transition. Shenzhen has already adopted much of the mindset of a KIZ, whereas the some part still is to be considered as a SEZ stadium. It might only be a question of time before they fully transform into a knowledge zone and intellectual capital becomes its competitive factor.

7.2 Final words

The two regions in our study are both a product of its time, but from different periods. Even though they today are in a phase distinguished by a seemingly never ending growth, there are regions all over the world establishing at a fast pace. They all compete in attracting the best human capital, the largest investments and the most fruitful collaborations. It is therefore essential for zones as Öresund and Shenzhen to constantly keep adapting and developing its intellectual capital. Because this is what eventually will settle the fight; this is what the battle will be all about; this is what decides who will cope with an increasing worldwide competition. As the intellectual capital of regions forms its very own foundation, it needs to be taken cared of, needs to be challenged as well as stimulated. By measuring its intellectual capital with the S-TKL, regions as Shenzhen and Öresund could be able to further cultivate, enrich and improve its intellectual capital. Hence, they might just be able to enjoy economic growth and blooming wealth in the following years to come.

7.3 Further Research Proposals

During our study, interesting thoughts about the knowledge economy and KIZ has aroused. It seems like such a zone is meant for educated people, knowledge workers, but what will be of the rest of our society, where do they fit? What will happen of the part in our society that is not involved in knowledge innovation, such as low skilled or non educated people? In the future, can one survive outside a knowledge zone? How do you minimize the gaps in a knowledge society? We have not yet included in our theory about how important a human health is to create innovation. We think it should be a very important part for a successful KIZ to have a healthy human capital, which regularly is exercising and having a good quality of life to be able to grasp knowledge and innovation. How could the satisfaction of the human capital in a zone be measured?

These are questions and concerns we believe would be interesting topics for future studies.

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9 List of appendix

Appendix 1: Value Added Intellectual Coefficient - VAIC™

VA=OUT-IN

When counting value added for a company one can also use the following formula where OP= operating profit, EC= employee costs, D= depreciation and A= amortization

VA=OP+EC+D+A

By using this index measurement a company or a region can show the ability they have in creating value from their investments including salaries, dividends, future development etc. In this way both IC and financial capital will be showed when calculating the actual health of a company/region. This index can then be used as a marketing tool for the region when drawing skilled workers and investors to the region.

According to Pulic (in Bounfour & Edvinsson, 2005:197*ff*), IC contains of two components: human capital and structural capital. Within the component human capital all expenditures for employees are included. This means that salaries are no longer considered a cost but rather as investments. Pulic (in Bounfour & Edvinsson, 2005:197*ff*) means that knowledge workers invest their time, and by doing so create value to a company or a region. As we have established that human capital is a resource we need a way to calculate it. Pulic (in Bounfour & Edvinsson, 2005:197*ff*) defines this coefficient as "human capital efficiency" (HCE) where HC stands for the total salaries and wages for a company.

HCE=VA/HC

Structural capital (SC) as we have seen above is the second part of the IC. It stands for the parts of the IC that stays in the company when the workers have left for the day. This part can be owned by the company. Structural capital is according to Pulic (in Bounfour & Edvinsson, 2005:197*ff*) calculated as:

SC=VA-HC

We have now showed the way to calculate SC, but as with human capital we want a way to measure the efficiency of the structural capital. Pulic (in Bounfour & Edvinsson, 2005:197*ff*) suggest the following where SCE stands for; "structural capital efficiency".

SCE=SC/VA

We can now sum these efficiencies in to total intellectual capital efficiency. The coefficient to be measures is intellectual capital efficiency (ICE).

ICE=HCE+SCE

Even though intangible assets have become the main focus in the modern companies of today, the financial focus can not be overseen. The knowledge workers of the 21 first century companies have the same function for efficiency as productivity had for the manual workers in the past. “IC cannot create value on its own”. (Pulic, in Bounfour & Edvinsson, 2005:197*ff*) We therefore need a way to measure the efficiency of the capital employed. Public suggest that this efficiency should be calculated as an “capital employed efficiency coefficient” (CEE) where the denominator is “book value of the net assets for a company” (CE) (Pulic, in Bounfour & Edvinsson, 2005:197*ff*)

CEE=VA/CE

We now have all the necessary coefficients to be able to calculate what we in the beginning of this chapter called the VAIC. We simply do this by adding the IC part with the numbers taking tangible assets such as physical and financial capital in to consideration. This indicator now shows an understanding of the total efficiency of a company or region.

VAIC=ICE+CEE

With this new measurement instrument we can now according to Pulic (in Bounfour & Edvinsson, 2005:197*ff*) show “how much new value that has been created per invested monetary unit in resources” (Pulic, in Bounfour & Edvinsson, 2005:197*ff*). In this way a company/region does not only show their financial ability but also their intangible resources, here named IC.

As we said earlier the VAIC has the benefit that companies or regions now in a better way can be compared and benchmarked. The VAIC provides according to Pulic (in Bounfour & Edvinsson, 2005:197*ff*) a standardized way to perform comparisons nationwide or internationally no matter company size or in what industrial sector they are present in. (Pulic, in Bounfour & Edvinsson, 2005:197*ff*) Another benefit when using VAIC when calculating the efficiency of a company is that all the numbers figures used can be found in the information given by the accountant. Therefore the results can be easily verifiable and according to Pulic (in Bounfour & Edvinsson, 2005:197*ff*) objective. The third benefit that Pulic (in Bounfour & Edvinsson, 2005:197*ff*) rise concerning the VAIC is that it is easy to calculate. This has the effect that all stakeholders and not only specialists can use the formula when looking after their interests.

Appendix 2:

Cities' Intellectual Capital Benchmarking System - CICBS

Divisions	Period	Value	Measuring unit
Financial Capital			
GDP (market prices)			
Household's disposal income			
GDP per capita			
Human Capital			
University/college + sec school			
Habitual internet users			
Percentage of qualified workers			
Activity rate			
Gini index			
Process Capital			
Service sector development			
Salaried workers in the high knowledge sector %			
Percentage of firms with Internet connection			
Market Capital			
Self-containment			
Self sufficient			
Exports/Import ratio			
Renovation Capital			
Youth rate			
New firms registered for taxation			

Appendix 3: Growth rates of countries with/without economic zones, 1993-1996 by GNP/Capita (Haywood, 2000).

GNP	**Countries With/Without Zones, GNP per Capita**	**Growth Rate of Total Exports to EU and US 1993-1996**
High GNP	Over US$9385	
	With Zones	28%
	Without Zones	45%
Upper Mid GNP	US$3035-9384	
	With Zones	62%
	Without Zones	33%
Lower Mid GNP	US$765-3034	
	With Zones	72%
	Without Zones	1%
Low GNP	Below US$765	
	With Zones	59%
	Without Zones	57%

Appendix 4: Further explanations of the S-TKL Performance Measurements

Leadership Capital & Diversity Capital

- **Ethnical groups in the zone:**
  Number of ethnical groups that live in the zone. Most recent data available.
  Implication: This measurement will show the degree of diversity and openness in the zone.

- **% of highly skilled professionals with higher education, originating from abroad:**
  Percentage of people employed in highly skilled professions with higher education, originating from outside the border of the country/countries where the zone is situated. Higher education should at least be a college or university degree. Most recent data available.
  Implication: This measurement will show the degree of diversity in highly skilled professions.

- **No. of published scientific papers**
  Number of scientific papers that has been published by researcher in the zone in one year. Most recent data available.
  Implication: This measurement will indicate the thought leadership in the zone.

Knowledge Capital

- **No. of exchange students as a % of total amount of students:**
  Most recent data available.
  Implication: This measurement will show the degree of interaction between students from the region and students from abroad.

- **Number of municipal and district library books per inhabitant**
  Number of available library books per inhabitant in the region. Most recent data available.
  Implication: This measurement will show the ability the inhabitants have in the region to increase their knowledge.

- **No. of available PH.D. placements:**
  Number of available PH.D. placements in the zone. Most recent data available.
  Implication: This measurement will show the readiness of the regions infrastructure in handling research and knowledge development.

Organizational Capital & Strategic Capital

- **Employment in high tech sector as % of total workforce:**
  High technological employment as a percentage of the total industrial employment in the zone. Most recent data available.
  Implication: This measurement will show the size of the technology industry in the zone regarding employment.

- **No. of foreign investments made in the zone:**
  Number of foreign investments that has been made in the zone in one year as a percentage of GDP. Most recent data available.
  Implication: This measurement will show how big the will to invest in the zone has been, which is an important indicator of possible future growth.

- **No. of companies incubated in Science Parks**[3]**:**
  Number of companies that are incubated in Science Parks in one year. Most recent data available.
  Implication: This measurement will show the success of zone Science Parks in terms of knowledge transfer infrastructure and creating new businesses.

Network Capital

- **DOI Index:**
  Measurement of the fulfilment of Digital Opportunity Index (DOI). In an ideal world, the whole population having easy access to ICTs at affordable prices; all homes equipped with ICT devices; all citizens having mobile ICT devices; everyone using broadband. Most recent data available. This index measures from 0-1 where 1 is 100%
  Implication: This measurement will show to what extent zone inhabitants are making use of, and can afford, existing technology and communication channels.

- **No. of projects between industry and university:**
  Number of collaborations between industry and university in the region.
  Most recent data available.
  Implication: This measurement will show the willingness to learn and collaborate in order to increase the welfare in a zone.

- **No. of hotspots:**
  Number of hotspots[4] in the zone. Most recent data available.

[3] "Science Park: a science park is a property development designed for a concentration of high-tech, science or research related business" (www.wikipedia.org)

Implication: This measurement will show how well the infrastructure is supporting channels of communication and knowledge transfer.

Innovation Capital & Technological Capital

- **% of patents leading to commercialisation:**
  Percentage of all patents that leads to commercialisation within a period of five years. The choice of period is due to the time it will take for a patent to be commercialized.
  Implication: This measurement will show actual knowledge innovation, since a patent can not be capitalized upon if not commercialized.

- **Industry spending on R&D as a % of GDP**
  Percentage of total GDP that industry is spending on research and development within a zone in one year. Most recent data available.
  Implication: This measurement will show how much companies values research and development that can lead to knowledge innovation.

- **% of zone GDP spent on DOI infrastructure**
  Percentage of total GDP that is spent on DOI[5] infrastructure in one year. Most recent data available.
  Implication: This measurement will show how important a zone sees ICT as a possibility to develop and facilitate the flow of knowledge and innovation.

Cultural Capital

- **Cultural and literary professionals per one million inhabitants:**
  Most recent data available.
  Implication: This measurement will show how strong the human cultural capital is. It will also give an indication on the possibility to survive on culture and literacy.

- **% of urban areas covered in greenery:**
  % of urban area in a zone that is covered with greenery (i.e. public parks) Most recent data available.

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[4] "Hotspots are venues that offer Wi-Fi access. The public can use their laptop, PDA, Dual-mode phones, Nintendo DS or PlayStation Portable to access the Internet" (www.wikipedia.org, http://en.wikipedia.org/wiki/Hotspot_%28Wi-Fi%29).
[5] "The Digital Opportunity Index (DOI) is at the present the most extensive ICT index providing an internationally-agreed benchmark of the status of ICTs around the world, and can be used to track progress made in infrastructure, opportunity and utilization of ICTs" (www.wikipedia.org)

Implication: This measure will show the recreation availability for the zone inhabitants.

- **Total subsidies for cultural entities:**
  Total subsidies from the government for cultural entities in a zone in one year. Cultural entities are i.e. art galleries, museums, theatres, cinemas, exhibitions, galleries, concerts etc. Most recent data available.
  Implication: This measurement will show how zone administration value cultural development.

Ecology Capital

- **CO^2 emission per capita:**
  Carbon dioxide emission in the zone divided per inhabitant during one year. Most recent data available.
  Implication: This measurement will show the level of pollution in the zone.

- **No of companies with ISO14000EMS accreditation:**
  Number of companies in the zone that has received an ISO14000EMS accreditation. Most recent data available.
  Implication: This measurement will show the environmental standard among companies in the zone.

- **% of consumed kWh produced from renewable resources**:
  Percentage of total consumption of kWh that is produced from renewable resources. Most recent data available.
  Implication: This measurement will show if action is taken towards a more environmental friendly lifestyle in the zone.

Reputation Capital & Brand Capital

- **Inhabitants turn-over:**
  Inhabitants moving in versus moving out of the zone as a % per year. Most recent data available.
  Example: 1000 moving in, 500 moving out = positive net value of 500→2,0 positive turn-over.
  Implication: This measurement is seen as the indicator of brain-drain in a zone, as well as a measurement of attractiveness of a zone.

- **No. of international summits:**
  Number of international summits that are held in the zone during one year. Most recent data available.

Implication: This measurement will show the interest of organizing these events from a zone perspective, as well as the attractiveness the zone has as a base for international knowledge transfer.

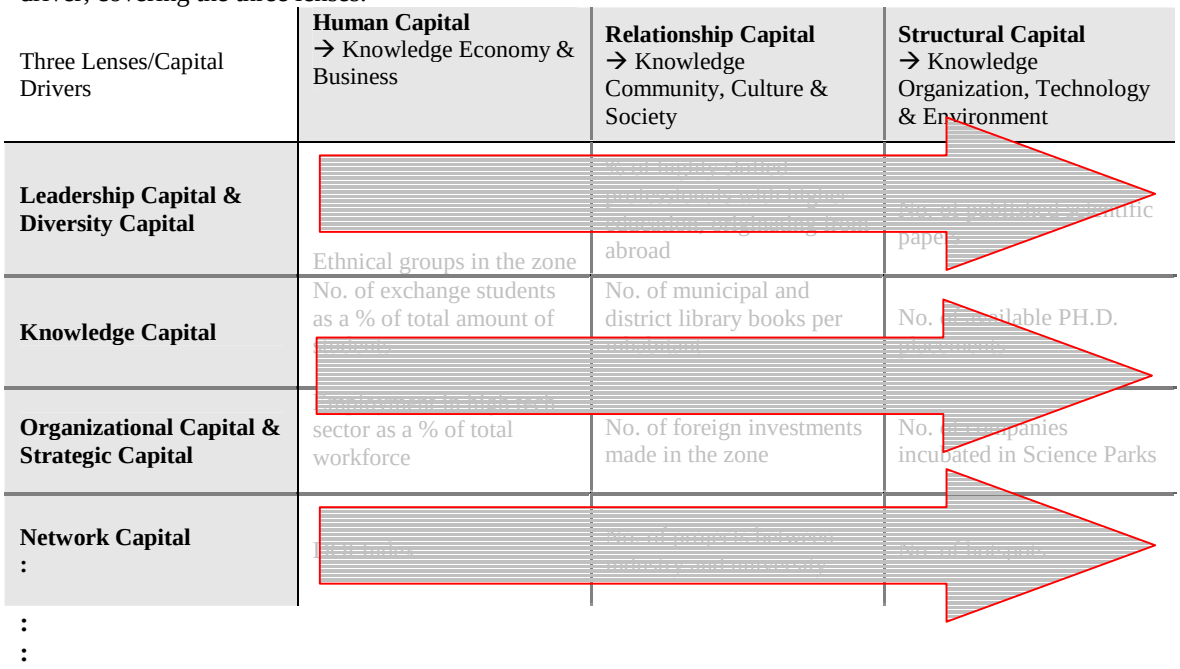
- **% of total zone administrative budget spent on branding/marketing activities:**
  Percentage of the total zone administrative budget that is spent on branding and marketing activities. Branding and marketing activities are activities which aim to increase the value of the zones brand itself. Most recent data available.
  Implication: This measurement will show how important zone administrative think of branding as a tool to attract foreign investment, talent, collaboration and tourism.

Appendix 5:

Empirical data for the regions of Öresund and Shenzhen, summarized by capital drivers

Data from empirical research of both regions will be presented under each capital driver, starting with the performance measurements for Leadership Capital & Diversity capital, followed by Knowledge Capital, etc. This is done to create a better alignment and understanding of how the different performance measurements differ depending on what lens it is connected with. By the end of each driver, there will be a table with a short summary of the performance measurements for that specific driver.

Disposition of S-TKL empirical research; data for both regions will be presented under each capital driver, covering the three lenses.



Leadership Capital & Diversity Capital

Ethnical groups in the zone:

Öresund Region:
There are 171 different ethnical groups represented in the region.

Shenzhen:
There are 54 different ethnical groups represented in the region.

Sources: Malmö Stad (www.malmo.se), Shenzhen Government Online (http://english.sz.gov.cn)

% of highly skilled professionals with higher education, originating from abroad:

Öresund Region:
There are 10295 inhabitants in the Öresund Region, with a non Swedish/Danish origin, that has a tertiary[6] education. This part of the population represent 1,57 % of the total with the same degree of education. Below is a table showing the education level in the Öresund Region:

Higher education in the Öresund Region

	Total population	Population with tertiary education	Population with a tertiary education originating from abroad
	3 614 448	657 023	10 295
% of total population	-	18,18%	0,28%
% of tertiary education	-	-	1,57%

Shenzhen
No figures for Shenzhen have been found, but our quantitative study indicates that 6500 foreigners are employed in the high technology sector. We assume that all of those have a minimum of Bachelor Degree. The quantitative study also shows how the zone has 600 000 professionals, and foreigners employed in the high tech sector would thus make a number around 1% of total professionals.

Sources: Öresund Statistics (www.orestat.scb.se)

No. of published scientific papers

Öresund Region
Copenhagen-Lund produced 29 002 scientific articles between the year 2002 and 2004, which places the zone among the five top regions in Europe.

Largest European research centres, no. of publications during 2002-2004, number in bracket indicates ranking internationally (Matthiessen *et al.*, 2005).

Ranking 2002-2004	Number of publications	Research Centre
1	73 403	London (2)
2	53 009	Paris (5)
3	44 094	Amsterdam-Hague-Rotterdam-Utrecht (9)
4	41 001	Moscow (11)
5	29 002	Copenhagen-Lund (15)

Shenzhen
In China, 35 000 scientific articles were published in 2001.

Sources: Matthiessen *et al.*, 2005, Community Research and Development Information Service (www.cordis.europa.eu)

[6] Tertiary, as in university or college degree.

Summary:

Summary of Leadership Capital & Diversity Capital

	Öresund	Shenzhen
Ethnical groups in the region	171	54
% of highly skilled professionals with higher education, originating from abroad	1,57%	min. 1%
No. of published scientific papers	29 002	35 000 (China)

Knowledge Capital

No. of exchange students as a % of total amount of students:

Öresund Region

The region has about 10 000 exchange students in 14 universities. This is 6% of the total population of 154 364 students.

Shenzhen

Shenzhen has 11 colleges and universities, with a total enrolment of 41 300 students. Shenzhen University had in 2006 about 1000 exchange students, which would be 2,4 % of the total student population. This implies that *at least* 2,4% of the students in Shenzhen were exchange students in 2006.

Source: Öresund Statistics (www.orestat.scb.se), Öresund University (www.uni.oresund.org), Shenzhen Government Online (http://english.sz.gov.cn)

No. of municipal and district library books per inhabitant

Öresund Region

There are 22 310 756 municipal and district library books in the region. This means that there are 6,19 book per inhabitant.

Shenzhen

There are 7 590 000 municipal and district library books in the region. This means that there are 0,91 books per inhabitant

Sources: Danska Biblioteksstyrelsen (http://sbs.bs.dk), Statens Kulturråd, Shenzhen Government Online (http://english.sz.gov.cn)

No. of available PH.D. placements:

Öresund Region
There is a total amount of 9 255 PH.D. placements in the Öresund Region. There are 154 364 students at a tertiary level in the region. Compared to the total amount of university/college students in the Öresund Region, PH.D. placements account for 5,5 %.

Shenzhen
NA

Sources: Öresund University (www.uni.oresund.org), SLU/Alnarp, Öresunds Statistics (www.orestat.scb.se) (Appendix 4)

Summary Knowledge Capital

Summary of Knowledge Capital

	Öresund	Shenzhen
No. of exchange students as a % of total amount of students	6%	min. 2,4% (1 out of 11 universities)
No. of municipal and district library books per inhabitant	6,19	0,91
No. of available PH.D. placements	9 225	NA

Organizational Capital & Strategic Capital

Employment in high tech sector as % of total workforce:

Öresund Region
The share of the high tech sector in total employment in the Öresund Region was year 2002 about 7,2 %, where Sjealand dominates the region in both high tech manufacturing and high tech services (Hansen & Serin, 2005):

Employment in the high tech sector in the Öresund Region as a percentage of total employment 2002 (Source: Hansen & Serin, 2005:78)

	Sjælland	**Skåne**	**Total**
High tech manufacturing	2,4%	1,8%	2,2%
High tech services	5,2%	4.4%	5.0%
Total high tech	7,6%	6,2%	7,2%

Shenzhen

In Shenzhen, 663 400 persons worked in the high tech sector 2004. The total workforce is 6,1 million people. The employment in high tech sector, as a percentage of total workforce, was 11% in 2004.

Sources: Hansen & Serin, 2005:78, Shenzhen Government Online (http://english.sz.gov.cn)

Number of foreign investments made in the zone:

Öresund Region
During year 2006, 85 foreign investments were made in the Öresund Region

Shenzhen
There were about 41 000 foreign investments made in Shenzhen in 2004.

Sources: Inward Invest Sweden, Invest in Denmark and Copenhagen Capacity

No. of companies incubated in Science Parks[7]:

Öresund Region
There are six functioning Science Parks in the Öresund Region. In Danmark: CAT Science Park, Scio-DTU, Symbion Science Park; in Sweden: Ideon Science Park, Krinova Science Park, Medeon Science Park. There is also a seventh, COBIS, that will open in 2008. Together they incubate 590 different companies.

Science Parks and number of companies incubated, Öresund Region, 2007

Name of Science Park	**No. of companies in incubator**
Ideon	200
Medeon	30
Krinova	35
CAT	65
Scion-DTU	170
Symbion Science Park	90
Total	***590***

Shenzhen
There is only one Science Park in Shenzhen, Shenzhen High-Tec Industrial Park, incubating 300 companies

Sources: CAT Science Park (www.catscience.dk), Scion-DTU (www.sciondtu.dk), Symbion (www.symbion.dk), Ideon Science Park (www.ideon.se), Krinova Science Park (www.krinova.se), Medeon Science Park (www.medeon.se), Shenzhen High-Tec Industrial Park (www.ship.gov.cn)

[7] "Science Park: a science park is a property development designed for a concentration of high-tech, science or research related business" (www.wikipedia.org)

Summary of Organizational Capital & Strategic Capital

Summary of Organizational Capital & Strategic Capital

	Öresund	Shenzhen
Employment in high tech sector as a % of total workforce	7,2%	11%
No. of foreign investments made in the zone	85	41 000
No. of companies incubated in Science Parks	590	300

Network Capital

DOI Index:

Öresund Region
The DOI index has not been measured for the region. Below are the figures for the two countries of Denmark and Sweden.

Denmark: 0,76
Sweden: 0,71

Shenzhen
The DOI index has not been measured for Shenzhen. It has though been measured for two major cities near by. Below are the figures for Hong Kong, Macao and China.

Hong Kong: 0,7
Macao: 0,69
China: 0,45

Source: World information society report 2006 (www.itu.int)

No. of projects between industry and university:

This parameter has not been measured for the regions. It is according to Bengt Streijffert Director Öresund University (2007-05-25) very difficult to say since it is not clearly defined what a project is. Since a project also can be divided between many parts of the university and industry, it makes it even more difficult. Kristian Lindel at Region Skåne (2007-05-31), also talks about the difficulties regarding the validity of the data if it is measured. According to him, many researchers and companies do not always want to share their research.

Öresund Region
The World Bank has made measurements on countries. For Sweden, the number is 9,66 and for Denmark 8,71. These figures are "normalized on a scale of zero to ten relative to other countries in the comparison group[8]" (www.worldbank.org)

[8] All countries

Shenzhen
In China this "normalized" number is according to the World Bank 7,59

Source: The World Bank (www.worldbank.org)

No. of hotspots:

Öresund Region
There are 842 hotspots in the Öresund Region.

Shenzhen
Shenzhen has 6 hot spots.

Sources: Spray Statistics (http://wifi.spray.se/statistics/statistics)

Summary of Network Capital

Summary of Network Capital

	Öresund	Shenzhen
DOI Index	0,76 (Denmark) / 0,71 (Sweden)	0,7 (Hong Kong) / 0,69 (Macao) / 0,45 (China)
No. of projects between industry and university	9,66 / 8,71	7,59 (China)
No. of hotspots	842	6

Innovation Capital & Technological Capital

% of patents leading to commercialisation:

Öresund Region
NA. The number of patents that actually leads to commercialization has not been measured in the Öresund Region, neither on the Danish, nor on the Swedish side.

Shenzhen
NA
Sources: Swedish Patent and Registration Office, 2007

Industry spending on R&D as a % of GDP

Öresund Region
The total expenditures on R&D from the industry accounts for 2,6% of the total GDP in the Öresund Region.

Shenzhen
NA

Source: Öresundsinstitutet (www.oresundinstittutet.org)

% of zone GDP spent on DOI infrastructure

Öresund Region
NA

Shenzhen
NA

Sources:

Summary of Innovation Capital & Technology Capital

Summary of Network Capital

	Öresund	Shenzhen
% of patents leading to commercialisation	NA	NA
Industry spending on R&D as a % of GDP	2,6%	NA
% if zone GDP spent on DOI infrastructure	NA	NA

Cultural Capital

Cultural and literary professionals per one million inhabitants:

Öresund Region
There are about 28 000 cultural and literary professionals in the Öresund Region, which means that there are 7 790 per one million inhabitants.

Shenzhen
There are about 3 000 cultural and literary professionals in the region. This means 362 per one million inhabitants.

Sources: Shenzhen Government Online (http://english.sz.gov.cn), Anders Axelsson, Öresundskomitéen (2007-06-13)

% of urban areas covered in greenery:

Öresund Region

In the Swedish part of Öresund Region is 13% of the urban area greenery.

Shenzhen
Shenzhen has 45% of its urban area covered with greenery.

Sources: Länstyrelsen Skåne (http://www.m.lst.se/documents/Plattform%20f%C3%B6r%20statlig%20samverkan.pdf), Shenzhen Government Online (http://english.sz.gov.cn)

Total subsidies for cultural entities:

Öresund Region
Government subsidy to cultural entities in the Öresund Region were last year (2006) €227 242 245. This number represents the subsidies to the 194 largest cultural institutions.

Shenzhen
NA

Source: Maria Videll (2007-05-28; 2007-06-01)

Summary of Cultural Capital

Summary of Cultural Capital

	Öresund	Shenzhen
Cultural and literary professionals per one million inhabitants	7 790	362
% of urban areas covered in greenery	13%	45%
% of total zone administrative budget spent on cultural entities	€227,2M	NA

Ecology Capital

CO^2 emission per capita:

Öresund Region
On the Swedish side of Öresund Region, Skåne, the CO^2 emission per capita is 4505 kg. On the Danish side the same number for the whole country is 8850 kg[9]. Since no measurements have been done for Öresund Region alone, we say that the average in the region is 5904 kg CO^2 emission per capita. The number for Öresund Region has been calculated by multiplying the per capita figure per country with the population in

respective country. This figure was then divided with the number of total inhabitants in the zone.

Shenzhen
NA

Sources: Statistiska Centralbyrån (www.scb.se), Globalis (www.globalis.gvu.unu.edu)

No. of companies with ISO14000EMI accreditation:

Öresund Region
Skåne: 446
Copenhagen: 29

Shenzhen
80

Sources: Swetic & Akrediterade Certifieringsorganen (www.certifiering.nu), Oslo Kommun (www.byradsavdelning-for-miljo-og-samfardsel.oslo.kommune.no), Shenzhen Governmnet Online (http://english.sz.gov.cn)

% of consumed kWh produced from renewable resources:

Öresund Region
There is no measure over the Öresund Region alone. However, there are numbers over Sweden and Denmark. In Sweden, 26% of the electricity used originates from renewable recourses. In Denmark this number is 15%. Because of how the distribution of electricity is build up in the countries, one could draw the conclusion that these figures represent the two sides of the region (see appendix 6).

Shenzhen
NA

Sources: Swedish Energy Agency, Danish Energy Authority, Skane Energy Agency

Summary of Ecology Capital

Summary of Ecology Capital

	Öresund	Shenzhen
CO^2 emission per capita	5 904 kg	NA
No. of companies with ISO14000EMS accreditation	446 (Skåne) / 39 (Copenhagen)	80
% of consumed kWh produced from renewable resources	26% (Sweden) / 15% (Denmark)	NA

Reputation Capital & Brand Capital

Inhabitants turn-over:

Öresund Region
There were 52 117 persons moving in and 38 127 moved out of the region 2006. The region has an inhabitant turnover of 0,37.

Shenzhen
The region has an inbahitant turnover of 3,2.

Sources: SCB - 2007, Danish Statistics – 2007, Shenzhen Government Online

No. of international summits

Öresund Region
Sweden (not Stockholm): 62 (2005)
Denmark, Copenhagen: 66 (2005)

Shenzhen
Hong Kong: 95 (2005)
Macao: 5 (2005)
China: 129 (2005)

Sources: International Congress & Convention Association (www.iccaworld.com)

% of total zone administrative budget spent on branding/marketing activities:

Öresund Region
The total amount spent on branding and marketing activities in the Öresund Region last year was €17,63M. The sum is the total sum of the five organizations in the region.

Organization	**Sum € (in millions)**
Wonderful Copenhagen	16,08
Copenhagen Capacity	0,07
Position Skåne	NA
Öresund Network	0,53
Inward Invest Skåne	0,95
Total	17,63

Shenzhen
NA

Sources: Wonderful Copenhagen, Copenhagen capacity, Position Skåne, Öresund Network and Inward Invest Skåne.

Summary of Reputation Capital & Brand Capital

Summary of Reputation Capital & Brand Capital

	Öresund	Shenzhen
Inhabitants turn-over	0,37	3,2
No. of international summits	66 (Denmark) / 62 (Sweden)	95 (Hong Kong) / 5 (Macao) / 129 (China)
% of total zone administrative budget spent on branding/marketing activities	min. €17,63M	NA

Appendix 6:

The Danish and Swedish energy market

The Danish energy market has been deregulated since 2002. The energy on the eastern part of Denmark is traded though Nord Pool, which is the Nordic power exchange. The western part of Denmark is also traded through Nord Pool but is an independent price bidding area (www.nordpool.com). The Swedish energy market has been deregulated since 1996 and is traded on the same marketplace as eastern Denmark. Eastern Denmark is physically connected to the same cables as Sweden meaning that the electricity traded on Nord Pool can be used both in Sweden and Denmark. The western part is connected with Germany. Since the two countries are connected and distributors buy the electricity on the open market, the percentage of renewable energy becomes part of the total energy distributed. We can therefore argue that the percentage for each country is adoptable to each of the two countries part of the Öresund Region.

Appendix 7:

The S-TKL including three different zones

The graph here below is an example of what visualization could look like when studying three regions. Using three regions make it possible to use one more variable n top of high or low: medium. Adding even more regions the graph becomes even more accurate. Studying the graph below we can state the green zone is developing the three lenses more simultaneously than the red or yellow zones, showing a “best in class” among the three.