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Anna-Katharina Hornidge

Institutions: University of Bonn

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Anna- Katharina Hornidge

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Authors' address

Anna-Katharina Hornidge
Center for Development Research (ZEF), University of Bonn
Walter-Flex-Str. 3, 53113 Bonn, Germany
Tel. 0228-731718; Fax 0228-731972
e-mail: hornidge@uni-bonn.de

www.zef.de

Singapore: The Knowledge- Hub in the Straits of Malacca

Anna-Katharina Hornidge
Center for Development Research (ZEF) University of Bonn

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1. Introduction

In the beginning of the 1990s, Singapore's government identified the local production of global knowledge as field of action that shall assure sustainable future economic and social development. This focus appears plausible when looking at the factors of production that – besides knowledge – Singapore can offer. As a small country with less than 4m inhabitants, little land and labour is available. Consequently, the Singaporean government decided to focus on knowledge and money as the factors of production that are increasingly regarded as responsible for the creation of wealth by members of the international scientific community. Besides others, the management guru Peter F. Drucker expressed this belief in the economic strength of knowledge by stating: “the central wealth-creating activities will be neither the allocation of capital to productive uses, not ‘labour’...Value is now created by ‘productivity’ and ‘innovation’, both applications of knowledge to work” (Drucker, 1994: 8).

This paper attempts to outline this push towards knowledge production and the positioning of Singapore as a knowledge hub in the Straits of Malacca initiated by the Singaporean government. The paper is divided into, first, grasping the dominant definitions of knowledge in Singapore and second, redrawing the government activities towards increased knowledge production, which is hoped to ensure long-term economic stability and growth.¹

2. Defining Knowledge: A Singaporean Perspective

The Singaporean politics of knowledge production focus on (a) certain fields of R&D, which are identified by the government as future economic growth areas; and (b) applied research.² The focus on certain fields of research and education goes back to the rapid, export-oriented economic development of Singapore after independence in 1965. In the 1980s, investment-lead producing industries increasingly moved out of Singapore to neighbouring countries. Consequently, Singapore's government identified in the late 1980s local content production and the local development of advanced technologies as means to ensure future economic stability and growth (Anwar/Zheng, 2004, Evers/Gerke, 2003; Evers/Gerke/Schweissheim, 2004; 2005).³ The total public and private R&D spending as a percentage of the GDP was increased from 0.85% in 1990 to 2.15% in 2003 (A*STAR, 2005: 26). The public R&D spending as percentage of the GDP was responsible for 0.39% in 1990 and 0.84% in 2003. The majority of the funding was spent on research in the fields of natural

¹ The research forming the data base for this paper was originally conducted for my PhD-thesis on the construction of k-societies under Prof. Dr. Hubert Knoblauch, TU Berlin and A/P Dr. Tong Chee Kiong, National University of Singapore.

² The Commission of the European Union defines ‘applied research’ in opposition to ‘basic research’ as follows: “Basic research can be defined in a combining manner: by reference to its ultimate purpose (research carried out with the sole aim of increasing knowledge); its distance from application (research on the basic aspects of phenomena); or the time frame in which it is situated (research in a long-term perspective)” (2004c: 4). Applied research stands in opposition to basic research and is characterised by its intention to directly contribute to a certain application. It generally is research on a short-term basis. The results of it are often regarded to contribute directly to the economy.

³ On aspects of knowledge loss in opposition to the conscious fostering of knowledge production, see Wall, 2006.

sciences, engineering and technology. Information on the R&D expenditures regarding the humanities, arts, social sciences and fine arts is not published by the Singaporean government.⁴

Besides the focus on science and technology, research areas regarded as directly contributing to economy, exists a strong focus on applied rather than basic research. While the total R&D expenditure for basic research in 2004 amounted to SGD765.05m, applied research was supported with 1,209.98m and experimental development with 2,086.86m. Hence, the two types of research that are regarded as directly leading to economic growth – applied research and experimental development – were supported the most (A*STAR, 2005: 26).

The high costs of basic research with little direct financial pay-offs are continuously topic of debate in Singaporean knowledge politics and the quest for applicable research, rather than basic research, has yet to be resolved. Nevertheless, it appears that a change in focus is taking place, as expressed by the founding of a Ministerial Committee on R&D, chaired by the Deputy Prime Minister and Coordinating Minister for Security and Defence, Dr. Tony Tan in October 2004. The aim of this committee is to review the national R&D strategies and to identify new growth areas for the country. On 11 August 2005, Dr. Tony Tan recommends that the public R&D funding should be increased to at least 3% of GDP in the next five years (People's Daily Online, 12.08.2005). The clear focus should lie “on selected areas of economic importance where Singapore can be internationally competitive” and a balance should be achieved between investigator-led and mission-oriented research in these areas. Based on this statement, it can be concluded that the change towards increasing basic research, as a sustainable foundation for economic development is nevertheless focused on R&D fields that are of direct economic relevance and ensure Singapore's competitiveness.

Although the high costs of basic research are difficult to legitimise on a short-term basis, given no basic financial output contributes to the economy, Singapore's government is aware of basic research creating a knowledge depth that, in effect, contributes to applied research. This awareness of basic research possibly contributing to more sustainable economic development than merely applied research secures its insecure position. Hence, the motivation to support basic research, just as the support for applied research, is driven by the aim for economic prosperity. Therefore, basic research is merely supported in the fields of knowledge production that are of economic importance, such as science, technology and biomedicine. Consequently, a change towards increasing basic research is not a change of the overall definition of knowledge. But knowledge in Singapore, no matter whether from applied or basic research, is very much weighted according to the financial profit and economic growth generated by it. This can also be observed in the government's recent turn towards creative industries in 2002. Here, the government formulated the aim to develop the arts, design and media – not just as “arts for arts sake” – but as economic sectors which contribute to GDP. The definition of knowledge in Singapore opens up for a wider range of knowledge creation and dissemination. Nevertheless, this opening up is very much market oriented and market driven. Basic research as well as experimental, non-commercial arts is respected as long as it potentially enriches applied research or the commercial arts (Hornidge, 2006).

⁴ It is neither part of the yearly published ‘National Survey of R&D in Singapore’ of A*STAR⁴, nor stated in the yearly budget of the government (Government of the Republic of Singapore, 2005). Referring to the definition of R&D published by OECD (OECD, 2002), the National Survey of R&D in Singapore 2004 assesses the government spending for basic research, applied research and experimental development. Regarding the R&D-subjects covered, it states: “The scope of the definition of R&D for this survey extends to R&D in science and technology only and excludes the social sciences and humanities” (A*STAR, 2005: 30).

3. Taking Action towards Singapore as a Knowledge Hub

3.1. Specialised Expertise: Life, Bio and Natural Sciences

The first recession after independence hit Singapore in 1985/86 and resulted in the founding of the Economic Review Committee in order to formulate recommendations for strategically positioning Singapore's economy in the world economy. In its report, the committee clearly states the necessity for Singapore's economy to diversify and increase the depth of the existing economic sectors. The document furthermore looks at other developed economies and assesses that most industrialised countries invest more than 2% of their GDPs into research and development (R&D). In Singapore, R&D investment in 1990 only amounted up to 0.85% of GDP (A*STAR, 2004: 26). In the visionary document "The Next Lap" (Singapore Professional Centre, 1991), the government formulates the aim to reach the Swiss standard of living by 2000 and therefore further enhances the aim to develop its economy in a sustainable and long-term fashion. It results in a stronger focus of government activities on R&D in diverse fields of knowledge production, the raising of the educational level in society, increasing innovativeness and creativity as well as the commercial exploitation of the arts.

In 1991, the government of Singapore founds the National Science and Technology Board (NSTB) as statutory board under the Ministry of Trade and Industry, which is renamed into Agency for Science, Technology and Research (A*STAR) in 2001. Today's chairman of A*STAR and co-chairman of EDB describes the beginning of A*STAR as follows:

"Our economy went through many different stages. We started in 1965 at high unemployment and worked ourselves up to full employment. We started with manufacturing industry, low-skill, labour-intensive, then steel and cotton industry, then chemical industry, then microchip and semi-conductor industry, then knowledge based industry. Knowledge is the key and the most important in knowledge is education, especially higher education" (Ph. Yeo, 11.02.05, interview with the author).

According to A*STAR's website, the board's goal is "knowledge creation and exploitation of scientific discoveries for a better world" (A*STAR, 2006). This shall be achieved by focusing on biomedical as well as engineering and science research in its research institutes (Menkhoff/Evers, 2005; Toh/Tang, 2002). A*STAR's endeavour is clearly based on the belief that knowledge becomes increasingly important to economic and social well-being and narrows this knowledge down to scientific knowledge, which is at the same time economical and marketable.

A*STAR regards itself as representing "today's research scientists and future generation of aspiring scientist who dare to race with the world's best towards the very limits of modern science". A*STAR comprises five main pillars: (1) the Biomedical Research Council (BMRC); (2) the Science and Engineering Research Council (SERC); (3) Exploit Technologies Pte Ltd (ETPL); (4) the A*STAR Graduate Academy (A*GA); and (5) the Corporate Planning and Administration Division (CPAD).⁵ When the present chairman of A*STAR joined the board in 2001, he changed

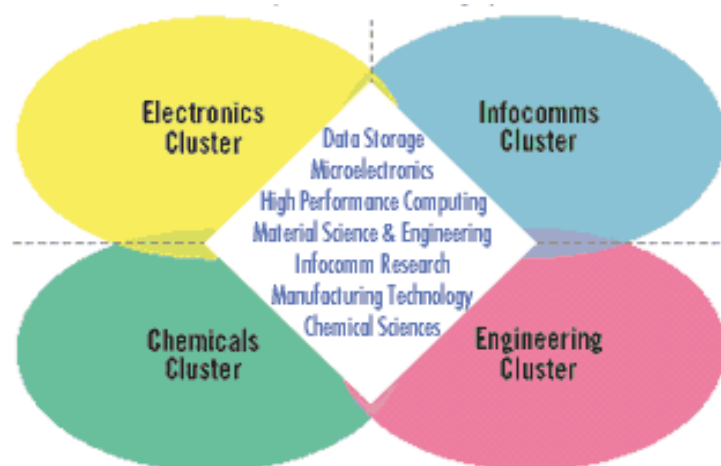
⁵ The Biomedical Research Council and the Science and Engineering Research Council promote, support and oversee the public sector R&D of Singapore. While BMRC oversees 5 research institutes, SERC supports 7 of the 12 research institutes of A*STAR. All of these institutes focus on R&D in Science, Engineering and Biomedical Science. Exploit Technologies Pte Ltd manages the intellectual property created by the research institutes and facilitates the transfer of technology from the research institutes to the industry. The A*STAR Graduate Academy is responsible for human capital development by promoting science scholarships and other manpower development programs or initiatives. The Chairman of A*STAR describes the development of the scholarship-program: "In 1990, I told the government that we better train people in science. And for this better create a National Science and Technology Board (NSTB). I wrote a one page brief for it, with the mission, passage no. 1 "training people". [...] So I created NSTB and got someone else to run it. But he and his successor did nothing to train our people! They just went out

the boards name from National Science and Technology Board to Agency for Science, Technology and Research (A*STAR). He explains:

“In Singapore from the age of 6/7 to 11/12 years, the primary school kids only take English, Maths, Science and Mandarin, Malay or Tamil. Only four subjects, which is the reason why Singaporeans are good in Maths and Science. At the age of 12, they take the national primary school leaving examination and the highest mark for each subject is A*STAR. So I when I took charge of National Science and Technology Board (NSTB) in Feb 2001, I changed the name from NSTB to the Agency for Science, Technology and Research (A*STAR). Because the kids who get A*STAR are going to top secondary schools in Singapore and if they again get A*STAR they will get overseas scholarships and go to top universities. This exam at primary 6 is the most important exam of a kid. So Singaporeans are very oriented towards these exams. It is very good marketing because school kids in Singapore understand the name. If you get A*STAR, you are the best” (Ph. Yeo, 11.02.05, interview with the author).

This description of the change in name illustrates A*STAR's as well as Singapore's urge towards reaching the top, for being the best, and achieving this within a short time frame. This drive also influences which knowledge production is mainly supported. A*STAR wants to contribute to Singapore's economy not only in the far future but as of today. Hence, the R&D conducted is mainly applied research, oriented along the requirements of the industry. When the board was formed, it was originally planned to support applied as well as basic research, in order to contribute to long-term growth. Nevertheless, the majority of research conducted by A*STAR institutes today aims at contributing directly to Singapore's economy. The board states on its website: “Together with scientists we will build up our intellectual capital and our scientific capabilities. That will boost the economic competitiveness of Singapore.” The following two diagrams are used by A*STAR to illustrate the potential of R&D conducted in its institutes for strengthening the key industry clusters of Singapore.

Diagram Fehler! Kein Text mit angegebener Formatvorlage im Dokument.- 1: SERC R&D-Efforts Strengthening Singapore's Key Industry

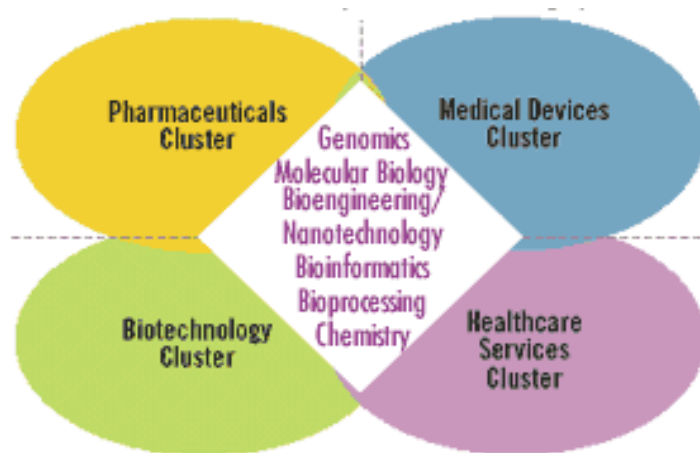


Source: A*STAR, 2006.

to recruit other people. So when I took over the board in Feb 2001, I realised the paucity of local PhD talent, (illegally) created the scholarship program, selected and sent our best and brightest high schools kids overseas to do their university Science studies. In the first batch, there were more girls than boys! Very clever girls. 36 altogether, 23 girls, 13 boys. And they are all in Maths and Science” (Ph. Yeo, 11.02.05, interview with the author).

Compared to the research areas supported by SERC, the research focus of BMRC aims at industry clusters that are still developing their potential. This is especially the case with the biotechnology cluster. Hence, the research requirements of these sectors are broader and the research conducted involves far more basic research.

Diagram Fehler! Kein Text mit angegebener Formatvorlage im Dokument.- 2: BMRC R&D-Efforts Strengthening Singapore's Biomedical Industry



Source: A*STAR, 2006.

The sudden increase of R&D investments from 1990 onwards did not lead to immediate economic growth. This lack in immediate economic growth resulted in criticism concerning the investments into R&D. These investments and R&D initiatives in the beginning mainly focused on ICTs. Due to low pay-off rates, the Singapore government aimed to identify future, profitable research fields in the late 1990s. Some of the new areas are biomedicine, life sciences, pharmaceuticals and healthcare services. Along the cluster theory of Michael E. Porter (1990, 1998), Singapore wants to develop several economic pillars, fuelled with high-technology R&D investments. This change in focus from ICTs to life sciences is described by the former Member of Parliament, Wang Kai Yuen as follows:

“If you go through the records of A*STAR-funding, you can see, that up to five years ago, investment has been put mainly in IT and then, 5 years ago, it suddenly came to a flip over and most of it has been put into life sciences, because the IT-R&D did not yield the expected results” (Wang K. Y., 12.04.2005, interview with the author).

Concerning the current investments into life sciences, he is not certain whether they will actually contribute to economic growth as hoped for. He explains:

“I think, that life sciences will yield better results than the money spent on IT. But having said that, it may not contribute too much to economy either. Because there is a current debate in parliament, which says, that to produce one life science researcher in Singapore, our A*STAR-scholarship for one person includes SGD\$1m. We are funding 40, so that is SGD\$40m. So you need a lot of money to fund researchers in the life sciences and they won't be ready until 8 – 10 years later.”

As expressed in this statement, the choice made by Singapore to diversify its economy and invest into knowledge production in order to build up various economic clusters that will

assure a sustainable long-term development requires time. It stands in direct opposition to the fast-track development path, taken by Singapore in the 1960s and 70s. Therefore, if successful, it might contribute to a more reliable and long-lasting development and wealth.

The push for development in bio and life sciences was further enhanced by the construction of Biopolis, beginning in 2001 and financed by the Singaporean government with Sin\$500m. Biopolis is a biomedical research hub, similar to an industrial park that offers home to approximately 2000 research scientists working in the fields of bio and life sciences for private and public research entities.⁶ Besides office buildings and laboratories, Biopolis also houses canteens, coffee shops and wine bars that enable researchers with diverse backgrounds, working in different fields and on other topics to meet, discuss, exchange and possibly develop new ideas. This infrastructure shall provide a fertile ground for a creative and innovative work atmosphere, produce synergies and nurture the development of an epistemic culture (Evers, 2000; 2003). It shall become the life science brain pool of Singapore and develop Singapore as knowledge hub in the region. Philip Yeo, chairman of A*STAR describes the decision to build Biopolis by referring to the hoped for critical mass:

“I became chairman of A*STAR in February 2001 and said, I want to do something where we put everybody together. Everybody together, it will become a critical mass. So I (illegally) built Biopolis” (Ph. Yeo, 11.02.05, interview with the author).

Besides creating a critical mass through the long process of training own research scientists by sending them overseas on A*STAR-scholarships, the research institutes of A*STAR heavily attract so-called foreign talents. Together with the local scientists, as well as employees of international research entities, hopes are pinned on these foreign talents to develop a Singapore-centred epistemic culture. The executive director of the Genome Institute of Singapore describes this endeavour:

“The most important thing that we can do in Singapore is to attract and to retain global talent. It is not just jobs, money or the resources, but the environment. Why do people like myself or many others in Biopolis come to Singapore? It is because the environment is conducive for what we want to do. Certainly, Singapore is safe, is clean, things work, people speak English, and it is a delightful living environment. But that is not the only reason. None of these aspects are the single most important reason, but together they form an environment that is ideal! It is a system that if you take one element away, the attraction may not be there! So part of our responsibility here is to provide that environment which also means that there are people who are very good, who are excited about working here, that we are doing first class research! Success breeds success and intelligent people like to be with other intelligent and successful people” (E. T. Liu, 04.02.05, interview with the author).

Growing your own and attracting foreign research scientists, leading them to Singapore and keeping them there is a time and cost intensive project. Building up from scratch high-ranking research and development centres, building research hubs and fostering a ‘critical mass’ within a relatively short time appears hardly possible. Nevertheless, Singapore’s government embarked on it in the name of a better future. Whether these projects will pay-off and lead to the pursued sustainable, long-term growth, remains to be seen. But the dauntlessness driven by a vision to do so is rather remarkable. Nevertheless, it is also criticised within the government administration itself. A deputy director of NLB remarks:

⁶ Biopolis is part of Fusionpolis, which is split into Vista X-Change (centre for private-public-partnership and industry development, financial and business services), Central X-Change (centre for ICTs, media and education industries) and Life X-Change (Biopolis). Together these three form Fusionpolis, which is stated in a newspaper article from 2003 to be “Singapore’s icon of the knowledge economy where talents gravitate naturally and where diverse ideas thrive. With a focus on knowledge intensive activities in critical growth sectors, one-north would provide an intellectually stimulating and creative physical environment for entrepreneurs, scientists and researchers to congregate, interact and exchange ideas” (JTC Corporation, 20.02.2003).

“The government may not be fully able to realise the short-term return on investment in the research infrastructure (hardware and software) in Biopolis. It is very futuristic and requires certain conditions for it to happen (J. Paul, 28.02.05, interview with the author).

3.2. Knowledge for Everyone: An Island- Embracing Library Network

Additional to the highly specialised R&D-development pursued by A*STAR, the government identified in the early 1990s, the need to raise the general level of education and creativity of Singapore’s population. Consequently, improving the nation’s library system becomes a government priority. In June 1992, the Minister for Information and the Arts, then BG George Yeo, appoints the Library 2000 Review Committee in order to undertake a comprehensive review of the Singaporean library services. The committee is chaired by Dr. Tan Chin Nam, then chairman of NCB and managing director of EDB. The conclusion drawn by this review is to position the libraries as an integral part of the national system supporting Singapore as a learning nation and knowledge hub in the Straits of Malacca region (Library 2000 Review Committee, 1994). Hence, the inherent aim is to provide every member of society with the access to knowledge as well as ICTs and therewith the possibility to use, transmit and further knowledge. The committee argues in the letter of submission from the committee to the Minister for Information and the Arts:

“We must expand Singapore’s capacity to learn faster and apply the knowledge better than other nations. This differential lead in our learning capacity will be crucial to our long-term national competitiveness in the global economy where both nations as well as firms compete with each other on the basis of information and knowledge” (Library 2000 Review Committee to Minister for Information and the Arts, 15.02.1994).

Furthermore, the committee builds on the national information infrastructure (NII) that shall be developed according to the IT2000-report, published by NCB. The NII shall link all libraries and therefore enable them as digital access points for information and knowledge. On 15 February 1994, the Library 2000 Review Committee submits its report to the Minister for Information and the Arts, entitled “Library 2000: Investing in a Learning Nation (L2000)”. In the report, the committee defines the tasks of the libraries in Singapore’s future as:

“to continuously expand the nation’s capacity to learn through a national network of libraries and information resource centres providing services and learning opportunities to support the advancement of Singapore” (Library 2000 Review Committee, 1994: 5).

In order to realise this vision, the committee lists six strategic thrusts⁷ and three key enablers.⁸ On 16 March 1995, the Parliament of Singapore passes the bill to establish the

⁷ The strategic thrusts include the following:

1. An adaptive public library system comprising a national reference library (ultimate reference centre), specialised reference libraries (e.g. law and medical libraries of NUS), public libraries (comprising regional, community and neighbourhood libraries), as well as special libraries (school libraries, business & arts library, ISEAS-library);
2. a network of borderless libraries by connecting the libraries of Singapore with overseas libraries and databases as well as providing online library access to users from their homes, offices and libraries through NII. Also, inter-library loans island-wide shall be made possible;
3. co-ordinated national collection strategy which empowers each library to be responsible for a certain range of collection in order to avoid duplications and maximise collection coverage nationally. Also, materials in native languages from China, Malaysia, Indonesia and India shall be acquired and the usage of libraries liberalised, meaning opened for everyone;
4. quality service through market orientation: public libraries have to face competition from a host of lifestyle and leisure activities to attract people as library users through publicity programs and the taking of fees ensuring that library meet real market demands;
5. symbiotic linkages with business and community in order to become part of the social fabric of Singapore. Library locations should be part of cultural, educational and commercial complexes;

National Library Board (NLB) from 01 September 1995 onwards. The board immediately starts with the implementation of “Library 2000 – Investing in a Learning Nation” under its first chief executive, Christopher Chia. Christopher Chia, similar to Tan Chin Nam and Philip Yeo formerly worked for NCB. He epitomises the civil servant that is increasingly called ‘technopreneur’ in Singapore. Under his leadership, “Library 2000” is rapidly implemented. Dr. Tan Chin Nam, chairman of the Library 2000 Review Committee describes the implementation approach taken by NLB:

“We wanted rapid prototyping and the ability to transplant experience gained from renovating or building one library to the renovation or building of another. We said that we will try things; if they work, we will quickly enhance and spread them around. If they don’t, we will retire them and look for alternatives” (Tan Ch. N. qtd. in Hallowell/Knoop/Neo, 2001: 3).

In 2005, NLB summarises its achievements in terms of the expansion of the library system in the last ten years as shown in

table fehler! kein text mit angegebener formatvorlage im dokument.- 1.

Table Fehler! Kein Text mit angegebener Formatvorlage im Dokument.- 1: Expansion of Library System between 1994 and 2004

| | In 1994 | In 2004 |
|-------------------|-------------|-------------|
| No. of Libraries | 15 | 73 |
| Collection Size | 3.4 million | 8 million |
| Library Visits | 5.5 million | 31 million |
| Active Membership | 500,000 | 1.1 million |
| Loans | 10 million | 27 million |
| Enquiries | 186,000 | 2.3 million |
| Online Retrievals | 0 | 4.7 million |
| Currency of Books | 12 years | 4 years |

Source: NLB, 2005: 2.

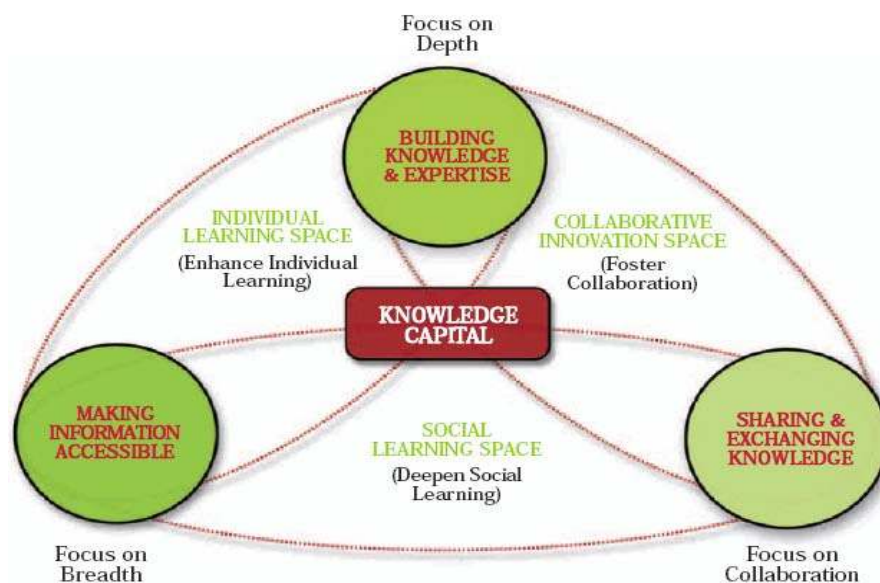
6. global knowledge arbitrage: Singapore’s libraries shall support its citizens with information relevant in building links to developing economies such as ASEAN, China, India, etc. by providing assimilated, disseminated knowledge on the region. Singapore shall become a centre of knowledge arbitrage by gathering, analysing, distilling, collating and making available useful information to businesses.

⁸ The implementation of these six strategic thrusts shall be facilitated by the following three key enablers:

1. Human resource development: adapting current librarian training courses to the requirements of the information age, retraining existing librarians as mediators between users and technologies for retrieving the required information, revising the scheme of remuneration for librarians;
2. technology (ICTs) should be exploited for the improvement of library services (information retrieval) as well as library operations;
3. organisational leadership: establishing a statutory board with a flexible structure and effective management system in order to implement the Library 2000 recommendations.

In order to push this development of the Singaporean library system further, integrate libraries as centres of knowledge sharing and creativity into the lives of the citizens, NLB publishes in May 2005 “Library 2010” (L2010). Here, NLB states its mission as expanding “the learning capacity of the nation so as to enhance national competitiveness and to promote a gracious society” (NLB, 2005: 1). “L2010” analyses the progress made by “Library 2000” in the past 10 years, and identifies the development into a learning society as the current need of Singapore’s society based on an assessment of changes in its economy.⁹ Overall, the report assesses that Singapore requires a new knowledge framework which entails (a) making information accessible; (b) building knowledge and expertise; and (c) sharing and exchanging knowledge. Therefore, the library system of Singapore aims to (a) enhance individual learning; (b) foster collaboration; and (c) deepen social learning in the next 5 years. These three aims are based on the assumptions that there are three main means, by which people gain and use knowledge in society: (a) information – knowledge embedded in information or knowledge artefacts, such as books, websites and databases; (b) knowledge & expertise – knowledge embedded in people, in their competencies, skills and experience; and (c) shared knowledge – knowledge held in common, such as the ability of a team to solve problems quickly and effectively (NLB, 2005: 16). These three main thrusts of “L2010” as well as their intended contributions to a new knowledge framework are illustrated in diagram fehler! kein text mit angegebener formatvorlage im dokument.-3 below.

Diagram Fehler! Kein Text mit angegebener Formatvorlage im Dokument.- 3: L2010 – Building Knowledge Capital



Source: NLB, 2005: 21.

The report concludes, that “the confluence of these activities, namely making information readily accessible, building content, sharing and exchanging knowledge, will help

⁹ According to the report, libraries can contribute to a knowledge society by supporting the following areas: (a) basic and applied R&D; (b) knowledge creation; (c) knowledge export; (d) knowledge acquisition; and (e) knowledge application.

create knowledge capital from which dividends will readily flow back to the society and nation” (NLB, 2005: 21). Public libraries shall be developed into the third most important place in the lives of Singaporeans, besides home and work. They shall no longer just be centres of knowledge transfer, for life styling and spending leisure time but instead, they shall emerge as centres of discussion, interaction, cooperation; centres of social capital production. Social capital is identified by the Singaporean government as the key to innovation, which is required for Singapore’s economic survival. It is called “the hidden potential of society” in the report (NLB, 2005: 23). That social capital is closely connected to critical thinking, and innovation to change, is taken into account and accepted. As long as change is necessary in order to survive economically as well as in the case of the People’s Action Party (PAP) politically, it seems to be accepted.

While the report mentions five goals¹⁰ as well as implementing steps¹¹, the overall aim is clearly the creation of a new knowledge framework for Singapore based on libraries as social centers and incubators for social capital. Whether this can actually be achieved, remains to be seen, since it requires the input of the people rather than merely the infrastructure in the shape of a vast library network. Nevertheless, it has to be pointed out that the developing of the required infrastructure is advanced in a very straight forward and clever way. While initiatives like Biopolis, A*STAR or the “Creative Industries Development Strategy” focus on the development of certain clusters and economic sectors, “L2000” and “L2010” aim at raising the general level of education, creativity as well as social capital of Singapore’s society. Therefore, they establish Singapore’s library system as social integrator. This inclusive character of “L2000” and “L2010” stands for the belief that a knowledge producing and processing hub rests on all members of society, basically on all human brain capacity available. The present chief executive of NLB describes the functions of the library system in Singapore’s society:

“L2000 and L2010 raise the general educational and response level of society by building the capacity to learn and adapt. NLB and its library network bridges social divide and support the bottom of society to cope in the KBE. It supports all social classes, but it also prevents the gap when the top takes off, leaving the rest behind. If you want, the library system is a form of a social system, because life-long education results in better careers and prospects. The library system enables people to have access to resources to educate themselves. This would have both financial outcomes as well as psychological fulfilment” (N. Varaprasad, 11.02.05, interview with the author).

While projects such as Biopolis and “Library 2000” both illustrate the focus of the Singaporean government on the production of knowledge, they concentrate on very different social and economic growth areas. The deputy director of Information Services of NLB sees Biopolis in comparison to the aims of “L2000” and “L2010” rather critically. He states, while drawing diagram fehler! *kein text mit angegebener formatvorlage im dokument.- 4*:

“The private-public investment into Biopolis is a lot of money, but it can result in a knowledge divide in Singapore and [NLB] needs to balance that out. So there is the high-end research in

¹⁰ As specific goals, the report mentions the following five (NLB, 2005: 24):

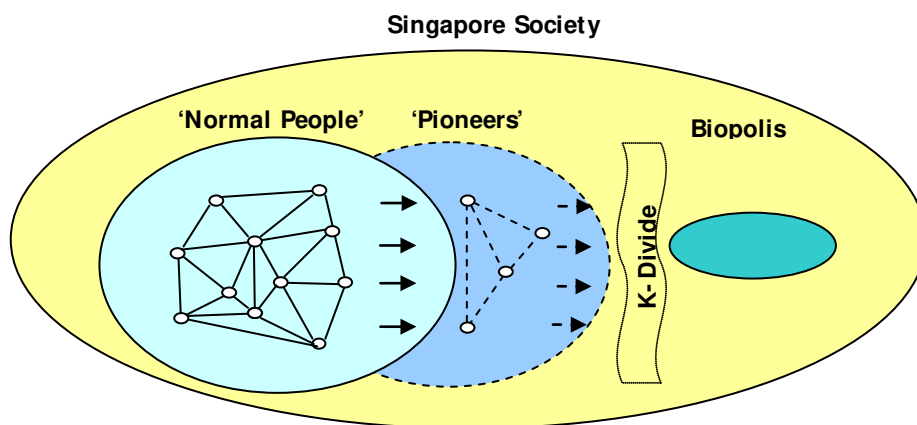
1. NLB being recognised as a first stop for Asian content and collection services;
2. a vibrant network of public libraries that are transformed into social learning spaces;
3. learning communities that are self-sustaining and self-renewing;
4. information and knowledge services that power a competitive economy;
5. a supportive environment for library, information and knowledge management professionals.

¹¹ These goals shall be reached by implementing 5 steps:

1. building a network of knowledge assets and make them accessible;
2. leveraging on technology, especially in support of collaboration;
3. organising around the customer communities to serve them better;
4. expanding the professional competencies;
5. measuring the impact to ensure continuing value and relevance.

Biopolis which may not have any relevance to the lay man or entrepreneur in the street. [...] So it becomes all the more important that we proactively connect both ends of society so that they would at least have the opportunity to interact and exchange knowledge. Some of them, maybe some product designer from an SME, might produce knowledge over here [outside the circle]. And we hope that the rest of the society connects to them and then slowly migrates to Biopolis or at least closer" (J. Paul, 28.02.05, interview with the author).

Diagram Fehler! Kein Text mit angegebener Formatvorlage im Dokument.- 4: Knowledge Divide, Exchange and Divide Closure



The Singaporean library system is oriented towards the integration of the whole society into k-society by raising the level of education and enabling people to become pioneers of k-society him/herself, rather than towards the development of one economic cluster, which involves high-end R&D and foreign talents.¹² Despite this impression of two directly opposing approaches (everyday knowledge versus high-end knowledge), both contribute to the local production of knowledge as well as to Singapore as a knowledge hub in the Straits of Malacca region. Nevertheless, it is the people who have to actually be creative, and this cannot be forced upon them. An inspiring infrastructure can merely help people to find and outlive their creativity. Yet, the creation of this infrastructure in Singapore takes place at an enormous speed.¹³

3.3. Creativity: The Gold of the New Age?

Up to the mid 1980s, Singapore's government did not make any distinct attempts to develop an overall long-term cultural policy (Kwok/Low, 2001: 150). The few existing cultural and art activities focused on the attraction of tourism and the generation of income. Arts for its own sake hardly existed. Kong and Yeoh explain this as follows (Kong/Yeoh, 2003: 174): "[F]rom

¹² The Chief Executive of the National Library Board explains this as follows: "NLB, L2000 and L2010 contribute to the KBE of Singapore, the creative industries, the R&D and all other cluster areas that shall and will be developed. NLB only contributes to them mostly indirectly, not directly. These cluster developments are more supported and catered for by the universities and research institutions. However, NLB has several components – public, reference, national and digital libraries – so we also able to support the overall development of the KBE both directly and indirectly. We aim to give the population the same level playing field as the specialists" (N. Varaprasad, 11.02.05, interview with the author).

¹³ For more details see Hornidge, 2006.

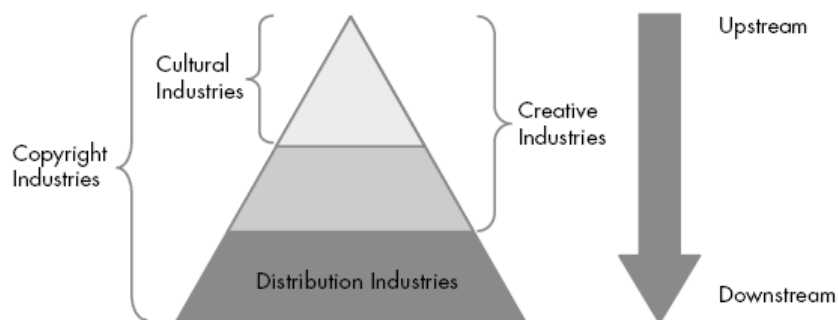
independence until the late 1970s (some would argue into the mid-1980s), landscapes of the arts were conspicuous by their absence because the arts were accorded low priority, given the view that scarce national resources should be diverted to develop Singapore's fledgling economy, reflecting the ideology of pragmatism and survival." According to Lee, the term 'cultural policy' finds its first official mention in Singapore's political sphere on 26 December 1978. On that day, then Minister of Culture, Ong Teng Cheong uses the term in a press release, referring to the protection of cultural heritage in order to provide younger generations with cultural depth, traditional norms and values (Lee, 2004: 285-286; Ong, 1978: 1). Aspects of arts and cultural expressions creating contemporary culture only began to play a role in government policy of Singapore, after they were identified as future growth areas by the Economic Review Committee in 1986. In February 1988, the government of Singapore appoints the Advisory Council on Culture and the Arts (ACCA), chaired by Ong Teng Cheong, in order to formulate recommendations on how to boost arts and culture as future growth sector in Singapore. In the "Ong Teng Cheong Report", as it is frequently named, published in April 1989, the ACCA assesses the state of the arts and culture in Singapore as well as formulates measures for creating a culturally vibrant Singapore (ACCA, 1989). The report includes multiple recommendations aiming at the shaping of the cultural landscape of Singapore. As such it recognises the necessity to establish a new agency which spearheads the development of the arts in Singapore, the creation of a museum complex in the central civic district and the construction of a performing arts centre at Marina Bay (ACCA, 1989: 5-6). Furthermore, it recommends the establishment of a Literature Board, a National Heritage Trust, improvements to arts education in schools as well as to cultural facilities and an increase of promotional efforts for the arts (through public-private-partnerships). Following these recommendations, the Ministry of Information and the Arts (MITA), today MICA, is founded in 1990. Furthermore in the same year, the construction of "The Esplanade" is announced by the government as a multimillion-dollar arts venue. As further coordinating and planning bodies, the National Arts Council (NAC) as well as the National Heritage Board (NHB) are established in 1991 and 1993, respectively. While it is the task of NAC to raise the interest of the general public in arts and cultural activities, NHB oversees the development of a museum scene, the preservation of cultural heritage as well as archival record keeping. The report can be regarded as the beginning and first blueprint of a Singaporean cultural policy (Lee, 2004: 286). Yet, the following efforts aiming at the creation of a culturally vibrant Singapore were mainly designed as "money spinning blockbuster performances" (Lee, 2004: 288). Until today, most performances are conducted by foreign, not local theatre groups; most plays are written by foreign authors and only rarely narrate Singaporean stories.

In 1995, the Ministry of Information and the Arts (MITA) publishes together with the Singapore Tourist Promotion Board (STPB) a document entitled "Singapore: Global City of the Arts". This policy document has to be regarded as an economic policy initiative that – as expressed by then Minister for Information and the Arts George Yeo – "hopes to do for the arts what it has done for banking, finance, manufacturing and commerce, and help create new ideas, opportunities and wealth" (G. Yeo qtd. in Kwok/Low, 2001: 152). It therefore re-affirms the already existing focus on arts and culture as potential economic sector rather than for its own sake (Lee, 2004: 288). In March 2000, MITA publishes the cultural policy document "Renaissance City Report: Culture and the Arts in Renaissance Singapore" (MITA, 2000). The report aims at the development of Singapore into a cultural capital of the twenty-first century and clearly emphasises the goal of developing Singapore into a global cultural hub that can compare itself with other cultural capitals worldwide, like London, New York or Paris. The "Renaissance City Report" assesses that Singapore has successfully developed the institutional infrastructure for a vibrant culture and arts scene, including the above mentioned MITA, NAC and NHB. Yet, the report sees the future task in emphasising 'software' aspects, meaning the support of the local cultural, theatre and arts scene. Nevertheless, as pointed out by Lee, this

interest in developing the culture and arts scene of Singapore does not go back to an interest in arts from an artistic standpoint but is more “attuned to the economic activity and political longevity of Singapore in an increasingly competitive global era” (Lee, 2004: 290). Kong talks of the “hegemony of the economic” in Singapore’s cultural policy (Kong, 2000).

The beginning of the 21st century is nevertheless influenced by economic recession, which again is faced by the Singaporean government with establishing an Economic Review Committee (ERC). The ERC analyses the current situation and future potential growth areas of Singapore’s economy. Within the ERC subcommittee ‘Service Industry’ the Workgroup on Creative Industries outlines the “Creative Industries Development Strategy” and publishes it in September 2002 (Workgroup on Creative Industries, 2002). According to the strategy, ‘creative industries’ can be defined as “those industries which have their origin in individual creativity, skill and talent and which have a potential for wealth and job creation through the generation and exploitation of intellectual property.”¹⁴ The strategy aims for the development of creative industries as a ‘creative cluster’, which goes back to Florida’s book “The Rise of the Creative Class” (Florida, 2002). Florida reasons that creative people have become the decisive source of competitive advantage in contemporary economy and society. Hence, businesses locate in places where clusters of creative people exist. Florida states: “A class is a cluster of people who have common interests and tend to think, feel and behave similarly, but these similarities are fundamentally determined by economic function – by the kind of work they do for a living. All other distinctions follow from that” (Florida, 2002: 8). The “Creative Industries Development Strategy” identifies three approaches to defining the scope of the creative cluster in Singapore: (a) the cultural industries; (b) the creative industries; and (c) the copyright industries. Together they form the creative cluster and mutually build on each other as shown in the diagram below.

Diagram Fehler! Kein Text mit angegebener Formatvorlage im Dokument.- 5:
Composition of the Creative Cluster



Source: Toh/Choo/Ho, 2003: 52.

Nevertheless, the creative industries are regarded as main driver of the cluster. Here, Singapore’s government distinguishes between basic (upstream) and applied (downstream) arts. Upstream arts refer to traditional arts such as performing, literary and visual arts. In opposition to this downstream arts refer to advertising, design, publishing and media-related activities. Upstream arts bear a commercial value in themselves, while downstream arts merely gain economic value when applied in other economic sectors (Toh/Choo/Ho, 2003: 52). Based on this

¹⁴ This definition is borrowed from the UK Creative Industries Taskforce (UK Creative Industries Taskforce, 1998).

analysis, the strategy aims to foster the development of the creative industries that will then further the whole creative cluster. In order to foster up and downstream arts, the Workgroup on Creative Industries of the Economic Review Committee formulates three blueprints focusing on arts and culture, design and the media industries (Workgroup on Creative Industries, 2002).

“Renaissance City 2.0” is merely a continuation of the “Renaissance City Report” published in 2000 (Workgroup on Creative Industries, 2002: 9-20; MITA, 2000). It basically adds innovation as a key policy outcome within the arts and cultural sector. Interestingly, “Renaissance City 2.0” calls for a shift in all MITA agencies “away from the ‘arts for arts sake’ mindset, (...) to contribute towards the development of the creative industries as well as our nation’s social development” (Workgroup on Creative Industries, 2002: 14). Looking back on the cultural policy of Singapore, one has to state that the idea of arts for economic growth was the originating reason for fostering the arts and cultural sector in Singapore from 1980s onwards. The second initiative, which is part of the creative industries policy is named the “Design Singapore Initiative” (2002: 21-32). It claims to be the first national collaborative strategy to spearhead the promotion of design in Singapore.¹⁵ The third initiative contributing to the development of the creative cluster is entitled “Media 21” (Workgroup on Creative Industries, 2002: 33-49; Media Development Authority, 2003). “Media 21” envisions Singapore as a “global media city, a thriving media ecosystem with roots in Singapore, and with strong extensions internationally” (Workgroup on Creative Industries, 2002: 37).¹⁶

“Design Singapore” but especially “Media 21” are economic policy agendas, although their physical manifestation lies in the framework of fostering the development of a creative cluster. A rather interesting aspect of the “Media 21” policy framework is also, that the media in Singapore is often regarded as the mouthpiece of the Singaporean government and has therefore mixed only a little with other economical and especially cultural sectors. The same Singapore as the one in which the press is regulated until today by a newspaper and printing presses act aims to position itself as a global media capital. The seeming contradiction is solved by aiming at attracting foreign media companies to produce their documentaries and programs on the region; not by encouraging local media players to conduct critical journalism on Singapore and its government.

Overall the “Creative Industries Development Strategy” has to be regarded as part of the attempt to develop several economic clusters on which Singapore’s economy can build in the future. Yet, after focusing on engineering, maths and sciences for the first two and a half centuries after independence, Singapore’s sudden aim to foster creative thinking, writing and drawing was criticised and smiled at. Cherian George, professor at the Nanyang Technological University, School of Communication & Information, Division of Journalism and Publishing states:

“Some economists say that Singapore should just give up in the creative industries sector and that it simply is not going to be Singapore’s strength. The education system has given the students too much science and math education and not enough literature and the arts. This is changing now but not very fast. (...) Singapore’s strength is to get the system right, in logistics, organisation, trade, infrastructure, reliability of services etc. It should just focus on that and let

¹⁵ It seeks convergence amongst different actors, namely enterprises (industry users and designers), expertise and education. The aim of this initiative is “to inspire a fundamental change in the promotion and development of a pervasive design culture” (2002: 27). This shall be achieved by focusing on four strategies: (1) integrating design in enterprise; (2) developing a vibrant & professional design community; (3) positioning Singapore as a global design hub; and (4) fostering a design culture and awareness.

¹⁶ The blueprint aims to reach this vision by implementing five strategies: (1) to develop a state-of-the-art media city; (2) to position Singapore as a media exchange; (3) to export made-by-Singapore content; (4) to augment the media talent pool; and (5) to foster a conducive regulatory environment and culture.

creative industries be the sector of other countries” (Ch. George, 08.02.05, interview with the author).

Later in the interview, Cherian George explains the expressed pessimism by pointing to the government:

“Actually these economists saying that Singapore should just give up on creative industries, argue that Singapore’s government is not likely to loosen up politically and as long as it doesn’t, you are not going to have the kind of creative culture that you have elsewhere.”

Whether Cherian George or the government’s optimism is right will be seen in the future. Nevertheless, the Singaporean government takes a very pragmatic approach in outlining a cultural policy in order to foster a creative cluster that will contribute to future economic growth. The same pragmatism and straightforwardness can also be observed in the process leading up to Singapore as a knowledge hub. The final intention is clear: to assure economic prosperity and together with this political stability, meaning PAP maintaining political legitimacy based on economic growth and therefore remaining in power.

4. Concluding Remarks

While in the late 1970s and all of the 80s, Singapore’s government embarked on building an island-wide information and telecommunication infrastructure and developing ICT applications, in the 1990s, the focus moved to positioning Singapore as the knowledge hub in the Straits of Malacca region. In order to succeed in this aim, Singapore’s government embarked on the fostering of high-end knowledge production through scientific research and development, i.e. in Biopolis, as well as on the development of an island-wide library network with the libraries emerging as centres of knowledge production, creativity and social capital. In recent years, the focus on creativity was further pursued by the development of creative industries, investing heavily in the arts and cultural scenes of Singapore as well as changing school and university curricula with the aim of fostering creativity.

This process of constructing Singapore as a knowledge hub underwent several shifts in focus. While the self-definition of the early independent Singapore was very technology focused, it increasingly opened up to R&D, the inclusion of every citizen in knowledge production, usage and dissemination and the fostering of the creativity of Singaporeans. Nevertheless, the whole process is guided by the clear focus on economic, sustainable, long-term development, through knowledge production, dissemination and exploration. In doing so, knowledge sectors such as the bio and life sciences, engineering and natural sciences as examples for future oriented, applied sciences are developed with enormous state funding. Yet, with a short delay, knowledge sectors that are regarded as incubators of creativity and innovations were additionally addressed in state programs. Consequently sectors such as the arts, fine arts, museums and the library system are developed, not for their inherent values but due to their potential long-term contribution to economic growth and prosperity.

References

- Advisory Council on Culture and the Arts (ACCA) (1989). Report of the Advisory Council on Culture and the Arts. Singapore, Singapore National Printers.
- Agency for Science Technology and Research (A*STAR) (2004). National Survey of R&D in Singapore 2003. Singapore, A*STAR.
- Agency for Science Technology and Research (A*STAR) (2005). National Survey of R&D in Singapore 2004. Singapore, A*STAR.
- Agency for Science Technology and Research (A*STAR) (2006). Key Focus, A*STAR.
- Anwar, S. and M. Zheng (2004). "Government spending on research and development and industrial production in Singapore." *International Journal of Asian Management* **3**: 53-65.
- Commission of the European Communities (EC) (2004). Communication from the Commission. Europe and Basic Research, COM(2004) 9, 14.1.2004. Brussels, EC.
- Drucker, P. F. (1994). "Knowledge Work and Knowledge Society - The Social Transformations of this Century."
- Evers, H.-D. and S. Gerke (2003). Local and Global Knowledge: Social Science Research on Southeast Asia . Southeast Asian Studies Working Paper No. 18. Bonn, Department of Southeast Asian Studies, University of Bonn.
- Evers, H.-D., S. Gerke, et al. (2004). Malaysia, Singapur, Indonesien: Wege zur Wissensgesellschaft. Bonn, University of Bonn.
- Evers, H.-D., S. Gerke, et al. (2005). "Wissen als Produktionsfaktor: Südasiens Aufbruch zur Wissensgesellschaft." *Soziale Welt* **56**(1).
- Florida, R. (2002). *The Rise Of The Creative Class*. New York, Basic Books.
- Hallowell, R., C.-I. Knoop, et al. (2001). *Transforming Singapore's Public Libraries*. Boston, Harvard Business School.
- Hornidge, A.-K. (2006). *The Construction of K-Societies: Germany and Singapore*. Institute of Sociology. Berlin, TU Berlin.
- JTC Corporation (20.02.2003). Fusionpolis launched in One-North. JTC Corporation.
- Kong, L. (2000). "Cultural Policy in Singapore: Negotiating Economic and Socio-cultural Agendas." *Geoforum* **31**: 409-424.
- Kong, L. and B. S. A. Yeoh (2003). *The Politics of Landscapes in Singapore: Constructions of 'Nation'*. Syracuse/New York, Syracuse University Press.

Kwok, K.-W. and K.-H. Low (2001). Cultural Policy and the City-state: Singapore and the "new Asian renaissance". *Global Culture: Media, Arts, Policy and Globalization*. D. Crane, N. Kawashima and K. Kawasaki. New York, Routledge: 149-168.

Lee, T. (2004). "Creative Shifts And Directions. Cultural Policy in Singapore." *International Journal of Cultural Policy* **10**(3).

Lee, T. (2004). "Creative Shifts And Directions. Cultural Policy in Singapore." *International Journal of Cultural Policy* **10**(3).

Library 2000 Review Committee (1994). *Library 2000: Investing In A Learning Nation*. Singapore, Ministry of Information and The Arts.

Library 2000 Review Committee and Minister for Information and the Arts (15.02.1994). Letter of Submission. Singapore, Library 2000 Review Committee.

Menkhoff, T. and H.-D. Evers (2005). *Strategic Groups in a Knowledge Society: Knowledge Elites as Drivers of Biotechnology Development in Singapore*. International Conference on Strategic Groups, Essen.

Ministry of Information and the Arts (MITA) (2000). *Renaissance City Report: Culture and the arts in Renaissance Singapore*. Singapore, MITA.

National Library Board (NLB) (2005). *L2010 - Our Vision for the Future (Overview)*. Singapore, National Library Board.

Ong, T. C. (1978). Addendum to Presidential Address at the opening of the second session of the Fourth Parliament on Tuesday, 26th December 1978: Singapore Government Press Release, Publicity Division. Singapore, Ministry of Culture.

Organisation for Economic Co-operation and Development (OECD) (2002). *Frascati Manual - Proposed Standard Practice for Surveys for Research and Experimental Development*. Paris, OECD.

People's Daily Online (12.08.2005). Singapore deputy PM recommends measures for R&D strategy. People's Daily Online. Singapore.

Porter, M. E. (1990). *The Competitive Advantage of Nations*. New York, The Free Press.

Porter, M. E. (1998). "Clusters and the New Economics of Competition." *Harvard Business Review* **Nov- Dec 1998**: 77-90.

Singapore Professional Centre (1991). *The Next Lap Together*. Singapore, JM Publishers.

Toh, M.-H., A. Choo, et al. (2003). *Economic Contributions of Singapore's Creative Industries*. Singapore, Ministry of Information, Communication and the Arts.

Toh, M.-H., H. C. Tang, et al. (2002). *Mapping Singapore's Knowledge-Based Economy*. Singapore, Economics Division, Ministry of Trade and Industry.

UK Creative Industries Taskforce (1998). Creative Industries Mapping Document. London, UK Creative Industries Taskforce.

Wall, C. (2006). Knowledge Management in Rural Uzbekistan: Peasant, Project and Post-Socialist perspectives in Khorezm. Faculty of Philosophy. Bonn, Rheinische Friedrich-Wilhelms Universität.

Workgroup on Creative Industries (2002). Creative Industries Development Strategy. Singapore, ERC-Subcommittee Service Industries/Ministry of Trade and Industry.

- 1 Evers, Hans-Dieter and Solvay Gerke (2005). Closing the Digital Divide: Southeast Asia's Path Towards a Knowledge Society.
- 2 Bhuiyan, Shajahan and Hans-Dieter Evers (2005). Social Capital and Sustainable Development: Theories and Concepts.
- 3 Schetter, Conrad (2005). Ethnicity and the Political Reconstruction of Afghanistan.
- 4 Kassahun, Samson (2005). Social Capital and Community Efficacy. In Poor Localities of Addis Ababa Ethiopia.
- 5 Fuest, Veronika (2005). Policies, Practices and Outcomes of Demand-oriented Community Water Supply in Ghana: The National Community Water and Sanitation Programme 1994 – 2004.
- 6 Menkhoff, Thomas and Hans-Dieter Evers (2005). Strategic Groups in a Knowledge Society: Knowledge Elites as Drivers of Biotechnology Development in Singapore.
- 7 Mollinga, Peter P. (2005). The Water Resources Policy Process in India: Centralisation, Polarisation and New Demands on Governance.
- 8 Evers, Hans-Dieter (2005). Wissen ist Macht: Experten als Strategische Gruppe.
- 8a Evers, Hans-Dieter and Solvay Gerke (2005). Knowledge is Power: Experts as Strategic Group.
- 9 Fuest, Veronika (2005). Partnerschaft, Patronage oder Paternalismus? Eine empirische Analyse der Praxis universitärer Forschungskoooperation mit Entwicklungsländern.
- 10 Laube, Wolfram (2005). Promise and Perils of Water Reform: Perspectives from Northern Ghana.
- 11 Mollinga, Peter P. (2004). Sleeping with the Enemy: Dichotomies and Polarisation in Indian Policy Debates on the Environmental and Social Effects of Irrigation.
- 12 Wall, Caleb (2006). Knowledge for Development: Local and External Knowledge in Development Research.
- 13 Laube, Wolfram and Eva Youkhana (2006). Cultural, Socio-Economic and Political Constraints for Virtual Water Trade: Perspectives from the Volta Basin, West Africa.
- 14 Hornidge, Anna-Katharina (2006). Singapore: The Knowledge-Hub in the Straits of Malacca.
- 15 Evers, Hans-Dieter and Caleb Wall (2006). Knowledge Loss: Managing Local Knowledge in Rural Uzbekistan.
- 16 Youkhana, Eva, Lautze, J. and B. Barry (2006). Changing Interfaces in Volta Basin Water Management: Customary, National and Transboundary.
- 17 Evers, Hans-Dieter and Solvay Gerke (2006). The Strategic Importance of the Straits of Malacca for World Trade and Regional Development.
- 18 Hornidge, Anna-Katharina (2006). Defining Knowledge in Germany and Singapore: Do the Country-Specific Definitions of Knowledge Converge?
- 19 Mollinga, Peter M. (2007). Water Policy – Water Politics: Social Engineering and Strategic Action in Water Sector Reform.
- 20 Evers, Hans-Dieter and Anna-Katharina Hornidge (2007). Knowledge Hubs Along the Straits of Malacca.
- 21 Sultana, Nayeem (2007). Trans-National Identities, Modes of Networking and Integration in a Multi-Cultural Society. A Study of Migrant Bangladeshis in Peninsular Malaysia.
- 22 Yalcin, Resul and Peter M. Mollinga (2007). Institutional Transformation in Uzbekistan's Agricultural and Water Resources Administration: The Creation of a New Bureaucracy.
- 23 Menkhoff, T., Loh, P. H. M., Chua, S. B., Evers, H.-D. and Chay Yue Wah (2007). Riau Vegetables for Singapore Consumers: A Collaborative Knowledge-Transfer Project Across the Straits of Malacca.
- 24 Evers, Hans-Dieter and Solvay Gerke (2007). Social and Cultural Dimensions of Market Expansion.
- 25 Obeng, G. Y., Evers, H.-D., Akuffo, F. O., Braimah, I. and A. Brew-Hammond (2007). Solar PV Rural Electrification and Energy-Poverty Assessment in Ghana: A Principal Component Analysis.
- 26 Eguavoen, Irit; E. Youkhana (2008). Small Towns Face Big Challenge. The Management of Piped Systems after the Water Sector Reform in Ghana.
- 27 Evers, Hans-Dieter (2008). Knowledge Hubs and Knowledge Clusters: Designing a Knowledge Architecture for Development
- 28 Ampomah, Ben Y., Adjei, B. and E. Youkhana (2008). The Transboundary Water Resources Management Regime of the Volta Basin.
- 29 Saravanan.V.S.; McDonald, Geoffrey T. and Peter P. Mollinga (2008). Critical Review of Integrated Water Resources Management: Moving Beyond Polarised Discourse.
- 30 Laube, Wolfram; Awo, Martha and Benjamin Schraven (2008). Erratic Rains and Erratic Markets: Environmental change, economic globalisation and the expansion of shallow groundwater irrigation in West Africa.
- 31 Mollinga, Peter P. (2008). For a Political Sociology of Water Resources Management.
- 32 Hauck, Jennifer; Youkhana, Eva (2008). Histories of water and fisheries management in Northern Ghana.
- 33 Mollinga, Peter P. (2008). The Rational Organisation of Dissent. Boundary concepts, boundary objects and boundary settings in the interdisciplinary study of natural resources management.
- 34 Evers, Hans-Dieter; Gerke, Solvay (2009). Strategic Group Analysis.
- 35 Evers, Hans-Dieter; Benedikter, Simon (2009). Strategic Group Formation in the Mekong Delta - The Development of a Modern Hydraulic Society.
- 36 Obeng, George Yaw; Evers, Hans-Dieter (2009). Solar PV Rural Electrification and Energy-Poverty: A Review and Conceptual Framework With Reference to Ghana.
- 37 Scholtes, Fabian (2009). Analysing and explaining power in a capability perspective.
- 38 Eguavoen, Irit (2009). The Acquisition of Water Storage Facilities in the Abay River Basin, Ethiopia.
- 39 Hornidge, Anna-Katharina; Mehmood Ul Hassan; Mollinga, Peter P. (2009). 'Follow the Innovation' – A joint experimentation and learning approach to transdisciplinary innovation research.
- 40 Scholtes, Fabian (2009). How does moral knowledge matter in development practice, and how can it be researched?
- 41 Laube, Wolfram (2009). Creative Bureaucracy: Balancing power in irrigation administration in northern Ghana.
- 42 Laube, Wolfram (2009). Changing the Course of History? Implementing water reforms in Ghana and South Africa.

- 43 Scholtes, Fabian (2009). Status quo and prospects of smallholders in the Brazilian sugarcane and ethanol sector: Lessons for development and poverty reduction.
- 44 Evers, Hans-Dieter, Genschick, Sven, Schraven, Benjamin (2009). Constructing Epistemic Landscapes: Methods of GIS-Based Mapping.
- 45 Saravanan V.S. (2009). Integration of Policies in Framing Water Management Problem: Analysing Policy Processes using a Bayesian Network.
- 46 Saravanan V.S. (2009). Dancing to the Tune of Democracy: Agents Negotiating Power to Decentralise Water Management.
- 47 Huu, Pham Cong, Rhlers, Eckart, Saravanan, V. Subramanian (2009). Dyke System Planing: Theory and Practice in Can Tho City, Vietnam.
- 48 Evers, Hans-Dieter, Bauer, Tatjana (2009). Emerging Epistemic Landscapes: Knowledge Clusters in Ho Chi Minh City and the Mekong Delta.
- 49 Reis, Nadine; Mollinga, Peter P. (2009). Microcredit for Rural Water Supply and Sanitation in the Mekong Delta. Policy implementation between the needs for clean water and 'beautiful latrines'.
- 50 Gerke, Solvay; Ehlert, Judith (2009). Local Knowledge as Strategic Resource: Fishery in the Seasonal Floodplains of the Mekong Delta, Vietnam
- 51 Schraven, Benjamin; Eguavo, Irit; Manske, Günther (2009). Doctoral degrees for capacity development: Results from a survey among African BiGS-DR alumni.
- 52 Nguyen, Loan (2010). Legal Framework of the Water Sector in Vietnam.
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