THE DEVELOPMENT OF A SOFTWARE CLUSTER IN NANJING

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Introduction

A survey was undertaken at the end of 2002 among the members of the Nanjing Software industries Association. After an explanation during their annual meeting 50 of the 150 questionnaires were returned, sometimes after an additional visit or phone call. These have been collected and analysed by Wang Quansheng and will be put in this paper in the broader context of our joint research project on cluster formation in Nanjing.iii

In this paper we will present the results of the research into the software cluster and link these results to earlier research concerning the development of a citywide cluster in Nanjing (Wang and Van Dijk, 2002). Previously the emphasis was on the Zhujiang Road electronic cluster (Wang, 2000 and Van Dijk, 2003)⁵, while later on the development of that inner city cluster was linked to the development of computer related activities in different high tech and economic and technological development zones in other parts of the city (Van Dijk, 2003)⁷. In total these activities take place in a limited number of districts (5 out of the eleven, see the Nanjing information and communication technology cluster map), but they do start to develop interrelations between them as can be seen from the analysis of the data concerning the software producers in Nanjing, which was hardly the case in Zhujiang Road.

We will compare the results of our analysis of an inner city cluster of mainly information and communication technology (ICT) selling shops and workshops with the sample results for fifty software companies, which indicate that these companies are an even more dynamic part of the economy of Nanjing. Their local value added tends to be higher; they have stronger interrelations with universities and researches centres and cooperate more often with each other. Also government policies seem to be more successful in this case and the high potential is linked to their increasing export achievements.

The physical location of the ICT industry in Nanjing

Nanjing is the capital city of Jiangsu province in China and counts more than 6 million inhabitants. Nanjing consists of 6 urban districts, 5 suburban districts and 2 (rural) counties. Nanjing was an administrative centre and the capital of China from 1912 to 1949, with an interruption during the Japanese occupation, when Chongqing became the capital. It is now an important business centre in the eastern part of China. For the ICT sector the following five districts are in particular important, because ICT activities are concentrated in those districts:

1. Xuanwu district with an ICT cluster (defined as a strong spatial clustering of ICT activities) on Zhujiang Road in the centre of the city and the location of the Jiangsu Software Park
2. Gulou district with the Nanjing university-Gulou district nationally approved university Science and Technology Park in the western part, extending to the north west until the river
3. Jiangning district in the south, where the Jiangning High Tech industry development zone is located
4. Xixia district in the north east, where the Nanjing High Tech development zone is located
5. Pukou, in the north west of Nanjing, where the High Tech development zone is developed, and where the so-called Nanjing Software Park is located.

Originally the borders of the city were natural borders: a river in the north and east, a small lake and a mountain in the northwest and a smaller river in the south. The historical development of the city can be traced from any map showing the old walls. The walls defended the centre and only at the beginning of the 20th century the real expansion across the walls started. A relatively old industrial area is located towards the northwest and in fact the Nanjing economic and technical development zone, which is located there still mainly regroups traditional manufacturing industries. This part of the city was less well connected until recently, but the second bridges, the tunnel under the lake and a complex of ring roads north of the lake have improved access recently.

Between the two world wars the extension to the south started and resulted in the nineties in the incorporation of the rural district in the south, Jiangning, which is located on the way to the airport. This district now has the most modern high tech industry development zone, with companies like Ericsson and Siemens. More recently the city has expanded across the river, stimulated by the building of the first and the second Changjiang river bridge in 1968 and 2001 respectively. Currently new extensions also go further in the direction of the airport located in the southeast. The southern part of the city is popular for enterprises because of the available space and infrastructure.

Nanjing is considered the centre of a so-called megalopolitan areas. The construction of such a megalopolitan area around the city has been given great importance by both government officials and experts since it was first planned in March 2002. The megalopolitan circle around Nanjing contains Zhenjiang and Yangzhou in Jiangsu province and Wuhu, Ma’anshan and Chuzhou and part of Chaohu in Anhui province as well as the southern part of Huai’an in Jiangsu province (China Business Weekly 9-9-2003). It is important for Nanjing since that city plays the role of centre of this urban hierarchy and as such it is an important market place for more advanced products such as computers and software.

Currently there are two real big software parks in Nanjing, one approved by the national government and created by the city and one initiated by the provincial authorities and created through a joint stock company with several Nanjing enterprises as shareholders. The first, the Nanjing Software Park, counts 130 enterprises and has a turnover in software of 1.2 billion RMB. The other, slightly older, Jiangsu (province) Software Park counts 171 enterprises and had a turnover of 2 billion RMB in 2002. Recently the Xuanwu district authorities have set up the Zhuijiang road software industrial park to attract foreign investments. It started it activities in 2003 and although initiated by the district it also operates as a joint stock company. Finally the Southeast University with the Xuanwu district has created its own Tech Park, approved by the national authorities in the centre of the city in 2002 and called a University Tech Park.
The software sector in China and Nanjing

The Chinese government is really trying to develop a software sector in China and in particular in Beijing, Shanghai and Nanjing. At the moment Nanjing counts 284 software companies or half of the total number in Jiangsu Province (data from local government Nanjing). At the national level the city comes at the third place after Beijing and Shanghai. The number of employees in the sector is estimated to be 13,000 (Nanjing only, data from Nanjing municipal statistics bureau website). Together these companies generated a turnover of 57 billion RMB in 2002. This represents an increase of 45 percent compared with 2001. This growth can be explained by the promotion policy of the different levels of government and the opening of the three parks, which started in 2001, 2002 and 2003 respectively. Even more remarkable is the total export of software. For Nanjing alone this amounted for software 16.58 million US$ in 2002 (Nanjing municipal statistics bureau website)!

As an illustration of the efforts to promote the software sector the visit of the Chinese prime minister to Bangalore, the Indian capital of software, can be mentioned (Van Dijk, 2002a). However the sector itself is also very active and announced recently that they are trying to establish joint software standards with Taiwan, to promote exports (China Daily, 9-9-2003). At the same time a ‘war on software piracy’ is announced. The copyright administrations in different provinces have started a month long special action against pirated software. The National Copyright Administration launched it as a move to support the development of China’s own software and electronic industries.

There are now also some initiatives to cooperate with India in software development. It has been suggested to use the same CMM (Capability Maturity Model for software, the software development standard), which usually comes from the United States of America (USA), but sharing it would make cooperation much more easy.

The theoretical framework

Earlier research focused on competitiveness and the differences between different types of clusters. Van Dijk (2002b) suggests a classification of clusters according to the geographical level, ranging from a national to a suburban cluster (the levels distinguished are national, regional, city-wide, inner city and suburban cluster) and emphasising the role of networks in these clusters (Castells and Hall, 1994).

As part of his PhD research Wang developed a theoretical framework that is depicted in figure one. The development of software is put in a global value chain context and the key actors at the local level are named. Besides the software companies these are the local government, the Nanjing Software industries Association (set up by the local government in particular the Nanjing Municipal Software Development Office), service agents (the business support system) and universities and research institutes. The nature of their interaction is very much the topic of this research.

Methodology and survey

The questions directing this research are: what policies are pursued at different levels of government to promote Nanjing as an ICT city and to what extent the dispersed districts together with the city centre cluster are indeed developing into a city-wide cluster because of...
the developing complementarities between them and the active role of a community of software producers.

Building on the previous research (Wang and Van Dijk, 2002) the questionnaire focused on the following topics:
1. Basic information (q. 2-5), including initial investments sources (q. 5-7)
2. Type of activities and growth (q. 8-9)
3. Labour market issues (q. 10-15)
4. Innovation (q. 16-18) and information exchange (q. 22-23)
5. Origin of equipment and material (q 21) and relations with suppliers (q. 24-26)
6. Relation with customers (q. 27-30) and relation with competitors (q. 31-40)
7. The relation with the Nanjing Software industries Association (q. 42-43) and the business support system for software companies (q. 44)
8. The relation with local universities (q. 45-48) and other enterprises (q. 54)
9. Location factors (48-49)
10. Barriers to development and the role of local government (q. 50-53)

The main results will be discussed in that order, before drawing a number of conclusions related to the topic of this paper.

The survey results

1. Basic information, including sources of initial investment
Nanjing counts three software parks, the Nanjing Software Park, the Jiangsu Software Park and the Zhujiang Road Software industrial park. Most of the companies interviewed were located in these parks. Their development has been very rapidly in the last few years, because of the promotion policy of the government and the take off of the three parks.

Of the 50 software companies in the sample only one was a state-owned enterprise. The majority were joint-stock enterprises (17) or private enterprises (15). It is remarkable that there were also 7 joint ventures (usually with international companies) and three collective enterprises (and eight others).

One third of the companies interviewed employ between 21 and 50 employees. However, eleven employ between 51 and 100 and 12 even between 101 and 300 employees. This indicates that the average size is much bigger than in the case of Zhujiang Road. In terms of turnover most of them (38%) are in the range of 1 to 5 million RMB per year.

It should be noted that a few large software companies generate 70 percent of the turnover of the whole sector in Nanjing. The biggest 11 enterprises each have over 100 million RMB turnover and together generate 70 percent of the turnover. Among the others there are another 57 enterprises with a turnover of more than 10 million RMB (Nanjing Municipal Statistical Bureau website).

The founders of the company are the main source of funding for these enterprises (31 cases). Local large companies funded nine software companies and large companies based elsewhere, financed seven. Only three have received a loan to start, while six were supported by venture capitalist. Also for additional finance more than half would rely on the founders of the company, or on the large local mother (18 %) or the large mother company located elsewhere.
(16%). The share of entrepreneurs using venture capitalists, foreign companies and loans from local banks would be 18, 16 and 4 percent respectively.

The enterprises can mainly be found in the Xuanwu and Gulou district. If the Baixa district, which is just south of these two districts and where office space is relatively cheap, is added, these three districts are good for 77.8 percent of the software enterprises, 60.9 percent of the employment and 58.5 percent of the turnover in the software sector in Nanjing. Xuanwu alone counts 88 enterprises with 3056 employees and 1.525 billions RMB as turnover (Nanjing Municipal Statistical Bureau website). The district benefits from the large number of universities located there, while Zhuijiang Road is nearby which facilitates sourcing at Zhuijiang Road and provides access to the companies in the Jiangsu Software Park, which is also nearby. In fact one could consider Gulou, Xuanwu and Baixa districts together make up one big inner city ICT cluster in terms of Van Dijk (2002b).

2. Type of activities and growth
Nanjing has the advantage of counting many universities and research institutes. This has helped to develop specific software products. In particular the following products have been successfully developed:

- software focusing on network security (for example Nandasoft)
- system application platform software
- bank and stock market management systems
- power automation and management software (two or three companies, for example Nari Tech)
- telecommunication and telecom network management software

According to figures from the local government the High-voltage protection software of Nari Relays supplies up to 50 percent of the national market in China. The Power network control systems and power station software of Nari Tech are good for about 20 and 40 percent of the national market respectively. The development of the power and telecom related software might have been helped by the presence of several power plants and telecom companies and the fact that Nanjing is the seat of the provincial government. However, as the figures indicate their market is much larger.

The development of security related software is very much linked to the fear in China to become to dependent on foreign software. The fear is that confidential material may become available to a larger than intended audience.

The specific nature of Chinese software should be underlined. Most of it is Chinese, using characters, but some of the software is in the English language. This limits its usefulness to these Asian countries where similar character sets are used. We found that exports are also mainly directed to these countries: Japan, Hong Kong and Singapore. The Chinese language has many characters in common with the Japanese, which facilitates working for Japanese customers.

Foreign companies have spotted the potential of Chinese software and are currently coming in through their own ventures or joint ventures (20 % of our sample), through joint projects and through subcontracting. Some of the big ICT companies have also set up research centres in Nanjing to use the technical and human resources available in this city of 6 million people with some 30 universities and colleges. The Chinese government is actively encouraging local firms to learn from multinational through co-operation (China Daily, 6-9-2003): “the capital,
technology, management expertise and network contacts that multinationals bring along with their investments in China are good resources for Chinese enterprises”.

We observed two types of enterprises in the software sector. At the one hand there are the product type companies and on the other hand one finds the project type companies. In the first case developing a trademark is interesting. In the second case being part of a network that generates these projects is important.

Asked for changes in their production, profits and exports only 10 percent reported no change. 44 interviewees increased their production capacity, 45 their quality, 41 their revenue and 40 their profit (out of 50; usually half of them report a small increase and half a substantial increase). Half of the sample does not export or did not see a change in their exports, but seven interviewees mentioned a small increase in exports and one an even large increase.

Most of the software producers are optimistic about the future. Asked to indicate their priorities (more than one answer was possible) most wanted to invest in new product development (33), or in technical development related to the existing products (32). Marketing scores third. Like in the case of Zhujiang Road it is recognized that good technicians are not necessarily good marketers and may need some planning or assistance in that field.

3. **Labour market issues**

High skilled workers for the software industry are difficult to find. Employment in the enterprises interviewed usually increased a lot (44%) or somewhat (44%) during the last year. Only four enterprises said that employment remained stable and two that it declined somewhat. 44 percent of the interviewed software managers mention that the number of people leaving has increased somewhat. The other software producers (36%) note no change or even a small decrease in the number of people leaving (16%). Although the problem is similar to what was found on Zhujiang Road (Wang 2000), the software producers are seeking solutions by suggesting organizing training courses and by indicating that they like linking up more with the universities and training institutes of Nanjing. The most important factors to be improved are better living conditions (improved housing and infrastructure) and more urban amenities, in the field of sports and culture.

In fifty percent of the cases future employees are recruited because they contacted the company for a job. Most enterprises also advertise. They also mention special personal relations as an important way to recruit employees. Only 12 companies have used headhunters. At present most of the training takes place within the company. Only seven software producers use local universities or colleges for that purpose and 6 make use of specific training institutes.

4. **Innovation and relations with suppliers**

Innovation is generally considered important for developing countries and in particular the development of new products is considered a priority by most of the managers interviewed (Van Dijk and Sandee, eds, 2002). Innovation has to come from the enterprise itself and in a small number of cases from an alliance with other local software producers or through purchasing locally or internationally developed advanced products. The most important sources of inspiration for innovations are customers. Good communication with them is preferred over communication with suppliers or visiting other enterprises.
Half of the entrepreneurs interviewed mention that suppliers do not provide market information about other companies, for example competitors producing similar software. However, 22 (44%) mention that they do! The majority of the software producers (84%) do exchange ideas or information with their suppliers, however. The relation with large suppliers is highly valued and a commitment to a long-term relationship is mentioned most often as a very desirable development. The software producers prefer to base this on a contract. Undertaking joint activities to improve the software products is also mentioned very often as important. The same order of preferences (long term relations and then developing joint activities) is found for the relationship between software producers interviewed and small suppliers.

The major problems with supplier are the high price and low quality with on the third place the low speed of delivery. Distrust between software producers and a supplier is mentioned by eleven producers as the major barrier between them and them suppliers.

5. Origin of equipment and material

Equipment is usually bought locally (30%), or elsewhere in China (34%). Only six software producers buy most of their equipment abroad. For raw materials the picture is 44 percent buys them in China, 26 percent locally and 8 percent (four entrepreneurs) buy raw materials abroad. The picture for components and other supplies is largely the same. Again four producers need to buy most of their components abroad. This shows that much is available in China and that only in ten percent of the cases the major suppliers are located outside China.

6. Relation with customers and relation with competitors

The Chinese domestic market is mentioned by 68 percent of the interviewees as the most important outlet. This clearly distinguishes this sample of software producers from the entrepreneurs interviewed at Zhujiang Road, who sold in particular to local and regional customers. In the software producers case only 22 percent of the customers are in the region and only six percent are local customers. These figures show an outward orientation of the software producers, which is confirmed by the two software producers that state their major market is abroad.

The best way to build a lasting relation with customers is to sign a business contract according to 34 percent of the software producers. Using a social network is mentioned by a number of entrepreneurs, while family networks is only the preference of one of the managers interviewed. The second way to build a lasting relationship with customers is through a good price/quality relation. This is the first choice of about one third of the people interviewed (17 interviewees).

Most entrepreneurs sell directly to their customers. Only a few use a wholesaler or a retailer. In a limited number of cases use is made of a sales agent or cooperation with other firms is sought to sell the software. Two third of the software producers is frequently communicating with their customers. They try to listen to suggestions concerning the improvement of their products and prefer informal ways of communicating.

Most interviewed software producers mention other large or medium scale companies as the main competitors. Only in one case small enterprises are considered a real challenge. 36 interviewees have experience with cooperation with other companies, while only 12 have never worked with others. The most common form of cooperation is joint marketing with joint product development on the second place. Other, more rare forms of cooperation are
joint renting of equipment and joint training efforts. The explicit objective of cooperation is usually enhancing the specialisation of the company. Other objectives that are frequently mentioned are integrated market development, the improvement of the quality of products and the reduction of the cost of the product or service delivered.

Three quarter of the interviewed software producers visits other local companies in the same branch. In 64 percent of the cases they have also been visited themselves. They consider the best way to build a relationship with other companies is developing private relationships with high managers or engineers in other companies. Secondly meeting of personnel may be a good way and the Nanjing Software Industrial Association and its regular meetings is considered a good way to build relationships with other companies.

These relations have led in 17 cases to outsourcing activities. Usually to domestic or local enterprises, but in three cases to regional enterprises and in two cases to foreign firms. The objective of outsourcing is enhancing specialisation and reducing costs (both mentioned 11 times). Also the increased opportunities for innovation (9 times) and the improvement of the quality of the product (3 times) are mentioned.

7. The relation with the Nanjing Software Industry Association and the business support system

Most of the software producers interviewed were already member of the Nanjing Software Industry Association, but eight first wanted to get to know the organisation better. For that reason they attended the annual meeting where they received the questionnaire. Many were interested in the results of this survey because they expected that the Nanjing Municipal Software Development Office would act upon the results of and recommendations based on such a survey.

Reasons for joining the Association were in the first place to change government policies (mentioned 40 times). Secondly, getting more market information is important (37 times), while others hope membership will lead to standardisation in the software sector. Other reasons mentioned are getting technical support (15), getting consultation on legal matters (13) and getting training opportunities (11). These figures prove the importance of government policies and activities for this sector.

The business support system is considered important, in particular access to accounting services, to legal advise and to training; in this order. Interesting enough access to credit is only mentioned a few times.

8. The relation with local universities and other enterprises

Ten enterprises were started by university staff or students. Ongoing long term relationships with local universities are reported by 26 percent of the software companies. Only six percent has never cooperated with universities, showing that the others have done projects with research institutes and institutions for higher education, sometimes (16) or often (18).

In particular the software companies interviewed have hired specialists from the university as advisors. Secondly they worked on technical issues and finally students may have taken up part-time employment in their company. Only two companies were not aware of the high density of research and training institutes in Nanjing. 52 percent of the software producers considered this a very important factor to be in Nanjing and another 44 percent mention it even as the critical factor.
9. Location factors
The factors mentioned most often for locating their business in Nanjing are the business friendly environment. A prior relation with a local company, access to skilled labour and a low tax burden were also mentioned as important location factors.

10. Barriers to development and the role of local government
Exporting software products turned out not to be easy for the smaller and medium size software companies. Five big software companies have set up the Nanjing Software export alliance, which may have favourably contributed to the strong increase in software exports reported above. However, the small software companies don’t have the same opportunities to export and look at the government for help.

The managers see the role of local government as helping them to improve the competitiveness of the ICT sector. 26 consider such a role very important and 21 even critical, leaving only three interviewees unaware of the important role of the government. The interviewees count on the local government to change policies in their favour, but consider the locally available science and technology basis an important factor in favour of settling in Nanjing. The first thing the entrepreneurs desire is more favourable policies towards the software sector. Secondly, they expect local government to operate more effectively and efficiently. Improving the local infrastructure (transportation and communication) is the third priority.

In the case of Zhujiang Road the role of local government was limited to providing space and some common facilities: accounting support, security and tax advise. However, in the case of the software producers the support goes much further, including facilitation of credit, helping to establish contacts with universities and promoting relations between the different software companies. This seems to be a more appropriate role and played with more success to judge from the results of this survey.

The feeling exists that the government favours in particular the bigger companies and does not see the interest of promoting the small and medium size software companies to graduate. The challenge is to find effective ways of supporting small and medium size software companies, which are WTO compatible. Secondly, the government and the Nanjing Software Industry Association should look for ways and means to promote the relations between small and larger software companies. It can be noted that this tends to be easier in clusters, where entrepreneurs can easily exchange ideas with their colleagues and where an atmosphere of cooperation and competition can be created. Experimenting with subcontracting and joint products may be stimulated by physical nearness (the cluster) and existing networks (the Nanjing Software Industry Association).

Conclusions
China’s information and communication technology industry has become the third largest in the world and a major income earner (China Daily, 27-9-2002). However, the same article stresses that China should change its image as a low-end manufacturer by increasing the technology content and controlling the patents of high–tech products.

Development zones have become important and overseas funds invested in these development zones accounted for 65.8 percent of Jiangzu province’s total contracted overseas funding
(China Daily, 16-5-2001). However, the conviction is growing that the market and not the government should develop technology parks (China Daily, 27-3-2002). Government’s support, especially favourable land transferring policies is considered essential, but “only the market can test and improve their operations”.

In Nanjing there are several high tech zones and the linkages between these zones and the inner city network that we studied could be developed further, to turn the whole ICT sector in Nanjing into a real city-wide dynamic high tech cluster. Suggestions for the relevant policies at different levels of government can be made (Van Dijk, 2002c).

The creation of two software parks in neighbouring districts by two different authorities, but both within Nanjing is an example of uncoordinated activities of local and provincial government (Van Dijk, 2002c). It shows the absence of intervention or co-ordination of higher levels of government, or a conscious promotion of competition between different levels of government.

The recent development of software activities in Nanjing has been extremely fast. We can no longer say that Nanjing is mainly a hardware-producing city, with a large number of outlets for computers and computer related activities at Zhujiang Road. The role of different layers of government in speeding up this growth process has been important and not been reported on empirically earlier. The other reasons for the rapid development of the software sector are the success so far of two of the three software parks and the co-operation between software producers in practice and through their Nanjing Software Industry Association.

In fact we have seen a community of software entrepreneurs developing, using the opportunity their Nanjing Software Industry Association offers to influence government policies and to achieve a more positive environment for the further development of their activities. Secondly they want to improve relations in the local network. Relations with customers are mentioned most often, but better relations with government score second and with universities third. More than half the software producers also want to improve their relations with suppliers. Finally, improved relations with other large (19 times) and small enterprises (20) are often mentioned.

The importance of the Nanjing Software Industry Association suggests that there is some kind of community. Typically the interrelations between these software entrepreneurs are more developed than among the 1500 small ICT enterprises in Zhujiang Road that we studied earlier (Xuanwu district government website and Van Dijk and Wang, 2002). We noticed some 150 entrepreneurs participating in the annual meeting and received positive reactions to our study as shown by the high response rate (one third returned the questionnaire).

The enterprises did receive real support from local government and it was often more appropriate than what we found in the sample of small ICT enterprises on Zhujiang Road (Van Dijk, 2003). It should be noted that the local value added generated in this software sector is probably much higher than what the shops and workshops on Zhujiang Road generate.

Concerning the software sector, one notes once again that the Chinese government has a clear strategy and puts in place the resources necessary to implement it. The mayor recently mentioned she expects Nanjing to count 1000 software companies by 2005! The government certainly wants this software cluster in Nanjing to take off and thinks about a citywide cluster
and not just an inner city cluster. This requires some co-ordination between the different districts concerned, which was sometimes missing in the past. A strategic plan to develop the software cluster in Nanjing should be developed at the municipal level and be implemented with the concerned districts.

The software producers of Nanjing are not only integrating in a local value added chain they are also becoming more and more part of a global value added chain. The relationship goes in two directions. One through the supply chain and secondly because the world starts buying these software products. The software producers buy in the global market the more sophisticated equipment they need and advanced software that is not produced in China. They offer their software, either as part of joint projects, or tailor-made for a customer. Contrary to India a number of own products with trademarks start to develop. These may eventually also be able to conquer a place in the world market under their own trademarks. We refer in particular to the security, power and telecommunication related software. It is, however, much more difficult for the smaller software enterprises to develop and market their own trademarks.

We conclude that the emerging software sector makes a dynamic contribution to the economy of Nanjing. Their local value added is high and the companies have started to export. They develop and have developed interrelations with universities and researches centres and cooperate more often with each other. Government policies seem to be more successful in this case and the high potential is linked to their increasing export achievements. Even if Zhujiang Road does not have the same potential, it is now part of a complex city wide cluster and contributes to the overall performance of this cluster. Clearly a community of software producers has developed and is negotiating with the local government to create the right environment for the further development of their company.

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Notes

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4 That research was based on an survey of 50 ICT companies in Zhujiang Road and concentrated on an inner city ICT cluster in Nanjing (Van Dijk, 2003a). It concerned the ‘electronic road’ in the city, where computer related shops and services are concentrated.

5 The focus of the research changed from studying an inner city cluster, to trying to determine whether Nanjing is an example of a city-wide ICT cluster based on a developing software producers network.

6 Six cities in East China’s Jiangsu and Anhui provinces planned a similar magalopolitan development.

7 The rate is 1$ equals 8.27 RMB during the field work.

8 The major in a recent speech mentioned the figure of 400 enterprises. This would be 40 percent of Bangalore’s total (Van Dijk, 2002a).

9 The interviews allowed determining the relations between the enterprises in the district and buyers and suppliers outside the district. In the same way the relation between the enterprises in the district and research and development institutions (R&D) in or outside the district were studied. Additional information was collected on the ICT enterprises in the other districts and the policies of different levels of government to promote the ICT sector in Nanjing.

10 Which is part of the Nanjing Municipal Science and Technology Bureau.