



Global Wireless Ventures

In November of 2002, Bjorn Magnusson, Theresa Byers, and Kai Leung Ping, the cofounders of Global Wireless Ventures, had to select the best location to establish the new worldwide headquarters of their new company. Global Wireless Ventures was a startup that was developing a killer application for mobile business professionals and it had the potential to revive the wireless-internet services marketplace. Wireless-internet services were in the doldrums, due to the worldwide recession, and the uncertainty about the future in the wake of terrorist attacks on the World Trade Center and the Pentagon in September of 2001.

The founders of Global Wireless Ventures were three friends and colleagues who had worked together for four years at NTT DoCoMo, helping to create a phenomenally successful market for wireless services in Japan. Bjorn Magnusson had graduated with a Ph.D. from the department of TeleInformatics at the Royal Institute of Technology (KTH) in Kista, Sweden. Theresa Byers had earned an undergraduate and masters degree in Computer Science at Stanford. Kai Leung Ping had completed an undergraduate degree in Electrical Engineering at National University of Singapore, and an MBA at the Harvard Business School. All three had learned Japanese in their undergraduate years, and had taken jobs in Japan with NTT DoCoMo in 1998. They wanted to be at the forefront of the wireless-internet services revolution and believed that it would become a major global market. They had learned a lot in their years with NTT DoCoMo, and in 2001 decided that they were ready to launch a new company of their own. Working nights and weekends, they developed a prototype of a new application for mobile business professionals. Following that, they demonstrated their prototype to a small circle of venture capitalists who were considered to be the world leaders in funding wireless-internet ventures.

Global Wireless Ventures had received multiple term sheets from leading venture capitalists (VCs) in three high-tech regions: Stockholm/Kista in Sweden, Singapore, and Silicon Valley. The VCs were convinced that Global Wireless Ventures had enormous potential. They offered copious quantities of "smart money," with reasonable terms and only one catch. The founders had to locate the headquarters of their new company in the home region of the VCs whose term sheets they selected. After careful analysis of the VCs offers, the founders were convinced that none of the firms or the term sheets had a clear advantage over the others. Previously, the cofounders had also visited all three locations and believed that they could be happy living in any of the three locations. Eventually they would need operations in all three regions. The issue facing them in November 2002

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was: What place offered the best context to launch the company, and to serve as the home base for Global Wireless Ventures?

Overview of the Wireless Industry

In 2002, the wireless industry had become very large and complex. The number of wireless subscribers had quadrupled from less than 200 million in 1997 to 770 million by the end of 2001. There were many players, ranging from start-ups to multi-national companies that formed different parts of the value chain. To describe this industry better, a framework was developed to help understand the different segments of the market. The five segments of the framework are described briefly below, and **Exhibit 1** shows a pictorial representation of the wireless segments.¹

The first segment of this space consisted of the wireless component providers. These players were the innovators at the component level. They produced components such as chipsets and antennas that allowed devices to communicate with the different wireless protocols that were available. The key players in this space were Conexant and Intersil. Both of these publicly traded companies were formerly divisions of larger technology companies, namely Rockwell International and Harris Semiconductors. They were spun off in 1999 and focused on providing communications integrated circuits (ICs). Due to the uncertainty of this space and the many standards available, this was a key breeding ground for many start-ups such as Atheros, Cambridge Silicon Radio and ArrayComm.

The second segment was the network equipment suppliers that made the physical infrastructure that was needed to make wireless networks function. They designed and manufactured the radio base stations, the receivers, the switches and other components of the network. Ericsson dominated the wireless infrastructure market with a market share of about 34%. Other key players in this market were Nokia, Motorola and Lucent. In 2001, the valuations of these companies suffered a significant decline. This was a result of the drastic capital expenditure reductions of their customers - mobile service providers. However, with the pressure to upgrade their networks to support 3G, analysts believed that it would not be long before this segment would pick up again. Looking ahead at the 3G contracts that had already been signed, Nokia had increased its market share and was currently competing head-to-head with Motorola. Traditionally, the network equipment manufacturers had sold primarily to carriers who build extensive wireless networks for the enterprises and the consumers. However, with the increased popularity of Wireless Local Area Networks (WLANs), players in this segment had started to target enterprises and consumers directly. Due to the evolving marketplace, this segment was also rich with start-ups, such as NetGear or FHP Wireless who were trying to carve out a piece of the pie for themselves.

The third segment was the end-terminal manufacturers. This segment was divided into 5 sub-segments - Laptop Manufacturers, Mobile Phone manufacturers, Personal Digital Assistant (PDA) manufacturers, Automotive Telematics and Wireless-Enabled Appliances. Mobile phones were traditionally the end-terminals of a wireless transmission and were the key product in this space. Although laptops and PDAs had become increasingly popular over the last 5 years, most of them were not wirelessly connected and had to be plugged into a fixed Ethernet connection for network access. The increasing importance of mobility and connectivity suggested that these two sub-segments could potentially become key growth areas. Although voice transmission would continue to be the key application for mobile phones, data transmission was the key usage for the laptops and PDAs. The automotive telematics sub-segment was still nascent in 2002, and automobile companies had started implementing navigational equipment in their vehicles using Global Positioning System. (GPS) This was still a very expensive option and thus a relatively rare

¹ For more information on the wireless industry and a detailed explanation of the framework, refer to "Wireless Industry in 2002"

occurrence. The final segment, wireless-enabled appliances was also a very new segment. This space included printers or digital cameras that were fitted with a wireless receiver module thus allowing the equipment to receive wireless data, usually using the Bluetooth protocol.

The fourth segment consisted of the carriers who were mobile service providers. The players in this space were companies that licensed the spectrum from the government, bought infrastructure from the network equipment manufacturers, deployed the infrastructure and provided wireless services to individual consumers or corporate users. They also served as the distribution channel for mobile phone manufacturers. Examples of mobile service providers in the U.S. included AT & T, Sprint, Verizon, and Cingular Wireless.

The final segment, wireless software providers, was divided into 3 segments depending on their customer types. These segments were 1) Carrier-Focused. 2) Enterprise-Focused. 3) Consumer-Focused. This sub division further highlighted the complexity of this space, because of the different services that each segment needed. The carriers needed software applications that could improve the network management and to provide value-added services to their customers. Enterprise-focused companies were trying to provide software that could help to extend company operations over wireless networks, or business software that could leverage the wireless capabilities that corporations had set up. Finally, consumer-focused companies provided mobile applications for individuals, and this included mobile gaming, content aggregators, scheduling and other software. This segment was probably the newest in the entire wireless space, and many start-ups were rising up to create software that could use the wireless networks of the future.

A comparison of the different wireless clusters

There were many hotbeds for wireless clusters all over the world in 2002. Some of the most innovative centers were in Tokyo (Japan), Kista (Sweden) and Helsinki (Finland). This was partly due to the dominance of wireless giants such as Ericsson, Nokia and NTT DoCoMo, the presence of sophisticated wireless users and the high penetration rates of wireless technology in these regions. Other technology clusters such as Silicon Valley in the United States and Israel had also developed wireless clusters that meshed intricately with the existing Information Technology clusters. There were also some important regions such as Singapore, Hong Kong, and Taiwan that were less renowned as innovative centers for developing breakthrough technologies. However, they had a high wireless penetration rate and were early adopters of wireless technology. **Exhibit 2** and **Exhibit 3** divide the world into 5 regions, America, Europe, Asia Pacific, the Middle East and Africa (MEA) and the Rest of World (ROW). Although the penetration rates for Asia Pacific was relatively low, it had one of the highest in absolute numbers of mobile subscribers because of the high penetration rates of advanced countries such as Japan, Taiwan, Korea and Singapore. **Exhibit 4**, **Exhibit 5** and **Exhibit 6** further breaks down the data into the individual countries.

To further describe these regions better, four different axes were used to analyze the development of these wireless clusters.

The first axis was to compare consumer-orientated technologies vs. enterprise-orientated technologies. The wireless industry in Asia and Europe seemed to be focused in providing services to the consumer, whereas the wireless industry in the United States seemed to be more focused on enterprises. Many analysts believed that cultural differences might be one of the major reasons for the deep penetration rates of wireless cell phones in Asia compared to the United States. In technologically advanced Asian countries such as Singapore, Hong Kong or Japan, almost every teenager had a cell phone. The "coolness" factor was measured by the sophistication of electronic gadgets owned. This could range from the latest Sony Playstation to electronic pets that were in fashion in the late 1990s. Furthermore, a greater proportion of the population in Asia and Europe commuted to work using public transportation and thus found the cell phone critical in making

“dead-time” useful. On the other hand, most of the U.S. population commuted to work by cars, and thus cell phones were less convenient. As a result, wireless technologies in Asia and Europe appeared to be tailored more towards the consumer market. In the United States, companies had extensive IT departments that implemented enterprise-wide software, such as Supply Chain Management (SCM), Customer Relationship Management (CRM) and Enterprise Resource Planning (ERP) software. These technologies had become highly integrated into the enterprise and were key components to the daily operations of the company. Many companies wanted to extend these applications wirelessly so that their employees were able to leverage these resources even when they were out in the field. U.S. companies were also more aggressive in adopting new technologies and integrating it into their organization than other countries. As a result, wireless technologies in the United States tended to be orientated more towards the enterprise.²

The second axis was to compare telecommunications-oriented vs. computing communications-orientated technologies. Although the Sweden-Finland region and Silicon Valley were all considered highly innovative wireless centers, Scandinavia came from a telecommunications perspective, whereas Silicon Valley came from a computing communications perspective. The presence of telecommunication giants such as Nokia and Ericsson were the driving force behind the growth of the wireless cluster in Scandinavia. Since these companies were primarily telecommunication equipment manufacturers, the innovation tended to be targeted towards the needs of these giants. Silicon Valley on the other hand did not have wireless gorillas that threw their weight around. However, in Silicon Valley, the presence of other clusters, such as the microelectronics cluster and the information technology cluster fostered an environment that tackled the wireless problem from a computing angle.

The third and fourth axes were somewhat related. The third axis was the speed of wireless innovation and the fourth was the speed of adoption of wireless technology. In wireless clusters such as Silicon Valley, there was tremendous technological innovation in the wireless space. However, the deployments of these technologies were still found to be lacking. Regions such as Singapore and Hong Kong did not have much innovative *development* of new wireless technologies, but they had been the most aggressive in *deployment* of wireless technology. These included the latest Nokia cell phones and Cisco 802.11b access points. Sweden and Finland had high levels of technology innovation as well as deployment. The low penetration rates in Silicon Valley were primarily due to the scarcity of spectrum as well as the fragmented wireless space that had retarded the deployment of wireless technologies. The low innovation rates in Singapore and Hong Kong were a result of the scarcity of wireless experts and technological innovators. Scandinavia and Japan did not suffer from either of these problems and thus were able to have deep innovation centers as well as extensive deployments.

The founders of Global Wireless Ventures had to analyze the three different regions - Silicon Valley, Sweden and Singapore. **Exhibit 7**, **Exhibit 8** and **Exhibit 9** show pictorial representations of each of these wireless regions, using the wireless framework that we developed earlier. The size of each component represents the importance and strength of its influence. Each of the exhibits is divided into two parts. The top half represents the internal forces within the wireless cluster, and the bottom half represents the external forces that were influencing the clusters.

Silicon Valley Wireless Cluster

Silicon Valley was known as the high-tech entrepreneurship center of the world. Over the last thirty years, some of the most successful high-tech multi-national enterprises such as Intel, Cisco and Oracle were founded in the Valley. However, in terms of wireless innovation, different segments of the value chain were at different levels of maturity. This could be seen in **Exhibit 7** that shows that

² For more information, look at *The Economist*, *The Internet Untethered* Oct 13, 2001

Segments 2 and 4 were still very weak, whereas there was more innovation in Segments 1, 3 and 5. As mentioned earlier in the text, the slow development of network equipment manufacturers (Segment 2) and the carriers (Segment 4) could partly be attributed the scarcity of spectrum in the United States and the lack of a dominant wireless standard. Some industry observers felt that the government should have played a more active role in trying to develop these segments. If the government had intervened to free up the spectrum earlier or stipulated one particular standard, the wireless industry in the United States would not be 2-3 years behind other developed nations in Europe and Asia.

A strong influence to the rapid growth of the wireless software providers (Segment 5) was the presence of the information technology cluster in this region. Experienced software engineers were able to switch from developing software for desktop computers to mobile devices. Similarly, the well-developed microelectronics cluster spurred the growth of the wireless component providers (Segment 1). For the end-terminal manufacturers (Segment 3), there were already incumbent laptop and PDA manufacturers in the region. Thus, it was relatively easy for them to add a mobile component to their existing devices. Although wireless innovation was a relatively recent phenomenon in the Valley, there were already related technologies strongly rooted in the Valley that helped the swift development of these segments.

Silicon Valley also had a strong start-up infrastructure that helped to support the growth of start-ups in this region. Specialized law firms such as Wilson Sonsini and Venture Law Group were experienced in helping start-ups formulate term sheets, and to give appropriate legal advice to help the inexperienced entrepreneurs with their ventures. Other important elements of the start-up puzzle included the presence of Certified Public Accountant (CPA) firms and Investment Banking firms that provided professional services that helped the growth of start-ups. There was also an easy access to research and skilled talent from world-renowned universities such as Stanford and Berkeley. The mature venture capital industry formed another crucial component in the valley. Although the majority of VC firms were still generic, there was a recent trend of VC firms such as Ignition Ventures that targeted wireless start-ups specifically. This strong network infrastructure that supported the wireless start-up industry was vital to the rapid development of this cluster.

Another interesting aspect of the Silicon Valley wireless cluster was the symbiotic relationship between start-ups and the large technology corporations that were in the valley. Large corporations like Cisco were looking to acquire start-ups with technology that had a good strategic fit with their portfolios. On the other hand, some corporations were spinning out divisions in the company so that they could focus on their core competencies. One example would be Hewlett Packard spinning out Agilent. This continuous interaction between corporations and start-ups created a healthy environment for the growth of start-ups, strategic alliances, potential exit strategies, and strong distribution channels.

Singapore Wireless Cluster

The wireless cluster in Singapore was not as innovative as that of Silicon Valley and Sweden. As can be seen from **Exhibit 8**, the only two segments with significant growth were in the carriers (Segment 4) and the wireless software providers (Segment 5). This was partly due to the shortage of technical and entrepreneurial talent in the country, and partly due to the strong presence of multi-national companies that had contributed significantly to the growth of the country in its short history of 37 years. Although there was not much domestic technological innovation, Singapore was one of the leading adopters of wireless technology worldwide.

With an estimated wireless penetration rate of 85% in 2002, Singapore had a very sophisticated wireless community. This had led to many wireless companies choosing Singapore as one of the first target markets for their products. For example, Handspring chose to launch the new

Treo Communicator in Singapore ahead of Europe and United States. In fact, Singapore was the second country world-wide to retail this product, a couple of days behind Hong Kong. Aether Systems also chose to partner with a Singapore wireless software provider (Segment 5), EON Infotech, to provide wireless and mobile computing solutions for the mobile sales force to financial, government and enterprise markets in South East Asia. With a population of only about 4 million people, some companies saw Singapore as an ideal test bed for wireless technologies. For example, Citibank chose Singapore as the first country to offer its new wireless service, Citibank Alerts. This service enabled customers to track their bank accounts, receive the latest news and stock prices through their mobile phones. After successful trials in Singapore, Citibank had continued to roll out this service in other parts of Asia and also in the United States.

Apart from being an ideal test site, Singapore was also often seen as the spring board for companies who were interested in the capturing the Asian market. Since its independence in 1965, many multi-national companies have flocked to Singapore to set-up their Asia headquarters. The state-of-the-art infrastructure, effective communications networks, and a stable government made Singapore the ideal home base for many companies. Furthermore, Singapore had one of the most competitive economies of the world. According to the International Institute for Management Development (IMD), Singapore was ranked the fifth most competitive economy in 2002. However, from 1998-2001, it was second only to the United States. **Exhibit 11** shows the World Competitive Yearbook rankings over the last five years.

Many wireless companies were very interested in Asia for two primary reasons. Firstly, Asia contained some of the most advanced wireless users such as Korea, Hong Kong, Taiwan and Japan. Secondly, it also contained more than half of the world population, especially the untapped markets of China and India. Many analysts believed that wireless technology would leapfrog wireline technology in the less developed countries, as they were easier and less expensive to deploy. Global entrepreneurs could not afford to ignore this market when considering their start-up strategies.

Within the wireless cluster, the carriers (Segment 4) in Singapore were the most developed. SingTel, the leading mobile service provider in Singapore was one of the most advanced carriers worldwide. Although Singapore only had a population of about 4 million, SingTel had moved beyond the domestic market and had more than 16 million subscribers from the Australasian region. The presence of a strong regional mobile service provider in Singapore was one of the key driving forces to the deep wireless penetration rates in Singapore. The strong connections between SingTel and the government also made it possible for them to deploy nation-wide projects more readily.

Another important incentive for these companies to deploy their products in Singapore was the active involvement of the Singapore government in promoting these technologies. The InfoComm Development Authority (IDA) had been the primary driving force in promoting the growth of the wireless industry in Singapore. In October of 2000, IDA launched its "Wired with Wireless" Program that was aimed at developing Singapore into a living lab for wireless development in Asia. One of the interesting projects under this scheme was the Call for Collaboration (CFCs), an open invitation to the wireless industry, both local and overseas, to propose innovative wireless projects in Singapore. Since its inception in May of 2001, 5 CFCs had been issued that focused on different parts of the wireless value chain, such as Mobile Payment, Wireless Java Solutions, etc. CFCs would also be awarded funding to help them deploy their projects. It was too early to tell if these projects would be successful, but they had received significant attention from industry leaders such as Nokia and Sun Microsystems.³ In addition, Singapore had also made great strides as a regional center for higher education. Besides three excellent local universities - the National University of Singapore, Nanyang Technological University and the Singapore Management University, they had also attracted leading universities including MIT, Johns Hopkins,

³ For more information, www.ida.gov.sg

and University of Pennsylvania's Wharton School to set up Asian centers in Singapore. The presence of these research institutes would attract technical and professional talent to Singapore and thus nurture the next generation of technologists.

Sweden Wireless Cluster

Of the three regions under consideration by Global Wireless Ventures, Sweden was the most developed cluster in terms of development and also deployment. **Exhibit 9** shows that all 5 segments had a certain level of maturity. However, the network equipment manufacturers segment was by far the most developed segment in this wireless cluster. This was primarily due to the presence of Ericsson, the gorilla in this space with more than 30% of the global market share for network infrastructure. The Swedish wireless cluster was centered in the Stockholm metropolitan area with the largest concentration of wireless companies located in Kista, north of Stockholm.

It was not possible to discuss the Sweden wireless cluster without Ericsson. Ericsson was one of the first companies to move into Kista when it was established in the 1970s and had continued to serve as the core of the wireless cluster in Kista. Ericsson had also played an important role in standards definition as well as the development of software to complement wireless networks and devices. This rich technological environment had led to the development of many wireless start-ups from all the segments in the wireless framework.

Unlike Silicon Valley where there were a multitude of large corporations that continuously interacted with the start-ups, there was only one major player in the Sweden cluster, Ericsson. As a result, many of the start-ups were developing technology that was compatible with Ericsson systems. Although Ericsson had been the driving force behind wireless innovation in Stockholm, some analysts were arguing that Ericsson's presence was actually starting to stifle innovation because start-ups had to pander to the strategic goals of just one company. As a result, a small but increasing number of wireless innovators were choosing to leave Stockholm for other clusters such as Silicon Valley. On the other hand, many other global industry players were starting wireless research centers in Kista to develop technology that could complement their existing products. Some of these companies included Oracle, Apple, Microsoft, Intel and Compaq. **Exhibit 10** shows a more comprehensive list of the companies that were involved in this cluster and the research areas that they were focusing on. The presence of these big companies and the hundreds of wireless start-up companies in this region had led Stockholm to be known as the "Wireless Valley".

One of the key players in the wireless sector in Sweden was the Royal Institute of Technology (Kungliga Tekniska Högskolan). The university had been the primary source of technical talent and research that fed into Stockholm as well as Kista Science Park, educating one-third of Sweden's engineering talent. In 2000, the university opened an Information and Communication Technology (ICT) university in Kista with the goal of becoming the largest ICT University in Europe. They targeted to have more than 12,000 students by 2010. The venture capital industry in Sweden had also been rapidly developing over the last 5 years. Many of these VC firms were investing specifically in the wireless industry.

Decision Time

In early 2002, Bjorn Magnusson, Theresa Byers, and Kai Leung Ping, reviewed the information about the three regions that they had collected from their web research and discussions with entrepreneurs, venture capitalists, and other industry professionals. As cofounders, they had to select the best location to establish the worldwide headquarters of their new company.

Unfortunately, things were not cut and dried. In addition to the information about each region, they had to think about how the choice of headquarters location might affect them personally

in the months and years ahead. For example, all three were currently single, but looked forward to finding the right person some day, getting married, and having a family. All three also had parents and brothers and sisters still living in their respective birthplaces of Sweden, Singapore, and Silicon Valley.

They knew that the decision of where to start would have unpredictable implications for both the company in its life cycle, and each of them in their personal lives. They wondered how to integrate both the macro and micro issues in an effective way to make the best decision.

Theresa: I think we should come to a decision about the headquarters of our new start-up. The VCs are fascinated both with our technology and our business plan, so we are in a strong position to choose who we want to support us. I don't have a strong preference for any particular VC, so I think we should make our decisions based on the needs of the company and our preferences as cofounders.

Bjorn: I agree with Theresa. The choice of our home base will be very important because it reflects the identity of the company. We need to be careful of the kind of message that we want to project to our customers and partners. I would vote strongly to base our start-up in Sweden, because it has both a strong culture for wireless innovation and a wide base of sophisticated wireless users. Besides, I know the professors at KTH where I earned my Ph.D., and I think we can use my relationships with them to get access to new technological developments from their labs, and to recruit their best students as new employees.

Kai Leung: Although I agree that Sweden is a good place to base our start-up, I'm a little wary about the strong presence of Ericsson and its influences in that region. We want to project ourselves as an independent global company. Besides, I am particularly attracted by the financial incentives that the Singapore government is giving to wireless start-ups, the growth in world class research institutes and the technical talent. But most importantly, I believe that Singapore is the perfect springboard into Asia especially the untapped markets of China and India. On a personal level, I would also like to get back to Singapore. I've been away from home for many years, and I need to return home to take care of my aging parents. I know this is a personal request, but it is an issue that I'm currently facing.

Theresa: I understand your situation Kai Leung. And I think we should definitely take our personal lives into consideration when making this decision. We can't put our whole heart into this start-up if we are worried about issues elsewhere. For the moment, let me play the devil's advocate for Silicon Valley. With its high concentration of hi-tech companies, Silicon Valley could provide us with a strong customer base for our initial product launch. This is particularly important, because our initial product targets the mobile business professionals. If these companies endorse our product, that could be a tremendous boost to our product reputation. I agree with Bjorn that access to a research university will be valuable, and I think that we can use my network as a Stanford alumna to connect with faculty and students with wireless software expertise at Stanford University.

Kai Leung: There seems to be so many different issues that we need to think about. How should we go about making the decision? The VCs want to know our decision by early next week.

Exhibit 1: Pictorial Representation of Wireless Segments

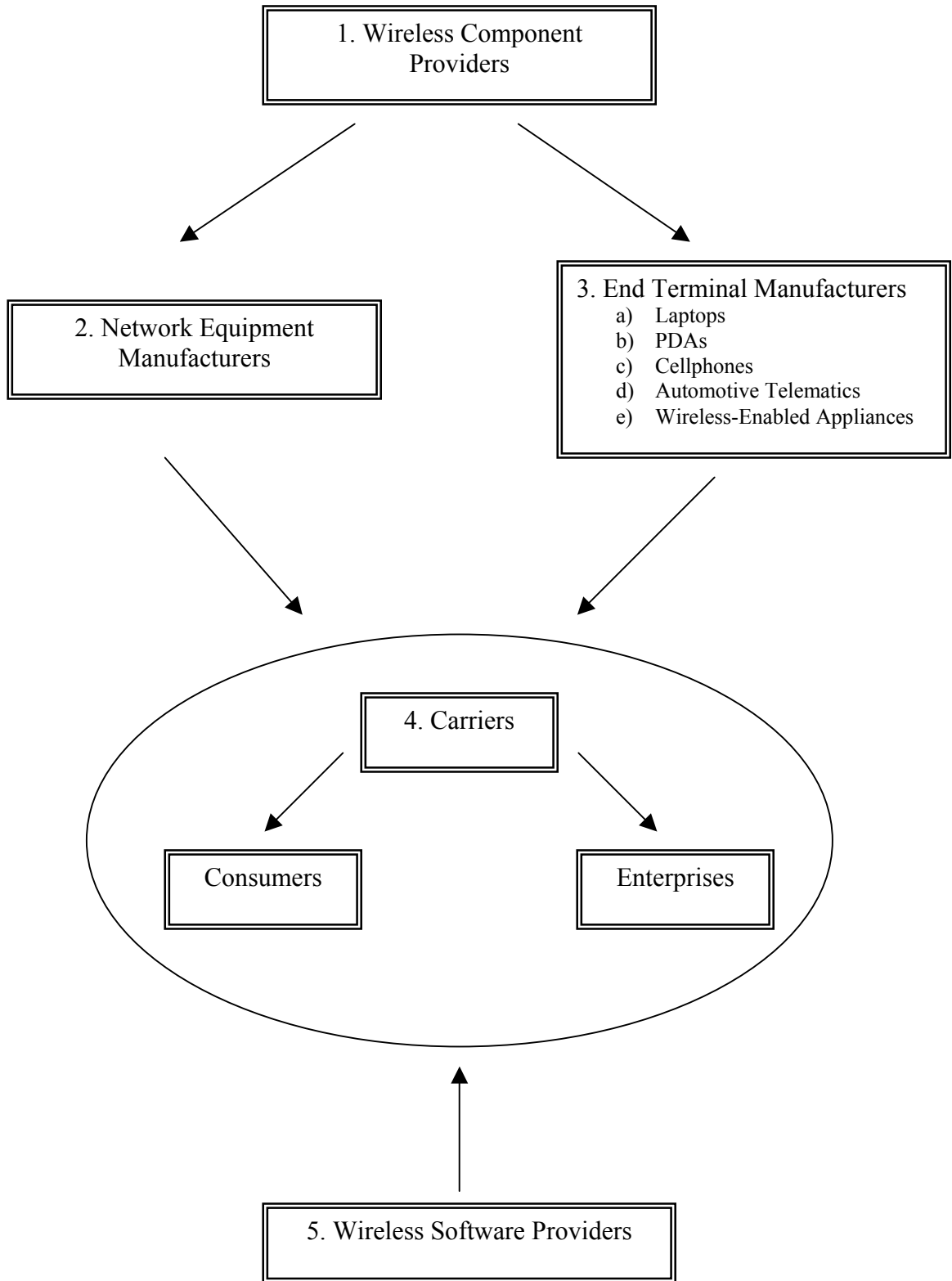


Exhibit 2: Worldwide Mobile Subscriber Forecast By Region (Thousands)

	2000	2001	2002	2003	2004	CAGR 01-04
NA/SA	182,300	222,400	247,897	277,535	300,355	10.5%
Europe	270,200	311,802	338,993	358,218	371,556	6.0%
Asia Pacific	231,900	304,200	356,413	384,235	414,813	10.9%
MEA	43,900	55,000	65,000	73,400	80,100	13.4%
ROW	3,400	5,000	7,000	8,000	8,500	19.3%
Total	731,700	898,402	1,015,302	1,101,388	1,175,324	9.4%
Growth		22.8%	13.0%	8.5%	6.7%	

Source: CIBC World Markets, Global Mobile

Exhibit 3: Mobile Subscriber Penetration Rate By Region

	2000	2001	2002	2003	2004
North America	37.4%	46.2%	51.0%	55.9%	59.8%
South America	12.7%	15.6%	18.0%	20.2%	22.3%
Western Europe	62.8%	71.1%	75.6%	78.3%	80.1%
Eastern Europe	8.3%	11.4%	14.4%	17.1%	19.0%
Asia Pacific	7.0%	9.1%	10.5%	11.5%	12.4%
MEA	5.1%	6.3%	7.5%	8.4%	9.3%

Source: CIBC World Markets, Global Mobile, CIA 2001 Fact Book

Exhibit 4. North American Subscriber Penetration Rate By Country

	Population	2000	2001	2002	2003	2004
US	278.0	41.5%	47.9%	53.1%	58.0%	62.0%
Canada	31.6	25.9%	31.2%	33.0%	37.0%	40.0%

Note: Population in millions

Source: CIBC World Markets, Global Mobile, CIA 2001 Fact Book

Exhibit 5. Western European Subscriber Penetration Rate By Country

	Population	2000	2001	2002	2003	2004
Austria	8.1	77.4%	78.6%	79.1%	79.4%	79.5%
Belgium	10.2	54.4%	70.5%	75.0%	80.0%	81.0%
Denmark	5.3	64.9%	76.0%	81.0%	82.0%	83.0%
Finland	5.2	78.8%	79.8%	80.3%	80.3%	80.4%
France	58.9	49.3%	61.5%	66.5%	71.5%	75.0%
Germany	83	58.3%	67.0%	75.0%	79.0%	79.5%
Greece	10.7	55.4%	69.5%	79.5%	84.5%	85.5%
Ireland	3.6	63.4%	73.4%	78.4%	80.4%	81.4%
Italy	56.8	74.7%	76.7%	78.7%	80.7%	82.7%
Netherlands	15.8	66.8%	76.8%	79.7%	80.7%	81.2%
Norway	3.1	74.6%	76.6%	78.6%	80.6%	82.6%
Portugal	9.9	63.0%	73.0%	78.0%	83.0%	84.0%
Spain	39.2	62.0%	70.0%	74.5%	75.5%	78.5%
Sweden	8.9	73.8%	75.8%	77.8%	79.8%	81.8%
Switzerland	7.3	63.1%	73.1%	83.1%	84.1%	85.1%
UK	59	67.8%	77.0%	78.0%	79.0%	81.0%

Note: Population in Millions

Source: CIBC World Markets, Global Mobile, CIA 2001 Fact Book

Exhibit 6. Asia Pacific Subscriber Penetration Rate By Country

	Population	2000	2001	2002	2003	2004
Australia	18.8	53.3%	68.0%	75.0%	75.0%	75.0%
China	1,266.0	6.8%	11.0%	13.4%	15.0%	16.5%
Hong Kong	7.1	74.6%	79.0%	80.0%	80.0%	80.0%
India	1,014.0	0.0%	0.4%	0.5%	0.6%	0.7%
Indonesia	224.8	0.0%	2.3%	3.0%	4.0%	5.0%
Japan	126.9	45.7%	52.2%	58.0%	62.0%	65.0%
South Korea	47.3	56.6%	58.5%	59.5%	62.0%	63.0%
Malaysia	21.4	26.7%	31.0%	34.0%	37.0%	40.0%
Philippines	79.3	7.7%	10.8%	13.0%	15.0%	17.0%
Singapore	3.2	76.4%	85.0%	85.0%	85.0%	85.0%
Taiwan	22.1	79.7%	90.0%	90.0%	90.0%	90.0%
Thailand	60.6	6.1%	9.4%	12.0%	15.0%	18.0%

Note: Population in Millions

Source: CIBC World Markets, Global Mobile, CIA 2001 Fact Book

Exhibit 7: Silicon Valley Wireless Cluster

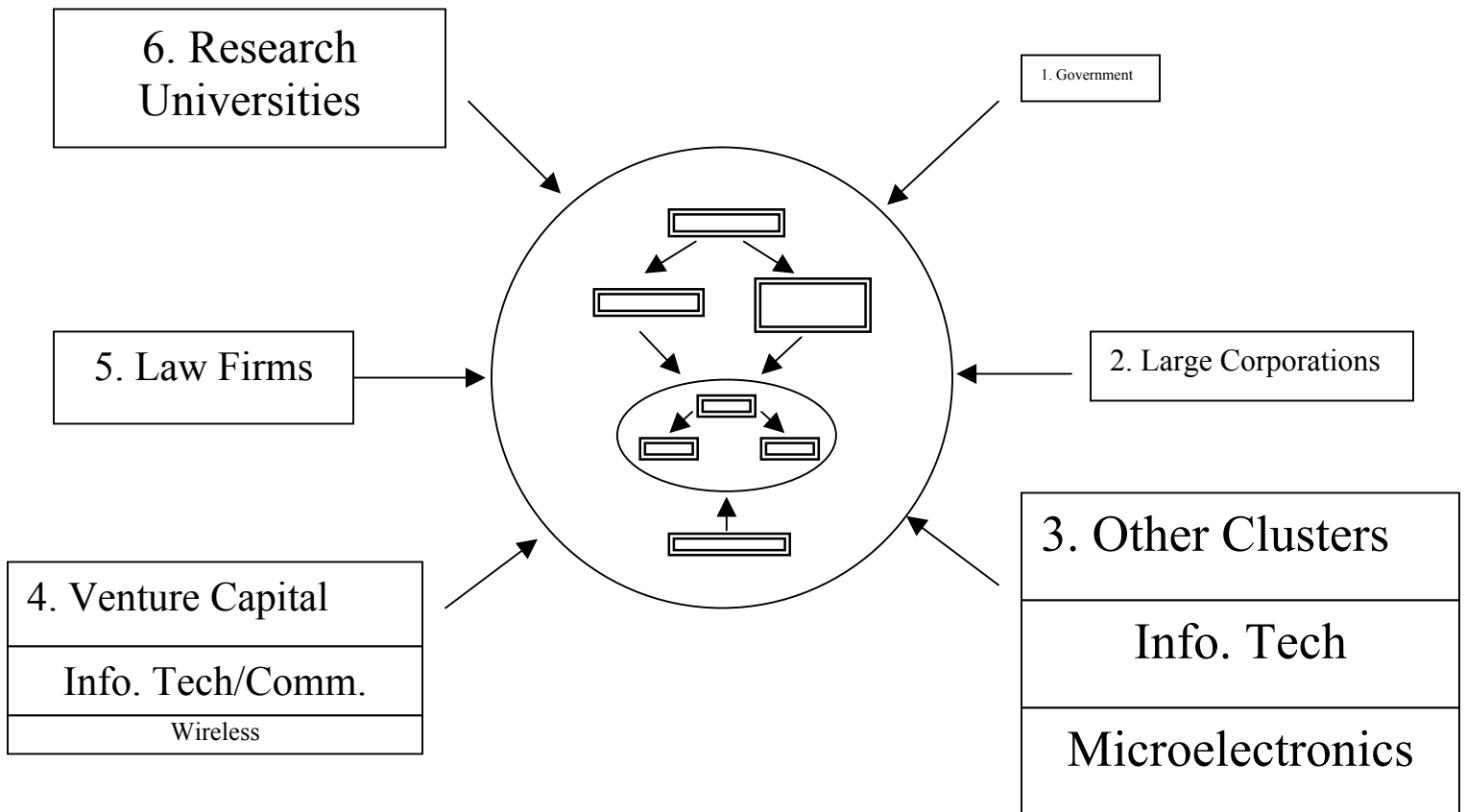
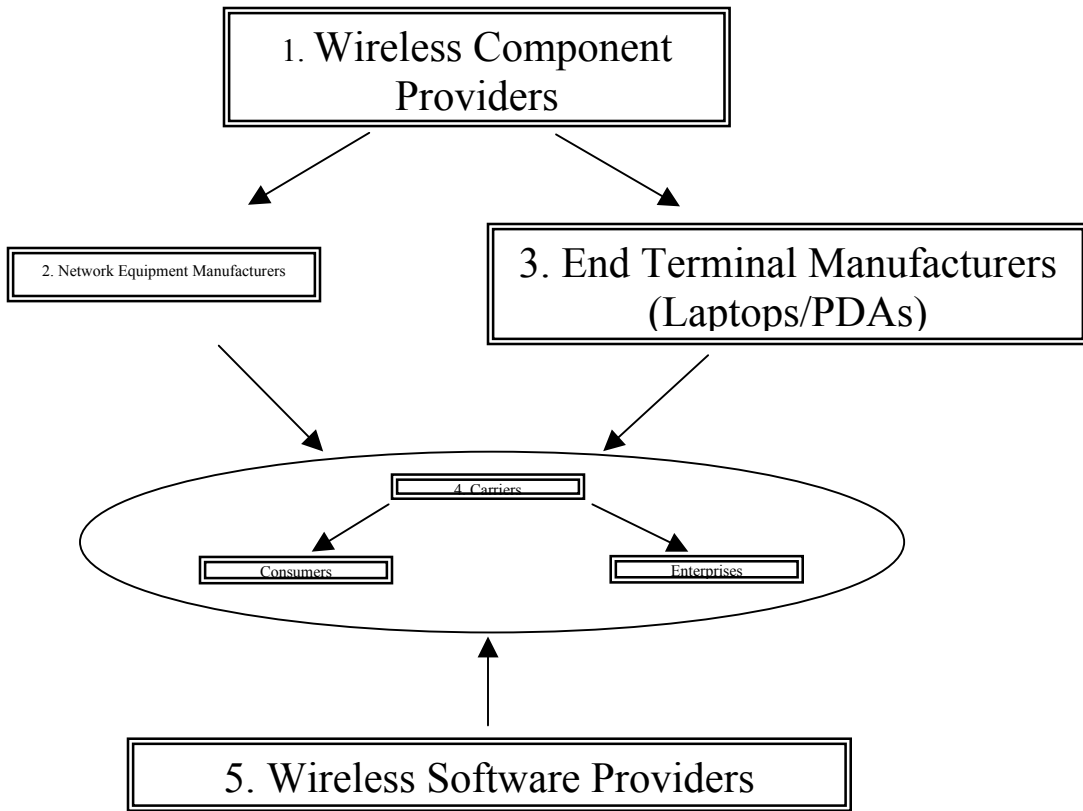


Exhibit 8: Singapore wireless cluster

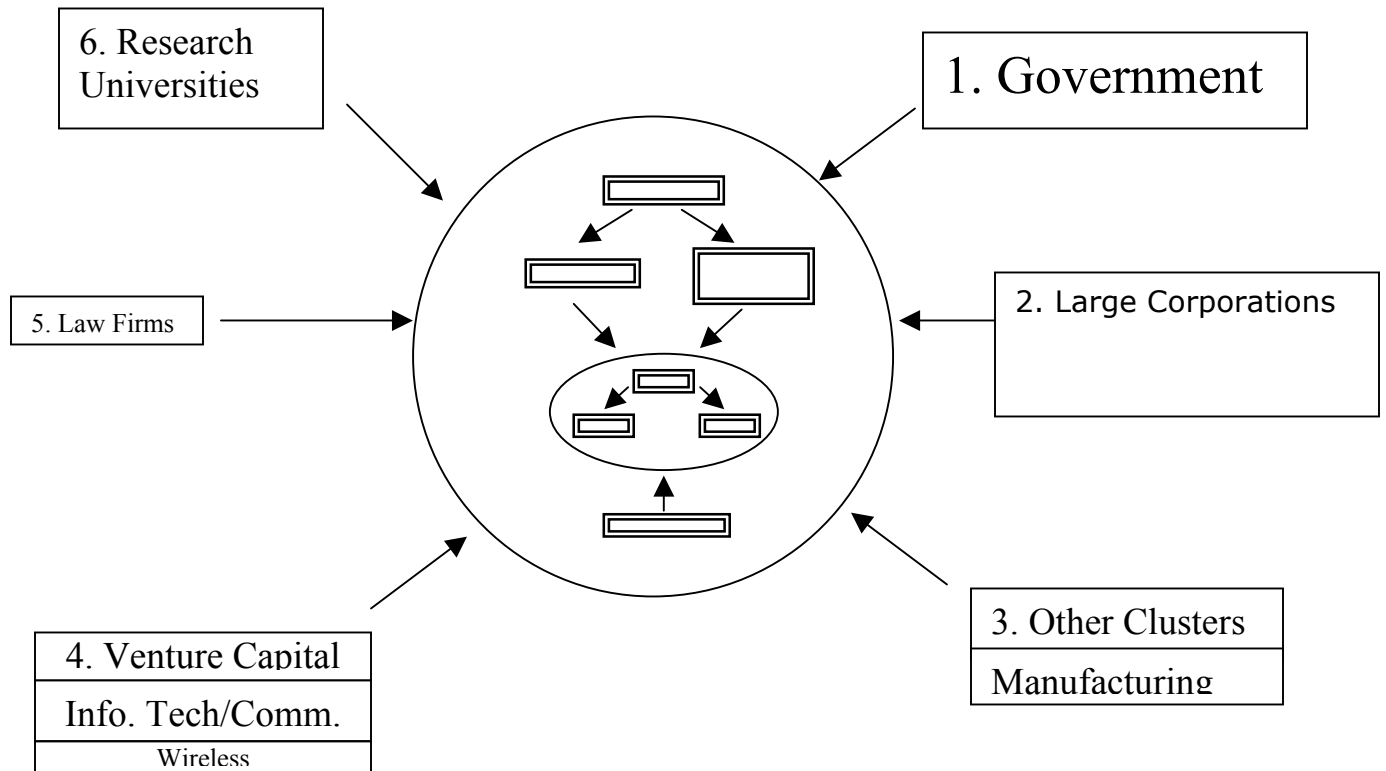
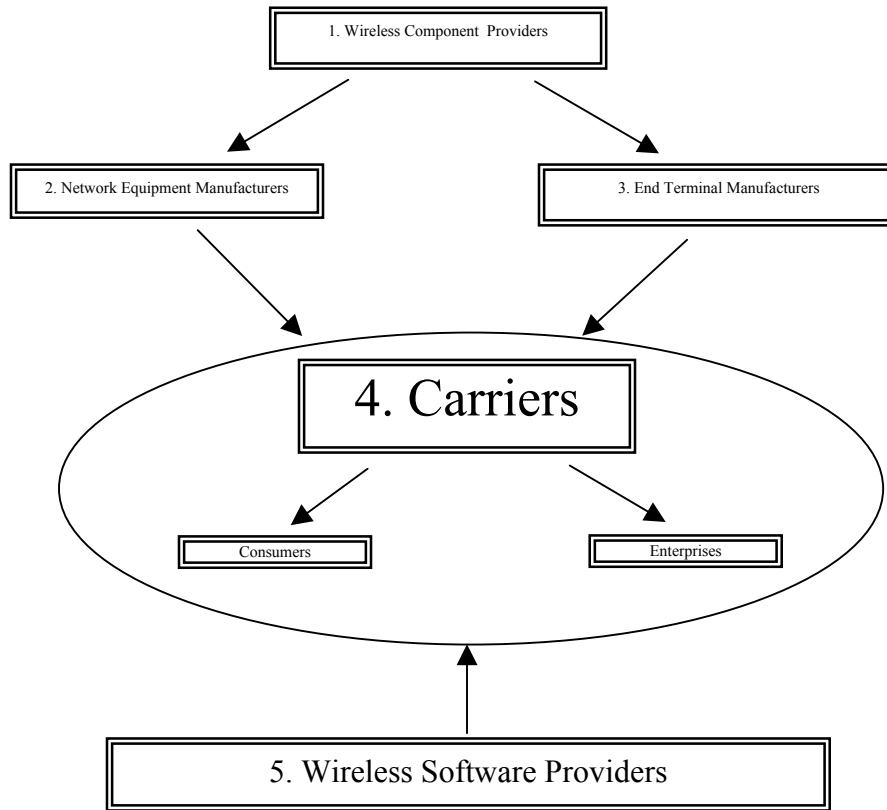


Exhibit 9: Sweden Wireless Cluster

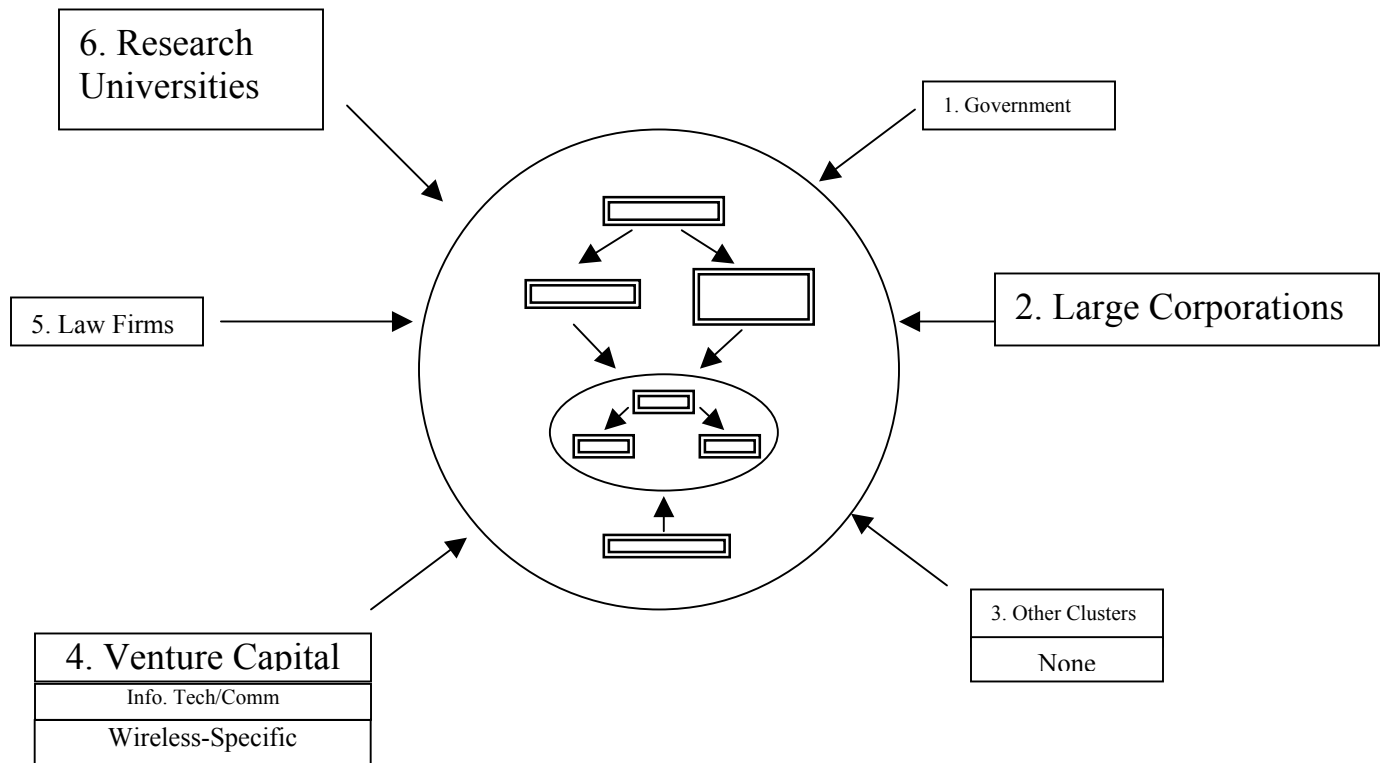
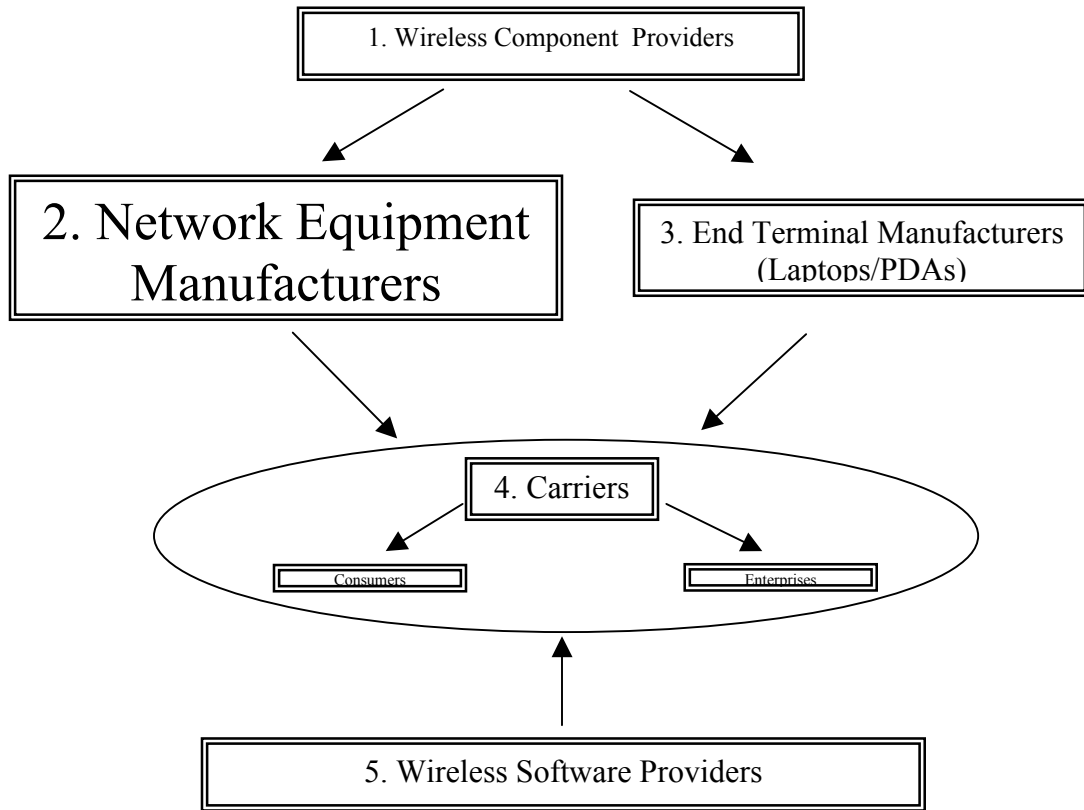


Exhibit 10: Companies with centers in Kista Science Park

Company	Description
Microsoft, U.S	Mobile Internet – for mobile internet applications and Ericsson Microsoft Mobile Venture (JV)
Intel, U.S	Wireless competence center & e-business solution center
Nortel, Canada	R&D in mobile communication
Motorola, U.S	Development center for wireless applications and services
IBM, U.S	Wireless Internet Center
Oracle, U.S	Wireless research and a joint project with Ericsson and Telia
Hewlett-Packard, U.S	Wireless research and a joint project with Ericsson and Telia
Andersen Consulting, U.S	Global center for WAP-applications and services
RSA Security, U.S	Development of secure wireless communications
Compaq, U.S	Wireless Competence Center and an eCommerce Knowledge Center
Nokia, Finland	R&D in mobile communication infrastructure
Cambridge Technology Partners, CTP, U.S	Global Wireless Competence Center
Siemens, Germany	R&D-center for mobile applications
Sybase, U.S	Test center for mobile business applications and a strategic alliance with Ericsson around Mobile Banking Solution
Sun Microsystems, U.S	Wireless Center of Excellence
CapGemini Ernst&Young, France/U.S and Cisco, U.S	Joint competence center for third generation mobile systems

Source: Invest in Sweden Agency, 2001 Presentation.

Exhibit 11: IMD World Competitiveness Scoreboard 2002 (Ranking as of April 2002)

Country	Rankings				
	2002	2001	2000	1999	1998
Usa	1	1	1	1	1
Finland	2	3	4	5	6
Luxembourg	3	4	6	3	3
Netherlands	4	5	3	4	4
Singapore	5	2	2	2	2
Denmark	6	15	13	9	10
Switzerland	7	10	7	7	9
Canada	8	9	8	10	8
Hong Kong	9	6	12	6	5
Ireland	10	7	5	8	7
Sweden	11	8	14	14	16
Iceland	12	13	9	13	18
Austria	13	14	15	18	24
Australia	14	11	10	11	12
Germany	15	12	11	12	15
U.K.	16	19	16	19	13
Norway	17	20	17	16	11
Belgium	18	17	19	21	23
New Zealand	19	21	18	17	17
Chile	20	24	25	25	27