

**'Connecting People':
The Telecommunications Industry in Europe and East Asia**

GPN Working Paper 6

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Introduction

Over the last 20 years, the telecommunications industry has undergone dramatic changes. The sector has been transformed on an unprecedented scale and today is one of the core industries of the new economy (cf. Fransman, 2002; Steinbock, 2003a). Employment in public telecommunications services worldwide has grown to almost 6 million people in 2000 (see Figure 1), generating hundreds of thousands of additional jobs in the communication equipment industry and related service sectors, especially retailing. The most significant triggers of transformation and corporate restructuring have been the liberalisation and privatisation of formerly government-controlled activities, the arrival of various generations of technological innovations like mobile telephony and data transmission, which led to a continuing globalisation of business activities within the sector.

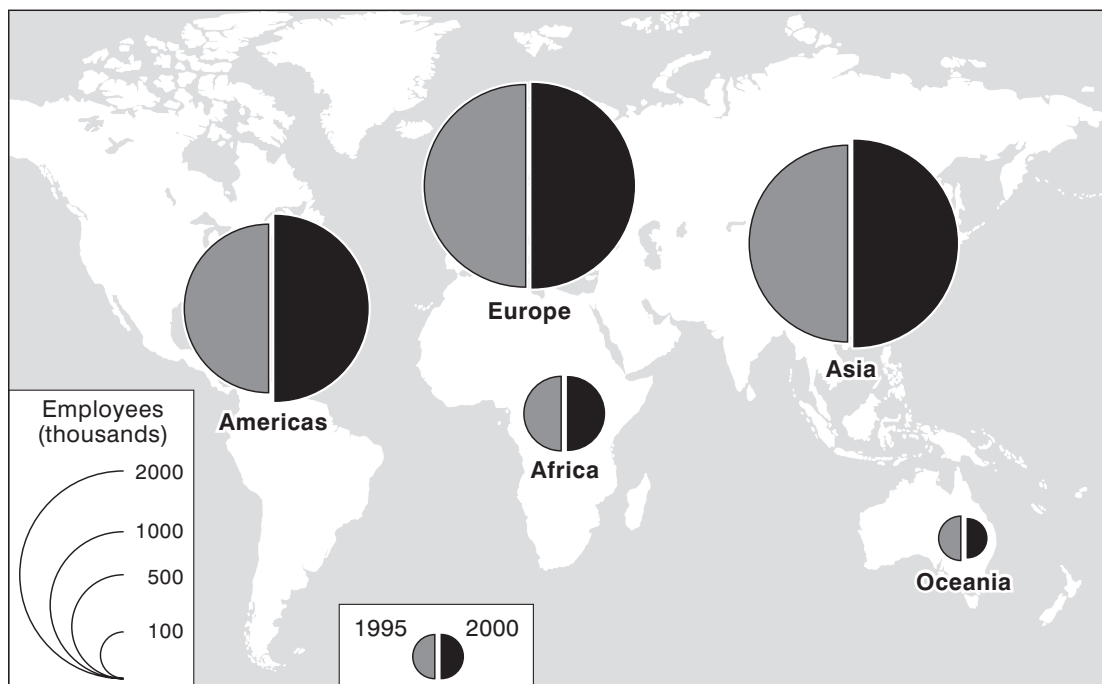


Figure 1: World telecommunications service employment, 1995-2000

Source: ITU 2002

However, the evolution of the telecommunications industry did by no means follow a path of continuous growth, as became evident at the end of the 20th century. Instead, “[a] cloud of doom hangs over the telecommunication world” (ITU, 2002: 1), since the economic bubble surrounding investments in information and communication technologies (ICT) burst and contributed to the slow-down of the world economy. As a result, many companies in the telecom sector faced declining business and a huge debt burden related to excessive investments while the companies’ market value was plummeting. As a consequence, cost-cutting measures had to be used in the restructuring efforts of most firms, including the closure and/or relocation of operations on a global level, divestment of non-core assets, and not least a large number of job cuts. Between the start of 2001 and May 2002, it is estimated that the number of layoffs and redundancies announced by telecom firms worldwide amounted to more than half a million people (FT, 2003). In autumn 2002, a further 60,000 job cuts were announced within the period of only ten weeks (Sherman, 2002). In total, the sector workforce has decreased more than 10%, while many large players – after divestments and layoffs - now employ far less than half the number of people only a few years ago. Among the hardest hit companies are the equipment manufacturers like Cisco or Ericsson, who suffered from a sharp decline orders by the telecom operators. Employment at the American equipment maker Lucent, for instance, stands at 35,000 people as of December 2002, down from a 123,000 strong workforce at the beginning of 2001 (Lucent, 2003).

This industrial transformation process is characterised by a growing complexity of the value creation process, a reconfiguration of power relations between the firm and non-firm actors of the telecom sector, and a global shift in the location of business activities. In order to understand the evolution of this industry, it is necessary to

analyse the changing nature of the generation of economic rents, the related institutional and regulatory framework, and the embeddedness of different actors from the telecommunications industry. The theoretical framework for this analysis is the global production networks (GPN) concept (Henderson et al. 2002). According to the main conceptual blocks of this framework, we first discuss the evolution of the telecom industry from nationally based, rather simple value chains towards globally integrated, complex GPN, as far as it is based on the technological change underlying this sectoral development. We then scrutinise the socio-economic and economic-geographical forces behind that transformation, focussing on the social and spatial reconstruction of relations between different actors, including firms and non-firm institutions. Finally, while the first two parts of this article provide a more or less general sectoral picture, in the last section we will discuss the globalisation and evolution of the telecommunications industry ‘on the ground’, i.e. in the geographical context of Europe and East Asia, using evidence from our research into GPN in these two continents.

Transforming the telecommunications value chain: The rise of global production networks (GPN)

From its beginnings until the early 1980s, the telecom sector has developed within the institutional framework of the nation-state. Conventional wisdom regarded the supply of communication services as a natural monopoly, based on economies of scale (Fransman, 2001: 112). Hence, in most countries there existed one incumbent service provider. In Germany, for instance, the public telecommunication operator (PTO) was Deutsche Telekom, British Telecom held the monopoly in the UK, NTT in Japan, and AT&T in the United States. While the former three PTO were state-owned during that

period of time, AT&T always was a private company, but in 1920 had been granted a national monopoly as well (Loveridge and Mueller, 1999: 68). These national carriers, while providing voice, fax and later on some other enhanced services to the final customers, were closely linked to network and equipment providers in their respective countries. Therefore, in the pre-liberalisation era the telecommunications value chain basically consisted of three layers (see Figure 2), whereby the value creation process in the larger economies of the developed world took place almost exclusively within the respective national boundaries. PTOs in countries like Japan, Germany, France, the UK or the US cooperated with their preferred national suppliers, e.g. NEC, Siemens, GEC, and Alcatel or even had both service provision and equipment manufacturing integrated within one company, as in the case of the US firm AT&T.

Table 1: Layers of the Old Telecoms Industry

Source: Fransman, 2002: 37

Layer 3: Services layer (voice, fax, 0800 services)
Layer 2: Network layer (circuit-switched network)
Layer 1: Equipment layer (switches, transmission systems, customer premises equipment)

Within this rather linear value chain, the degree of specialisation and social division of labour was obviously rather limited. While the PTOs were able to retain monopoly rents from the final consumers, the firms in the infrastructure layer could achieve quasi-monopoly rents through very limited competition based on preferential treatment by the PTOs. Likewise, the equipment and terminal manufacturers, often strongly linked with or integrated in the network infrastructure providers, gained their profit from limited competition. In addition, the value chains of the hardware manufacturers were – by and large - characterised by a high degree of vertical

integration, in what can be described as a genuine fordist accumulation and regulation regime. While developed economies like the US, the UK, Germany and France provided a domestic market big enough to sustain service providers and equipment makers, manufacturers from smaller economies from the beginning had to rely much more on international markets than had their counterparts. The Swedish manufacturer Ericsson's exports of telecom equipment, for instance, exceeded domestic sales already at the end of the 19th century, hardly 20 years after the invention of the telephone. Before the start of the first world war, Ericsson had expanded not only its sales office network abroad, but established production facilities in the United States and – in addition to its Swedish homebase - six other European countries (Steinbock 2003a: 246-7).

The telecommunication industry value chain, however, remained rather unchanged until the early 1980s, when the privatisation of the sector, the introduction of digital mobile communications and the technological convergence with the IT industry had a major impact on the value generation process.

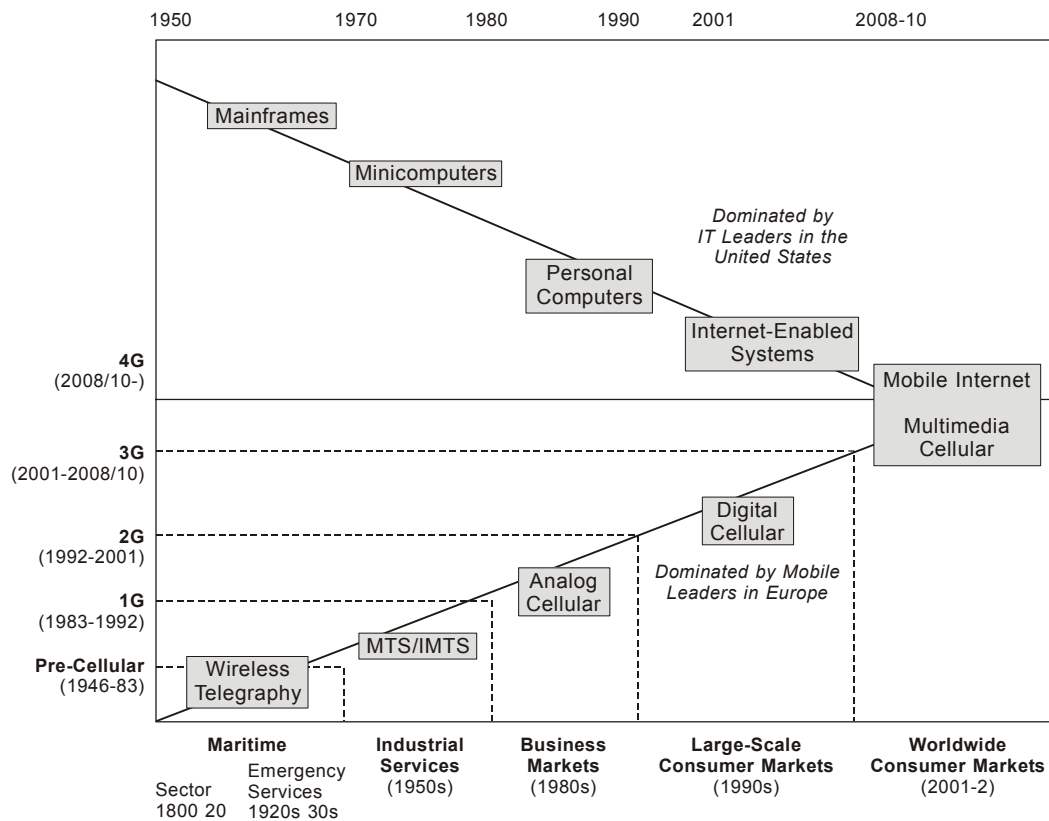
Deregulation of the telecommunications industry set in with the break-up of the American Company AT&T in 1984, enforced by the US Federal Communications Commission, while in the same year the UK Telecommunications Act led the privatisation of the PTO British Telecom (Loveridge and Mueller, 1999: 70-1). Other countries followed suit, albeit with some time-lag and, in a number of cases, quite hesitantly. As of 2001, the incumbent telecom operators in 113 countries worldwide have been fully or partly privatised (ITO, 2002: 2), and the regulation authorities in the remaining countries that still run state-owned telecom companies all have at least indicated first steps towards liberalisation and privatisation. As a consequence, the market for telecommunications services have opened up, increasing competition and

allowing new providers to enter the arena. Initially, this liberalisation process only had a limited impact on the intensity of competition in most economies, and many incumbents were able to temporarily retain leadership in their respective home markets. However, due to significantly reduced barriers of entry, more and more newcomer service providers challenged the traditional PTOs and quickly gained market share (Li and Whalley, 2002: 454). For telecom equipment vendors, these developments provided new business opportunities. In the traditional system, most PTOs in large developed markets maintained close links to national equipment manufacturers or even had both functions of manufacturing and service integrated within one company, as was the case with AT&T, where the equipment business was divested only as late as 1995. Nevertheless, vendors already have been competing outside their home markets before the liberalisation process got started, and now had a chance of selling to new customers.

As deregulation was transforming the competitive arena of the telecom sector, technological innovations at the same time changed the value chain much more profoundly. With the development of wireless communications, from mobile phones of the first generation (1G) with a small and selected customer base to the recent 2nd and 3rd (2, 2.5 and 3G) generation of mobile telecom systems for mass markets, an increasing specialisation and reorganisation of the corporate landscape went under way. Not only did this include the above mentioned newcomers in services, but companies from sectors formerly not associated with telecommunications. Today's wireless communications systems are the result of a gradual technological integration process that brought together the knowledge and technologies from telecommunications with that of the IT and software sector, as represented in the development of the internet (see Figure 2). The co-evolution of digital mobile

communications and the internet has merged both technologies into what is know now as mobile multimedia, combining the former, almost separate spheres of voice and data transmission and creating a completely different structure of the value added system.

Figure 2: From wireless telegraphy and mainframes to broadband cellular
 Source: Steinbock, 2003b: 226

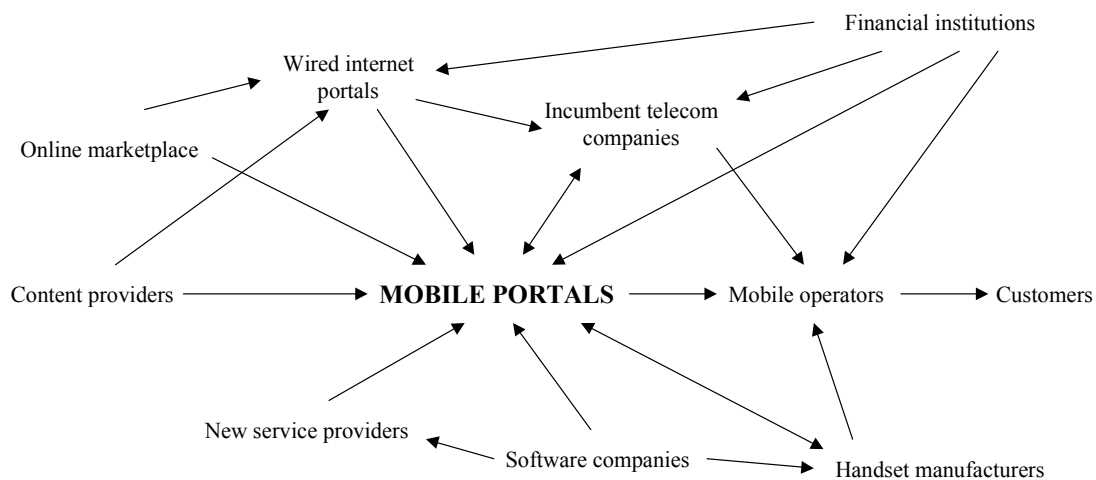


The digitalisation of telecommunications led to a growing importance of information technology in the form of computer chips and telecommunications software and therefore new entrants in the telecom market were chipset manufacturers, providing the hardware, and software developers, providing not only the basic operating systems for mobile telephony, but more and more new, mostly internet-based applications in addition to the traditional voice services, like mobile phone gaming, e-mail, and the

like. This, in turn, opened the market for new forms of services, with internet platforms like AOL or Lycos and information content providers entering the market place as well. This way, the former linear value “chain” has evolved into a complex network of value added activities, now dominated by the wireless or mobile technology, as illustrated in Figure 3.

Figure 3: The value network of mobile portals

Source Li and Whalley, 2002: 468



The telecom industry reconfiguration, which took place in less than 20 years, had enormous implications for research and development (R&D), manufacturing, and not least the value added services transmitted via the telecom networks. Until the 1980s, the leading national operators carried out R&D in house, through their often famous internal laboratories – for instance, AT&T’s Bell labs or BT’s Martlesham Laboratories. These labs produced the technology not only for the evolving telecom industry, but also undertook R&D that would related industries like computing or consumer electronics. However, during the transformation period, technological knowledge creation increasingly shifted from the operators to the equipment manufacturers. From 1987 to 1999, AT&T’s research and development expenditures fell from 7.3% of sales to 0.9%, due to the spinning off of its Bell Laboratories,

together with its equipment manufacturing business (which became Lucent Industries). In the same period, BT's R&D intensity dropped from 2.1% to 1.8%, while the figures for Japan's NTT remained almost unchanged, at 3.8% in 1987 and 3.95 in 1999 (Fransman, 2002: 105). Compared to other industries, these figures are astonishingly low.¹ Fransman (2002: 4) claims two reasons for the shift in the technological knowledge base: Firstly, established as well as new specialised equipment vendors had accumulated their own knowledge base and increased R&D; secondly, the arrival of the internet led to an entirely new system, open system, and lead to rapid, concurrent innovation, thus challenging the rather closed systems of innovation of the incumbent operators. Apart from the effects of liberalisation and deregulation, this low R&D intensity no longer allowed for the creation and maintenance of technological rents², but rather reduced the barriers of entry for competitors. This led to considerably lower prices for standard (voice) services and thus falling average revenues per user (ARPU), forcing the telecom operators to look for new sources of added value.

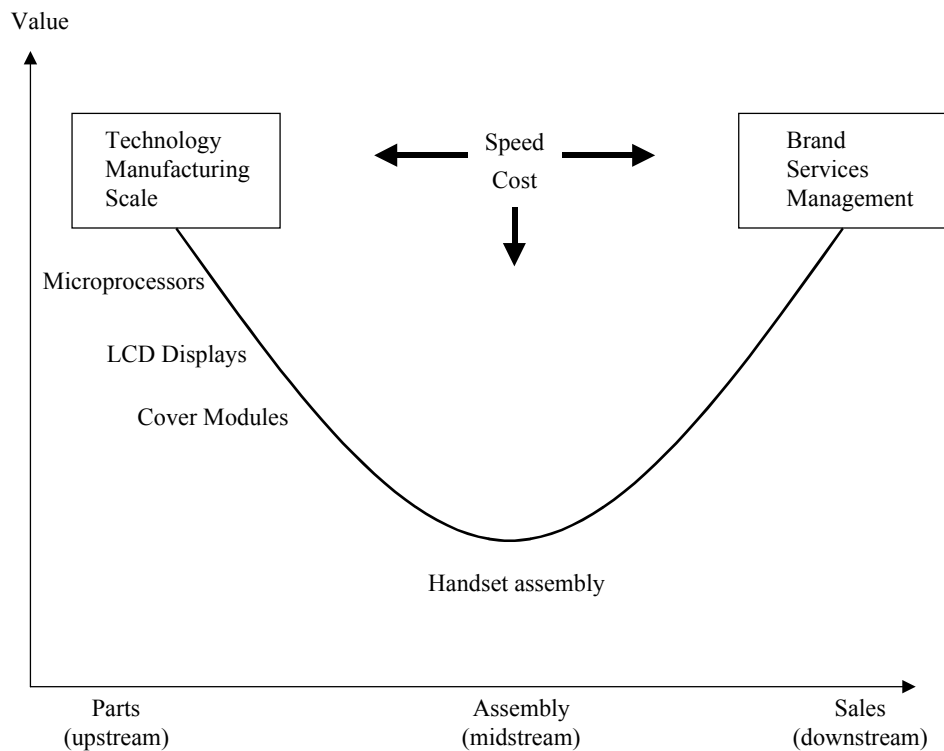
With mobile telecommunications having become a mass market in many countries, the manufacturing system of telecommunications equipment and especially mobile phones – like the production of computers - faced a structural change. The value added shifted away from assembly, upstream to the production of parts and downstream to branding and sales (cf. Ohki 2001). Hence, the assembly of mobile phones has been increasingly outsourced to other companies, known in the 1980s as Contract Manufacturers (CM). From the 1990s onwards, these CM took over

¹ Telecom operators' R&D expenses as a percentage of sales now are about the same or even lower level as the beverages, leisure & hotel or building materials industry, that are not normally considered to be high-tech industries. Equipment vendors like Cisco, Ericsson or Nortel, on the other hand, have a R&D intensity comparable to the pharmaceuticals sector, spending between 10% and 20% of sales on R&D.

² For the concept of value and rents, see Kaplinsky, 1998; Henderson et al., 2002.

additional functions like sourcing of materials and components, product development and order fulfilment and thus developed into international, capital-intensive Electronics Manufacturing Service (EMS) firms. Virtually every telecom equipment company today has outsourced part or all of their handset manufacturing to EMS providers like Flextronics, Solectron, Celestica or Elcoteq. Along with economies of scale, that type of EMS is able to gain technological and organisational rents from the production process, while the customers (e.g. companies like Nokia, Ericsson, Siemens) increasingly rely on establishing brand-name prominence in major markets, thus gaining a brand rent. On the upstream end of telecom equipment manufacturing, the parts and components suppliers, depending of the technology intensity of their products, successfully entered the telecom equipment value chain. Indeed, the value added in telecom manufacturing systems today is highest at both ends of the production chain, which has been described occasionally as “smile curve” (see Figure 4).

Figure 4: The smile curve
 Source: modified after Ohki, 2001: 73

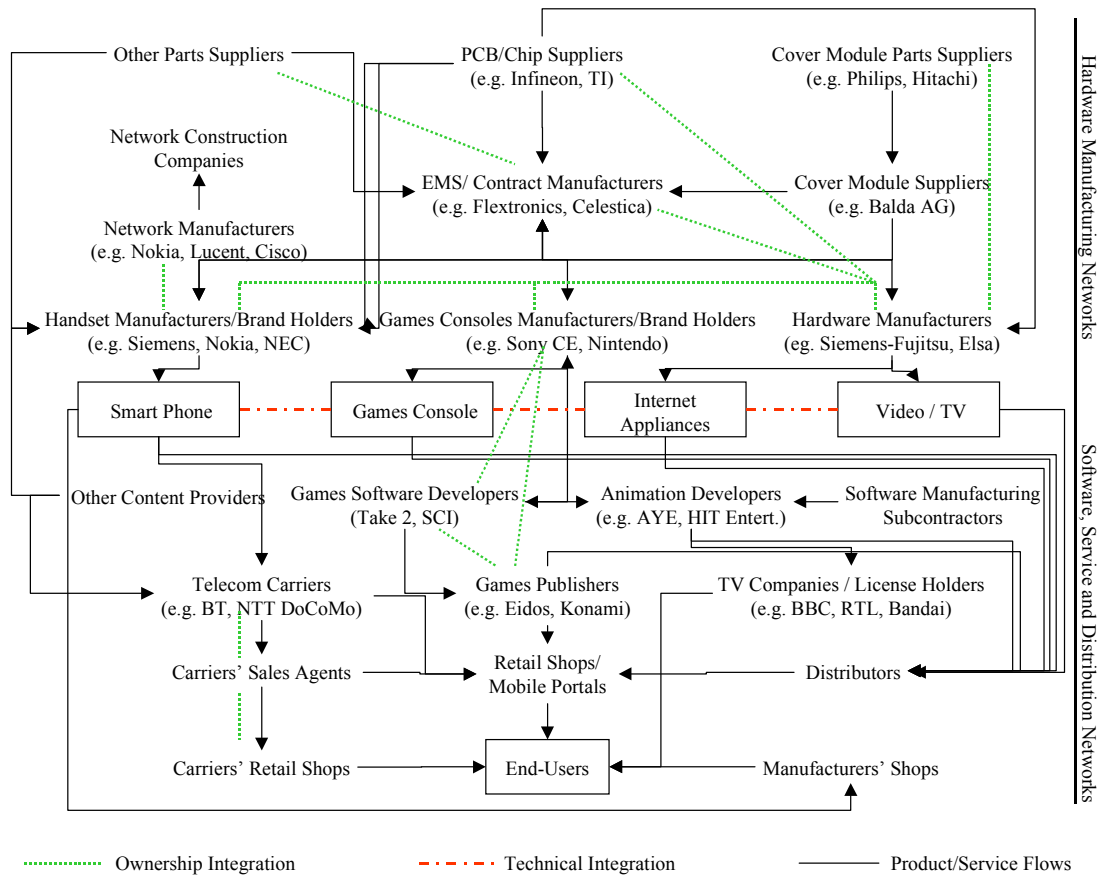


As integration between telecommunications and the IT industry progressed, forming a mobile multimedia system, more players entered the telecom arena and began to form what is called the mobile data value chain (Maitland et al., 2002) or the value network of the mobile portal (Li and Whalley, 2002: 466). For the new market entrants, mobile data transmission meant either additional revenues, on top of their hitherto wired internet revenues, or a business opportunity for start-up firms, specialising in contents, application and software development for mobile data networks.³ For the established telecom operators, facing ever decreasing profit margins on voice services and having spent a fortune on licenses for new 3G networks, providing new value-added services seemed one essential way to recover their expenses and stay in business. A clear competitive advantage for the operators is their ownership of network infrastructure,

³ According to Bughin et al. (2001), more than 200 mobile portals have been launched in Europe alone.

thus controlling the access of customers to the contents and applications available. With a range of different players trying to tap this value-added service market, the telecoms production and services network has become even more complex and, with the geographical expansion of activities beyond the nation-state, now forms truly global production networks (see Figure 5). The development of telecom GPNs certainly was driven by the massive technological changes and the convergence between previously separated economic activities. However, since technological progress itself is socially constructed, based on the strategies of actors and the relationships and structures they form, a closer look is needed on the actors influencing the evolution of GPNs in the telecommunication industry, the sources of power within these GPN, and the embeddedness of the actors in different societal, territorial, and network configurations.

Figure 5: The telecoms/computer entertainment network



Power and embeddedness in the Telecommunications Industry

“Telecommunications networks are complex product systems, in which the ability to appropriate economic rents is determined by control. In telecommunications systems, technological control influences economic control, i.e. the ability of some network members to appropriate some of the economic benefits generated by others.” (Keil et al., 1997: 305)

The breaking up of national monopolies in telecommunications not only has changed the system of value generation in this industry, but triggered substantial shifts in the control of scarce resources by different types of players, the distribution of power among the actors and the geographical as well as organisational scope of relationships between these actors. Despite all the emphasis on deregulation and liberalisation over the last two decades, there is no doubt that governmental, quasi- and non-

governmental institutions still play a major role in shaping the industry and influencing the strategies of corporate actors. Furthermore, these institutions play an active part in the process of setting industry standards, together with their private sector counterparts. The success of particular standards on a global scale is an important means of gaining technological control within the telecoms system and therefore is crucial for an understanding of the dynamics in a fast developing sector. Even in the post-monopoly era, the telecommunication sector still is one of the most regulated industries, primarily based on national governing bodies. However, with privatisation and competition progressing worldwide, there was a growing pressure not only to introduce independent regulation authorities on the nation-state level, but to open up the telecoms market for international trade and investment. The latter was achieved not least by including the telecom sector in the Uruguay round of the WTO negotiations and by writing down the fourth Protocol annexed to the General Agreement on Trade in Services (GATS), coming into force in 1998 with some 69 countries making commitments to liberalisation. Since then, a further 17 countries have signed commitments to open up their markets. In addition to other harmonisation and liberalisation attempts on a supra-national scale, like the EU policies, an institutional framework has been created that exceeded the nation-state and enabled the globalisation of telecommunication services. “Privatization and deregulation not only allowed local private capital into telecommunications, but they generated a wave of foreign investment by the Baby Bells and the national telephone companies of OECD countries (Ramamurti, 2000: 151) At the same time, the number of independent national regulatory bodies has increased from 13 at the start of the 1990s to 112 agencies at the end of 2001 (ITU, 2002: 49). Independent regulatory bodies are defined as “separate from, and not accountable to, any supplier of basic

telecommunication services. The decisions of and the procedures used by regulators shall be impartial with respect to all market participants” (ITU, 2002: 49). This independence, however, is questionable in many cases, since a large number of agencies is financed by the telecom sector they are thought to be independent of, by way of license awards or spectrum fees, for instance. Other regulators still depend on government funding. The case of 3G licensing is a case in point . The auctioning and sales of radio spectrum to the bidding telecom providers proved to be a tremendous source of income for the regulatory bodies and thereby the respective governments, or what has been called “a windfall for treasury” (Ure, 2003: 191). Since the start of 3G auctions in Finland in 1999, far more than US\$ 100 Billion worldwide have been paid to governments by the successful bidders (see Table 2).

Table 2: Allocation of 3G mobile licenses

Source: ITU 2002, 60

<i>Country</i>	<i>No. of licenses</i>	<i>Mobile incumbents</i>	<i>Method</i>	<i>Date awarded</i>	<i>Amount paid, US\$ million</i>
Australia	6	3	Regional auction	March 2001	610
Austria	6	4	Auction	November 2000	618
Belgium	4	3	Auction	March 2001	421
Czech Republic	2	2	Auction	December 2001	200
Denmark	4	3	Sealed bid auction	September 2001	472
Finland	4	3	Beauty contest	March 1999	Nominal
France	4 (2 still to be issued)	3	Beauty contest + fee	July 2001	4,520 (subsequently reduced to 553 each)
Germany	6	4	Auction	August 2000	46,140
Greece	3	3	Hybrid	July 2001	414
Hong Kong SAR	4	6	Hybrid	September 2001	Minimum 170 each plus royalties
Israel	3	3	Beauty contest + fee	December 2001	157
Italy	5	4	Hybrid	October 2000	10,180
Japan	3	3	Beauty contest	June 2000	Free
Korea (Rep.)	3	2	Beauty contest + fee	August 2001	2,886
Malaysia	3	3	Beauty contest	December 2001	Nominal
Netherlands	5	5	Auction	July 2000	2,500
New Zealand	4	2	Auction	January 2001	60
Norway	4	2	Beauty contest + fee	November 2000	88

Singapore	3 (+1?)	3	Cancelled auction	April 2001	166
Slovenia	1	2	Cancelled auction	December 2001	82
Spain	4	3	Beauty contest + fee	March 2000	480
Sweden	4	3	Beauty contest	December 2000	44
Switzerland	4	2	Auction	December 2000	120
Taiwan, China	5	4	Auction	February 2002	1,400
UK	5	4	Auction	April 2000	35,400
Total (25)	99+	79	13 auctions 9 beauty contests 3 hybrid		105,330+

The issues raised so far give a clear indication that, despite globalisation tendencies and an increasing importance of supra-national institutions like the WTO and the International Telecommunications Union ITU, national governments continue to exercise considerable power vis-à-vis other players in the telecoms sector. In a number of cases, governments are still major shareholders in privatised incumbent operators (e.g. Germany), many countries still apply some form of access restrictions for foreign competitors (e.g. Japan, most ASEAN countries), and finally some governments still apply some sort of protectionist procurement and industrial policies in favour of the respective national carriers and suppliers (Loveridge and Mueller, 1997: 64). The means by which this power is exercised differ from country to country, pending on the respective policy priorities and industrial/institutional development paths. What has clearly changed in all cases, however, is the subject of regulation, placing an increasing emphasis on issues of competition and antitrust policies, considering liberalisation, globalisation, and the resulting wave of alliances, mergers and acquisitions in both the equipment vendors and the service provision sectors (cf. ITU 2002b). The latest example for this shift to anti-trust regulations is the EU investigation of roaming prices charged by UK and German mobile operators and the EU's new rules of telecom regulation, to be introduced in July 2003. It enables the European Commission to overrule national regulators in a range of different areas including roaming. Competition Commissioner Mario Monti, meanwhile has argued

that the telecom sector is mature enough to be governed by competition law alone, thus questioning the need for specific sector regulation (Guerrera and Dombey, 2003). Over the last years, the number and value of cross-border mergers and acquisitions (M&A) has grown substantially. The largest deal ever signed was the acquisition of the German operator Mannesmann by the British mobile group Vodafone in 2000. This single transaction was valued at more than 200 Billion US\$ (cf. OECD, 2001: 17), almost twice the amount of money spent by all operators for buying 3G licenses. The second largest cross-border M&A deal, valued at about 60 Billion US\$, also happened within the telecom sector. In total, 7 out of 20 international M&A between 1998 and 2000 have been carried out by telecommunication providers (see Table 3).

Table 3: Top 20 cross-border M&As, 1998-2000

Source: OECD 2001, 17

	Deal value US\$ billions	Acquired company	Host country	Acquiring company	Home country
2000	202.8	Mannesmann AG	Germany	Vodafone AirTouch PLC	UK
		<i>Telecommunications</i>		<i>Telecommunications</i>	
1999	60.3	Airtouch Communications Inc.	USA	Vodafone Group PLC	UK
		<i>Telecommunications</i>		<i>Telecommunications</i>	
1998	48.2	Amoco Corp.	USA	British Petroleum Co. PLC	UK
		<i>Petroleum</i>		<i>Petroleum</i>	
2000	46.0	Orange PLC- Mannesmann AG	UK	France Télécom SA	France
		<i>Telecommunications</i>		<i>Telecommunications</i>	
1998	40.5	Chrysler Corp.	USA	Daimler-Benz AG	Germany
		<i>Automobile</i>		<i>Automobile</i>	
1999	34.6	Astra AB	Sweden	ZENECA Group PLC	UK
		<i>Pharmaceuticals</i>		<i>Chemicals</i>	
2000	32.6	Orange PLC	UK	Mannesmann AG	Germany
		<i>Telecommunications</i>		<i>Telecommunications</i>	
2000	27.2	ARCO	USA	BP Amoco PLC	UK
		<i>Petroleum</i>		<i>Petroleum</i>	
2000	25.1	Bestfoods	USA	Unilever PLC	UK
		<i>Food Products</i>		<i>Food Products</i>	
1999	21.9	Hoechst AG	Germany	Rhône-Poulenc SA	France
		<i>Chemicals</i>		<i>Chemicals</i>	
2000	19.4	Allied Zurich PLC	UK	Zurich Allied AG	Switzerland
		<i>Insurance</i>		<i>Insurance</i>	
1998	18.4	BAT Industries PLC- Financial	UK	Zurich Versicherungs GmbH	Switzerland
		<i>Insurance</i>		<i>Insurance</i>	

2000	14.8	Airtel SA	Spain	Vodafone AirTouch PLC	UK
		<i>Telecommunications</i>		<i>Telecommunications</i>	
1999	13.6	One 2 One	UK	Deutsche Telecom AG	Germany
		<i>Telecommunications</i>		<i>Telecommunications</i>	
1999	13.2	YPF SA	Argentina	Repsol SA	Spain
		<i>Petroleum</i>		<i>Petroleum</i>	
1999	12.6	PacifiCorp	USA	Scottish Power PLC	UK
		<i>Electric and Gas</i>		<i>Electric and Gas</i>	
2000	11.8	Ernst & Young-Consulting	USA	Cap Gemini SA	France
		<i>Consulting Service</i>		<i>Consulting Service</i>	
2000	11.1	Crédit Commercial de France	France	HSBC Holdings PLC	UK
		<i>Banks</i>		<i>Banks</i>	
2000	11.0	CWC Consumer Co.	UK	NTL Inc.	USA
		<i>Telecommunications</i>		<i>Media (Radio & TV)</i>	
1998	10.9	Energy Group PLC	UK	Texas Utilities Co.	USA
		<i>Electric and Gas</i>		<i>Electric and Gas</i>	

The struggle for market power has led to a considerable degree of industry consolidation on the one hand and a comparatively large number of new market entrants on the other hand. As mentioned earlier, the technological barriers of entry to the telecom service market had dwindled, leaving access to capital as the major hurdle for newcomers. During the boom of telecommunications in the 1990s, however, this proved to be no problem, as investors rushed in to participate in what was considered to be an extremely lucrative market. This was reflected in the huge market capitalisation of new entrants like Qwest and WorldCom in the US or firms like COLT and Vodafone in the UK at the end of the 1990s. The strong competition between incumbents and operators new to the market resulted in aggressive pricing policies and decreasing revenues, which together with the debt burden - accumulated due to licensing costs and investments in network infrastructure - badly hit the whole industry. The market value of most major service providers, incumbents as well as newcomers, crumbled away, which in some cases even led to companies filing for bankruptcy. As a consequence, despite growing debts and a difficult financial situation, some telecoms operators tried to expand their market base via industry

consolidation, i.e. through alliances, M&A, and globalisation, gaining access to new geographical markets. Others had to give up expansion plans under continuous financial duress or had to sell non-core assets. During the first half of the 1990s, strategic alliances often were the preferred mode of inter-firm linkages rather than equity investments (cf. Chan-Olmsted and Jamison, 2001). That picture has subsequently changed, with equity investments, mergers and acquisitions now dominating within the industry (cf. Amesse et al., 2001; Bormann, 2001). A case in point is the British mobile operator Vodafone, which will be examined in some more detail in the next section of this paper.

The changing nature of telecommunication service provision not only resulted in globalisation and consolidation tendencies among operators, but had knock-on effects towards the equipment vendors.

“The conclusion of deregulation within the industry made a significant impact on telecommunications equipment manufacturers by intensifying the opening and globalization of the telecommunications equipment market (which used to be primarily domestic) and by changing the nature and behavior of its clientele. Equipment manufacturers thus had to contend with increasingly larger international markets as a strong, diversified demand emerged from different areas in the world. They also had to face a larger client base with changing requirements” (Amesse et al., 2003: 4)

Although some of the telecom equipment manufacturers, especially those from smaller economies like Sweden’s Ericsson, had internationalised their activities earlier and to a greater extent than the providers, strong links with the respective domestic PTO remained the norm until the 1980s. After that, national vendors had to cope with increasing international competition, thus being forced to defend or reconstruct relations of dominance or dependency within the industry (Loveridge and Mueller, 1999: 82). Since most of the R&D in the telecoms sector had been transferred to the equipment manufacturers, a vendor’s competitiveness and position

within telecoms GPNs depended – along with its overall cost competitiveness - on its ability to create or gain access to innovations that would set the global industry standards and thus allow for technological and hence economic control. Perhaps the most prominent example of economic control by setting the de-facto standards is the personal computer industry, where Microsoft’s “Windows” operating system and Intel’s processors dominate the market, a system that is known as “Wintelism” (cf. Hart and Kim, 2002).

“The market for telecommunications services and equipment has been described [...] as an arena. This social space was created both by a contestual struggle between rent-seeking organisations for the appropriation of technological advantages and by the efforts of national governments to regulate the process in the interests of a range of stakeholders” (Loveridge and Mueller, 1999: 80). Unlike the case of Wintelism, the standard-setting process in telecommunications is negotiated and played out not only by firms setting de-facto standards, but is heavily influenced by nation-state governments having the power to set de jure standards. Recent developments in establishing successive generations of mobile networks are the latest example of how the introduction and adoption of global standards relate to the distribution of power between the actors in telecommunications GPN.

The creation of the first generation mobile standard has been driven largely by the US government’s decision to adopt a single standard. Since the US are a large market area, many other countries followed this decision in order to secure economies of scale and therefore cheaper handset prices (cf. Funk and Methe, 2001, for the following discussion). While Canada, South Korea and the UK followed the US standards, other nations like Germany, France, Italy and Japan pursued their own path of standards development in an attempt to promote their domestic industries. Unlike

the US, where the government exercised its power to implement a single standard, despite rivalries among domestic firms, the balance of power between firms and governments in Europe and Japan was more balanced. This balance of power between manufacturers, telecom carriers, and governments in Europe continued to be the basis for the development of the most successful of second generation of mobile standards, GSM. Actors now cooperating under the framework of the European Technology Standards Institute (ETSI), the former national technology paths of the 1G era converged into the GSM standard of the 2G era during the 1990s, with 17 European and 24 non-European countries having adopted GSM in 1994. The success of GSM was based not only on the balance of power between the actors and the willingness to cooperate in Europe, but on the openness of the standard which allowed other interested parties to participate. In Japan, on the other hand, governmental power led to a standard based on a proprietary system by the national carrier NTT, therefore deterring other countries and hence showing no potential to become a global standard. US standards development in the 2G era was based on shifting power from the government to competing service providers and manufacturers, thus creating a range of standards which outsiders wouldn't adopt, because of uncertainty about the future trajectories of these systems (Funk and Methe, 2001: 600-1). As for the third generation of mobile standards, however, Japan and its mobile carrier NTT DoCoMo seem to have taken on the leadership on the way to a global standard. Increasing global rather than continental cooperation between governments and firms has led to a situation where two standards are likely to be used, based on Code Division Multiple Access (CDMA) technology.

Currently, the existing 2G standards can be differentiated technologically into CDMA systems and TDMA (time division multiple access) systems, with strong implications

for the distribution of power between the network carriers and the equipment manufacturers. With standards based on TDMA, control over the communication traffic flow lies with the network operators, since the traffic information (i.e. who is calling whom) is stored within the telecom network. CDMA systems, on the other hand, use the peripherals (mobile handsets) as storage device for traffic information and control, while the network itself acts as a mere physical communication channel. “This difference not only affects the balance of power between the network operator and the supplier of peripherals, it also affects the potential economic rents of the related component suppliers” (Keil et al., 1997: 306). In other words, equipment vendors and their suppliers gain power under the CDMA system, while TDMA allows operators of networks to control the technological system. With the 3G standards all being based on CDMA technology, this will affect the balance of power between vendors and operators to shift in favour of the vendors.

Apart from network standards discussed above, the digitalisation of mobile communications, starting with the 2G system, created another arena for standard setting, since mobile devices need software to operate in particular networks and handle the growing range of data and internet applications for mobile systems. Again, this is a question of open standards needing cooperation of otherwise competitive companies against the monopoly power of proprietary systems. An illustration of this struggle for market control is Microsoft’s recent entry into the mobile software business, in an attempt to establish a closed, proprietary system linked to its IT software, and thereby reinforcing the Wintelism system of market power and control (cf. *The Economist*, 2002). Device manufacturers have reacted to this by creating an open platform for mobile software development under the roof of a new company called Symbian, together with partner firms from different areas like semiconductor

manufacturers, network operators, tools providers and of course software developers. Although in this case governments don't play a role as active participants, it is obvious that "reciprocal interdependencies in a network of relations, as found [...] in the development of new communication standards and technologies" (Andersen and Fjeldstad, 2003: 2). It is important, then, to acknowledge the embeddedness of actors in global production networks, as well as in the societies they stem from and the territories they operate in.

Compared with other sectors, the embeddedness of firms and organisations in the field of telecommunications has always been very strong. During the monopoly era, most actors established and maintained strong and ongoing relationships within their respective national framework. This is true especially for the larger markets like the US, Japan, and a number of Western European countries, which led the technological and commercial evolution of the telecoms sector. Most of the incumbent telecom carriers were state-owned, and even after privatisation the governments in a number of countries still are major shareholders of these carriers. Together with national industrial and procurement policies to foster the domestic equipment manufacturing industries, a system of long-term obligational relationships evolved and, in spite of continuing globalisation and liberalisation, societal embeddedness still is traceable in many cases. "[...] all the network operators, whether incumbents or new entrants, [...], have come to realize the importance of close, obligational relationships with specialist suppliers that go beyond market contracting" (Fransman, 2002: 87). In the process of globalisation, societally embedded actors also tend to replicate their domestic relationships and leverage on cultural proximity, with many operators expanding into historically connected markets (Marrewijk, 1997: 372) and equipment vendors trying to maintain established links with their domestic component suppliers

abroad. “[...] it can be argued that national culture continues to affect corporate strategy making and to provide differences in style and mode of implementation within MNCs. These are, of course, currently being tested in global markets” (Loveridge and Mueller, 1999: 82).

The following section will take up the above raised issues by looking at the telecoms sector ‘on the ground’. It will provide a brief overview of industry employment, investment and trade, before discussing the globalisation processes in the subsectors of equipment manufacturing and service provision in Europe and East Asia.

Globalisation and the evolution of the telecommunications sector in Europe and Asia

As we have seen earlier, the telecom sector has created a quite remarkable number of jobs worldwide. During the evolution of the telecoms industry, the growth of sector employment usually has been strongly connected to the overall development of national economies. This is mirrored in Figure 6, which shows the recent employment figures in public telecommunication services for selected European and Asian countries. Over the period from 1995 to 2000, the number of jobs in many of the economies remained roughly constant or grew moderately, around the world average annual rate of 1.7%, with Asia (including South Asia) finally overtaking Europe during these five years. Employment was declining especially in the transformation economies of Eastern Europe, where privatisation and sector reforms reduced the workforce by an annual rate of 1% (e.g. Czech Republic, Poland) to almost 10% (the Baltic states of Latvia and Lithuania, for instance). In Asia, the financial crisis of 1997 and continuing reforms led to job losses in Japan and some of the Southeast Asian countries, while Vietnam and China saw the biggest growth rates in public

telecoms services of all Asian economies, with 17.2% and 9.3% respectively. This shows the strong demand for telecoms provision in order to catch up with the already more saturated markets. Within the EU, most of the northern states experienced the biggest growth rates during this period, while countries in the southern EU, especially Spain and Italy, fell back. This might be explained by the different expansion rates of mobile services.

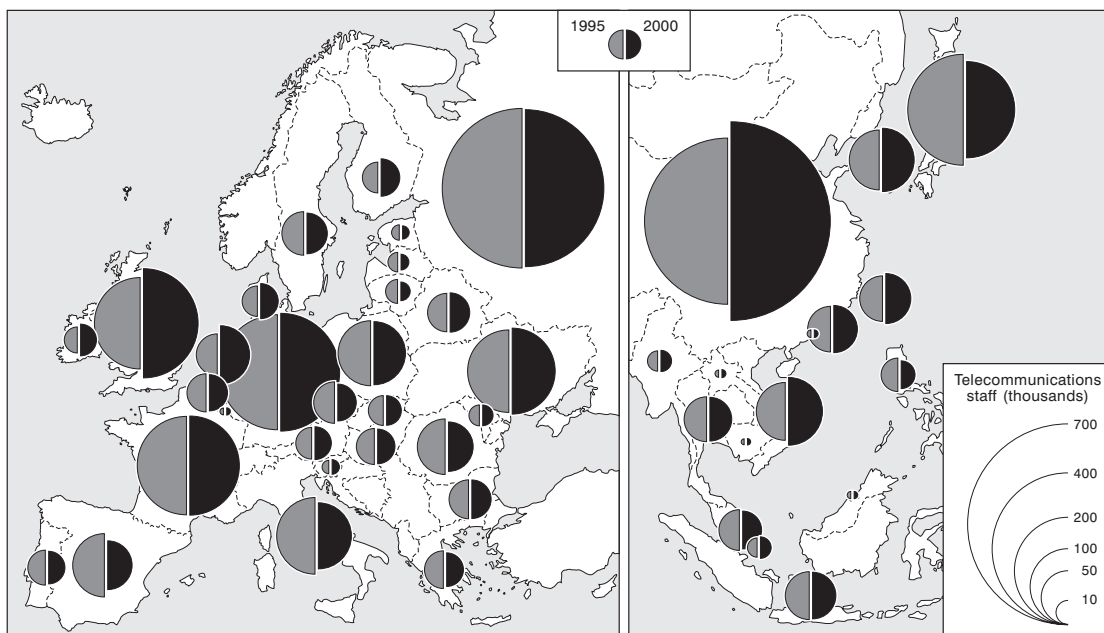


Figure 6: Telecommunication service employment in Europe and East Asia, 1995-2000

Source: ITU 2002

While the above figures reflect the boom phase of ICT industries worldwide, the picture has changed drastically since 2000. The telecoms sector has suffered dramatic job losses, both in the service and manufacturing activities, across the globe. Many service providers have been forced to downsize their workforce because of flattening demand, increased competition and the accumulation of huge debts related to the acquisition of 3G licenses. As a consequence, far less orders for new equipment have been placed, thus hitting the telecoms vendors and forcing them to cut costs through

layoffs and relocation or outsourcing of manufacturing activities. This has transformed the economic landscape of telecom equipment manufacturing in Europe and East Asia, whereby a considerable proportion of the job losses at large OEM firms like Ericsson, Siemens or Panasonic Mobile Communications has been compensated for by employment growth in Contract Manufacturing (CM) and Electronics Manufacturing Services (EMS) providers like Flextronics, Elcoteq, or Celestica.

A growing share of telecommunications employment is related to the increasing globalisation of business activities carried out by the major players in the sector. Value creation in form of direct employment and related income certainly contributes to the development prospects of countries and regions. Equally important, however, are the jobs created indirectly through the activities of telecoms companies, thereby opening up opportunities for technology and know-how transfer and thus value enhancement. One illustration of the importance of indirect employment creation is the case of an European telecoms equipment manufacturer and its operations in Malaysia. The company started its activities in Malaysia in 1984, to fulfil a major contract with Telecom Malaysia (TM) for building up their infrastructure. Due to the size of the contract, a local manufacturing base was required, but has been closed down in 2001, after the contract expired. Since then, the company directly employs only 150 people in Malaysia, in R&D and marketing/sales, which arguably is not a major contribution to Malaysia's labour market. In terms of inter-firm linkages, however, indirect employment and technology/know-how transfer is rather remarkable. The Malaysia branch of the European firm is the source for indirect employment in the software, manufacturing and construction industries, as indicated by the local MD during an interview.

“[...] we are working together with low cost software companies to develop applications and content for new technologies such as GPRS or WAP or whatever. MIC Mobile Internet Centre, that is [our] lab where we test and verify those applications [...]”.(Interview, 24.02.2002)

“As far as I know just about everyone of those [software companies] are local companies. Established by young entrepreneurs, small companies, maybe the biggest of the companies has 30 people and typical size is maybe 10-15. [...] They are people who have ideas and believe in mobile internet and have established companies to develop these ideas to applications. What we are doing is we are providing our software tools and platforms that they can use to develop that idea to an application. We are giving the coaching and finance in all the areas that they are concentrating on. And manage all these connections to [our parent company] and do the testing and we do it free of charge”. (Interview, 24.02.2002)

“In this software thing, we have about 1,000 people working in that, doing applications. In the manufacturing of these set-top boxes we have a bout 1,000 people working in that. In the subcontractor networks we have a few thousand. All in all the number of people in relation to our activities is very very big but only a small number is our own people. That is the way how we do it [...].(Interview, 24.02.2002)

Another indicator for value creation is the investment in telecommunications services. In absolute terms, investment during the year 2000 has been highest in the Northeast Asian economies of Japan, China, Taiwan and South Korea (see Figure 7). The only European countries that come close to these figures are Italy and the UK. The relative importance of telecoms investment, however, becomes more evident by looking on its 1999 share in total gross fixed capital formation (see Figure 8). Again, China ranks among the countries most heavily investing in telecoms. Among the emerging economies of East Asia, Thailand and Malaysia are found above the world average of 3%, whereas the majority of the transformation economies in Eastern Europe belongs to that category.

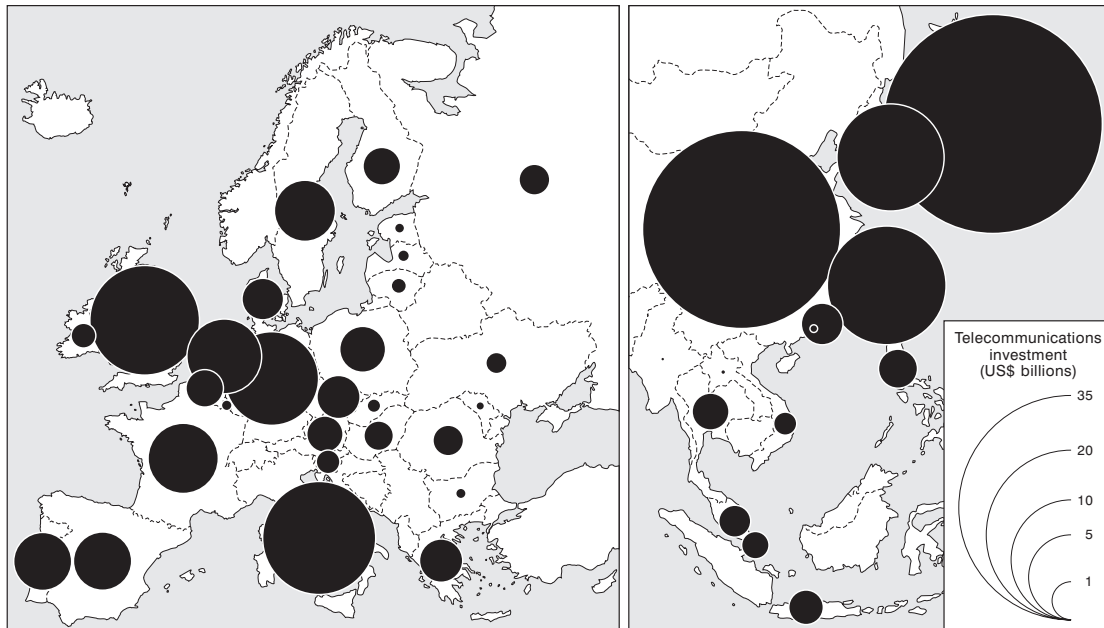


Figure 7: Telecommunications investment in Europe and East Asia, 2000
 Source: ITU 2002

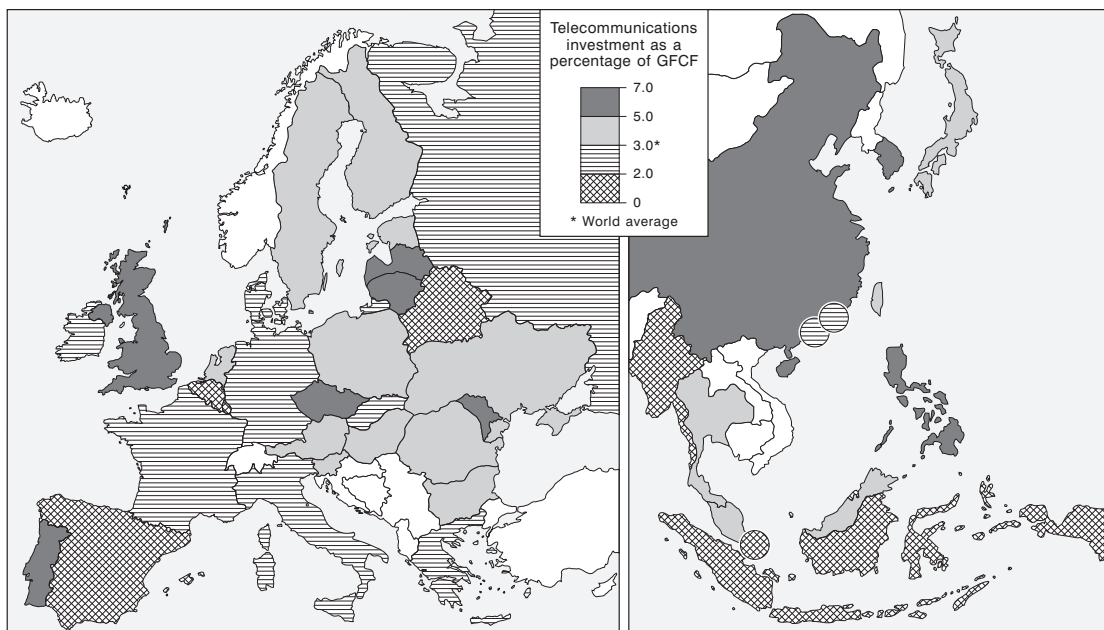


Figure 8: Relative telecommunications investment in Europe and East Asia, 2000;
 Source: ITU 2002

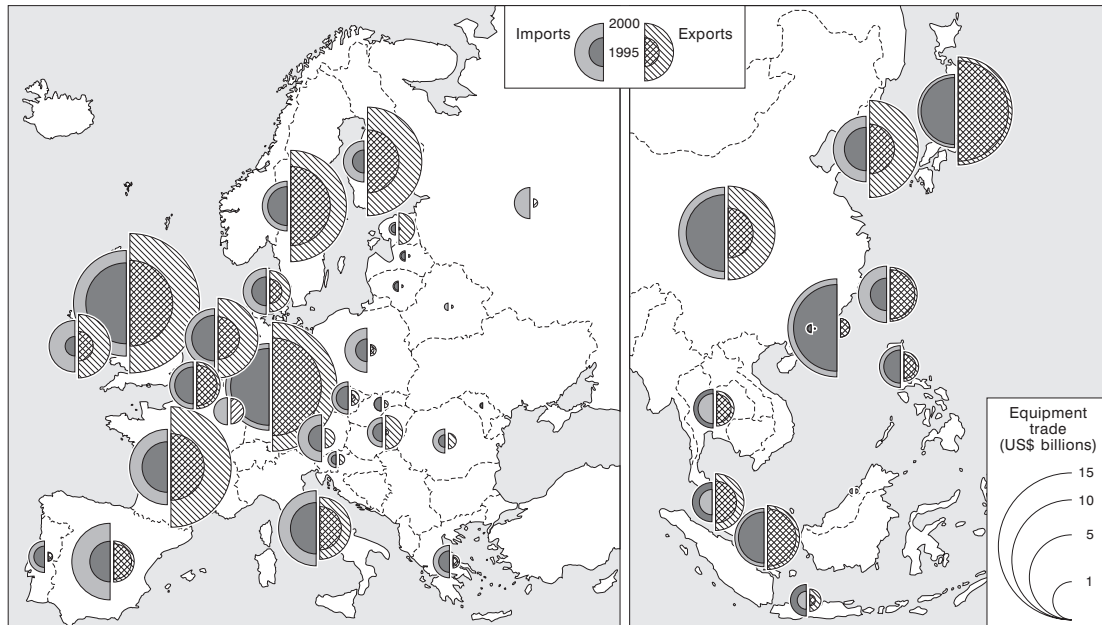


Figure 9: Telecommunications equipment trade in Europe and East Asia, 1995-2000

Source: ITU 2002

While the amount of investment in Asia demonstrates the importance of the region as a market, a look at the telecoms equipment trade figures for the years 1995 and 2000 indicates the dominance of European vendors over that period of time (see Figure 9). An outstanding example is Finland, home to the equipment maker Nokia. Exports of this company alone account for about 25% of all Finnish exports (Castells and Himanen, 2002: 43) and about 70% of Finnish ICT exports. Similarly, Sweden generates high export volumes partly due to its telecoms giant Ericsson, as do Germany (Siemens) and France (Alcatel). Thanks to direct investment in equipment manufacturing facilities, Ireland and the UK also expanded their telecom equipment export base, being a preferred location manufacturing base during that time. In Asia, Japan and South Korea were a major source of exports, with China catching up quickly. Hit by the financial crisis, Thailand, Malaysia and Indonesia are the only countries that have experienced a contraction of imports from 1995 to 2000, while moderately expanding their exports. Behind this picture lie the changing strategies of

equipment manufacturers towards globalisation and restructuring, which transformed the global production networks of the players involved and led to a shift in the locational structure of these GPN in Europe and Asia.

Telecom equipment can be broadly differentiated into two categories: network and switching equipment, and terminals. This section will concentrate on the global production networks of mobile phones and the changes of value added, power and embeddedness within them under globalisation. Since the introduction of mobile telephony about 15 years ago, a small number of vendors has established themselves as market leaders in this segment. By far the largest company producing and selling mobile phones is the Finnish Manufacturer Nokia, with about 35% market share worldwide and shipments of almost 140 Million handsets in 2001 (Törnroos, 2002: 10). Nokia is followed by Motorola (USA), Samsung (South Korea), Siemens (Germany) and SonyEricsson, the recently created Swedish-Japanese mobile phone joint venture. Together, these five companies cover about 75% of the world market for handsets and therefore their strategies and GPN very much dominate this subsector. A common denominator for all the leading handset manufacturers is their strategy towards relocating the actual manufacturing activities to low-cost sites. Since handsets have become commoditised, the value added in the manufacturing process has fallen sharply, according to the smile curve mentioned earlier, and hence economies of scale are crucially important. Therefore, the assembly of mobile phones has been scaled down in the United States and Western Europe, while production has been increased in Eastern Europe and East Asia. The Japanese firm Panasonic Mobile Communications, for instance, has relocated its plant in Thatcham/UK to the Czech Republic, while Nokia has partially withdrawn from manufacturing in the US and expanded production at its Mexico and South Korea plants. What is different among

the main players in this field is their strategy towards outsourcing. Every lead firm is using EMS companies now as contract manufacturers, but to different degrees. Nokia, the market leader, still produces about 80% or more of its handsets in house, at 8 locations worldwide, which is economically feasible only through the sheer volume of production. By the same token, South Korea's Samsung does the bulk of production still in house. On the other hand, SonyEricsson has given up all of its own manufacturing and cooperates with Flextronics as EMS partner, which took over the previously Ericsson-owned plants. Siemens runs a strategy of both in house manufacturing and outsourcing, because it sees production know-how as a core competence and does not want to lose the know-how related to it, despite profit margins being negligible or even negative. Interestingly, whatever strategy these focal firms have chosen, in most cases the effects of societal embeddedness or home-country effects, as well as network embeddedness can be found in the GPN inter-firm relationships with their suppliers and EMS partners.

It often – though not exclusively - can be observed that the focal firms prefer partners and suppliers of their own nationality or culturally proximate countries, because of similar corporate cultures, often long standing business relationships and a resulting high level of trust. As one interviewee from a mobile phone EMS put it,

“[...] well, I am a [country x citizen], a [country x citizen] trusts a [country x citizen], like that. They might not trust someone else – maybe that's the benefit” (Interview, 25.11.2002).

It is notable, for instance, that Nokia cooperates with a Finnish EMS firm, Motorola uses a US company, Japanese handset manufacturers like NEC – initially reluctant to follow the outsourcing model at all – started to create their own EMS spin-offs and only very lately engaged in outsourcing relationships with Western firms. Siemens and SonyEricsson, however, chose Flextronics as their EMS partner, a Singapore-

based, US-managed firm with global operations. The co-evolution of suppliers and focal customers is also reflected in the business relationships between handset manufacturers and handset cover suppliers. Siemens is working with the German Balda AG, while Ericsson's lead supplier is the Sweden-based Nolato. Motorola uses the US company Nypro, while Nokia's main supplier is the Finnish firm Eimo. With the globalisation of handset manufacturing the focal firms asked their lead suppliers to follow them to new production locations, mostly in East Asia and Eastern Europe. Thus these societally embedded inter-firm relationships were transplanted to different geographical and cultural contexts. To some extent, this is similar to developments in the car and car components industry, including the development of territorially embedded telecom clusters of producers, suppliers, and logistics companies. These clusters are developed by brand name firms and EMS firms alike, as the examples of the Nokia-led Xingwang Industrial Park in Beijing (cf. Liu et al., 2003), the Finnish ICT cluster (cf. Leinbach and Brunn, 2002; Castells and Himanen, 2002) or the Flextronics-led Industrial Park in Hungary show. Much like the car industry, the major suppliers were 'persuaded' to follow the manufacturers to these locations. The preferred outsourcing partners usually are obliged to use suppliers chosen by the OEM or brand name holder, a fact which is not always economically viable and beneficial for the EMS manufacturer. One Asian plant of a large EMS, for example, has to use European suppliers certified by the OEM customer, even for low-value products:

"Some of the packaging moves to us from operators in [customer's home country]. [Our customer] has some interest in these suppliers, maybe they have some shares in these suppliers so they want to use them. [...] We are trying to localise, that is our plan. Once you have local suppliers, they become easy to deal with. [...] The cover is coming from [the customer's home country] and the UK. Imported. It doesn't make sense but they don't have a plant here. They should set one up. [...] That's right that

could be one of the reasons why – I’m gonna be honest with you – why [our customer] has not been doing very well financially. Some of these divisions are not understandable and not financially sound. It’s common sense, if you’re making a component which is a couple of cents and you look at the whole cost of the product, the product cost, material cost is probably 40% and 60% transportation cost, not very productive” (Interview, 26.04.2002).

A similar story of lock-in into particular networks through co-evolution was the development of Finnish EMS firm Elcoteq, having had an over-reliance on two customers, as shown by Wallin (2002: 11):

“[...] in the beginning of 2001, Elcoteq encountered in a very harsh way the risks related to a very close focus on a small number of large customers. Poor financial performance forced Ericsson to close down all its own mobile phone manufacturing plants in high-cost European countries, and without informing Elcoteq formed an agreement with Flextronics, a Singapore/US based manufacturer with 80 000 employees to sell all its European plants. In one single deal, announced 26.1.2001 Flextronics took over the entire manufacturing of Ericsson’s mobile phones, which Ericsson had already agreed should be contracted out to Elcoteq’s plants in Hungary and Tallin. This was a major blow for Elcoteq, and the company’s shares lost 55% of their value in one day. The result was that Elcoteq had to close its mobile phone manufacturing operations in both Hungary and Estonia”.

From this, it seems obvious that power within the mobile phone GPN lies with the brand name holders. However, as EMS firms and suppliers accumulate technical and production know-how, the balance of power between suppliers, EMS and brand manufacturers becomes more evened, since the brand name holders have to rely more and more on the quality and capabilities of their partners. Not least, the power of customers has to be taken into consideration, with the mobile operators now being the largest purchasers, placing single orders of up to 10 million handsets or more. The downstream end of the mobile phone GPN also proves the complexity of business networks in this sector:

“This is a very complex distribution model. As you have three layers, there are more but let’s say three significant layers. Network operators, distributors, and retailers. Those retailers may either be fully owned by operators, Vodafone stores for example, or independent [...] A market like Poland is 100% dominated by network operators. Anything you sell as a manufacturer goes to an operator and then they sell it. A market like Sweden or Greece is rather retail driven. [...] Going back to the distribution model, [...] the interesting thing is that all these channels sell to each other. Manufacturers sell to operators, manufacturers sell to distributors, and manufacturers sell to retailers. At the same time that operator may sell to the same distributor, so that distributor may get the product from two channels. For the retailer it’s the same thing. The retailer may get it directly from us or he may get it together with a subscription from the operator or he may get it from a distributor. So it’s a rather complex model where all these layers cooperate and work independently at the same time”. (Interview, 26.07.2002)

[Figure 10: GPN elements of Siemens handset manufacturing]

[Figure 11: GPN elements of SonyEricsson handset manufacturing]

Mobile network operators have become key players in the telecoms industry. Even before the introduction of mobile telephony, incumbent operators have been crucial in generating the kind of sophisticated demand that drove the telecoms innovation system (cf. Berggren and Laestadius, 2003). Liberalisation and deregulation of the telecommunications sector enabled and triggered the globalisation of network operators. The strategies and the successes in gaining access to foreign markets differ considerably. To date, the most globalised mobile service provider arguably is the UK-based Vodafone (see Figure 12), one of the new entrants in the telecoms market and not related to ex-PTOs, therefore being free of many restrictions former state-owned companies still faced at the time. While many European providers were struggling with restructuring processes in the post-PTO phase, Vodafone was from the beginnings concentrating on mobile service provision and international expansion. Building strategic partnerships with foreign firms early on allowed it to successfully compete with other bidders – also forming complementary partnerships - for mobile

licenses in different countries. Later on, Vodafone's financial power enabled them to merge with or acquire its main competitors abroad, as was the case with Airtouch in the United States and the hostile takeover of Mannesmann Mobilfunk in Germany.⁴

"[...] we were almost unique in that Jerry [the company's founder] went to all the opportunities. There was a guy in California who ran the operation in California, the mobile phone network there, [...]. He had the same vision and the company was called Airtouch. And Airtouch also went for the same licenses that we ran for and basically what it boiled down to in all of the financial markets was we would be in one partnership and they would be in another partnership both trying to bid for a license. And if we won they lost and if we lost they won. [...] Because what happened was we had Vodafone building up an overseas empire of partnerships and we had Airtouch building up an empire on the other hand, and they didn't overlap because where we won they lost. So, we eventually got eight or nine countries and they've actually got eight or nine countries and they went ... like that ... absolutely perfect". (Interview, 20.7.2002)



⁴ In many countries, following the example of the UK, one mobile license was given to the national incumbent, while another one or more licenses were given out to tender. Since foreign firms weren't allowed to bid in some countries, partnerships with and financial investment in domestic firms and the backing of banks was essential.

Figure 12: Vodafone's proportionate customer base 2001/02;
 Source: Company Information



Figure 13: Orange's proportionate customer base 2001/02
 Source: Company Information



Figure 14: T-Mobile's proportionate customer base 2001/02

Source: Company Information



Figure 15: NTT DoCoMo's proportionate customer base 2001/02

Source: Company Information



Figure 16: Singtel's proportionate customer base 2001/02

Source: Company Information

The other main European mobile providers, like Orange (France) and T-Mobile (Germany) have not yet reached a comparable status of global presence, and even less so have the largest operators in Asia, NTT DoCoMo from Japan and Singtel from Singapore (see Figures 13-16). Although NTT DoCoMo is highly successful in the domestic market and has pioneered 3G services, its globalisation strategy was until recently hindered by Japanese regulations. Compared to the telecom equipment vendors and their GPN, the major mobile service providers – with the exception of Vodafone - are still rather confined to their respective macro-regions, i.e. Europe and Asia. This not only has to do with regulatory frameworks and corporate financial restrictions, but also reflects the fact that knowledge about markets and the ability of creating connections and contacts is important, especially for smaller players, as illustrated e.g. in the case of Thailand's Jasmine Group (Pananond, 2001). Understanding customers demands gets even more crucial as operators try to tap the high value-added opportunities in software, applications, and mobile content.

Outlook

The last decade has witnessed tremendous transformations within the telecommunications industry. Privatisation and deregulation, digital convergence and mobile voice and data transfer have reshaped the power configurations within the sector, changed the nature of the value-added networks and redrawn the global map of telecoms equipment manufacturing and service provision. Telecom GPN have grown into more and more complex constellations of business activities, and the rise of a mobile multimedia industry has attracted new players in this field. While the era of 3G mobile communications is just about to start, the industry will be increasingly dependent on new value-added services like mobile internet access, online gaming,

video and entertainment. So far, NTT DoCoMo's I-mode service is leading the path to mobile multimedia, while vendors and network operators alike try to tap this market and building up alliances with software developers, mobile portal companies and contents providers. Future research, therefore, will have to draw attention to the growing links between telecommunications and the media industry, enabling new applications for private customers, industries (e.g. telematics in cars) and organisations (e.g. electronic government).

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